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THE IMPACT OF COVID-19 AND THE CHALLENGES OF OCCUPATIONAL HEALTH: A BIBLIOMETRIC AND ANALYTICAL APPROACH TO INFECTION CONTROL

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Abstract: This paper presents a bibliometric analysis of occupational risks, focusing on scientific literature published between 2020 and 2024, highlighting the impact of the COVID-19 pandemic on occupational health and safety. The aim is to identify emerging trends, gaps in research and discuss the results obtained, with a view to informing future policies and practices in occupational health and infection control. The research used VOSviewer software to visualize the co-occurrence of terms and Excel to tabulate the data, analyzing articles indexed in the ScienceDirect database. The results reveal a growing emphasis on topics such as COVID-19, mental health, ergonomic practices and preventive measures, including the use of Personal Protective Equipment (PPE), social distancing and hygiene protocols. In addition, the increase in psychosocial challenges such as anxiety and depression stands out, highlighting the importance of promoting mental health in the workplace. The analysis also highlights intense international collaboration and discusses ethical issues related to resource allocation and access to treatment. This study provides a solid basis for future research and practical recommendations, contributing to the creation of safer and healthier work environments, both in crisis contexts and in normal situations.

Keywords: Occupational Risks; Bibliometric Analysis; Occupational Health.

INTRODUCTION

Occupational risks are an essential part of safety analysis in the workplace, involving situations, conditions or substances that have the potential to harm workers' health and safety. These risks vary widely depending on the nature of the work activities, the industry in question and the specific conditions of each workplace. Identifying and properly managing these risks is fundamental to ensuring a safe and healthy working environment (AZER, 2015).

Occupational risks are divided into five major groups, with physical risks being one of the most common. These risks are associated with physical agents which, depending on their intensity, frequency or duration of exposure, can cause damage to the body. Prolonged exposure to high levels of noise, typical in industrial environments such as factories and buildings, can cause hearing loss. In addition, extreme temperatures, both intense heat and severe cold, pose significant health risks and can lead to conditions such as heatstroke or hypothermia without adequate protection. Vibration, which affects operators of vibrating equipment, can also result in related health problems (FAHIMNIA; SARKIS; DAVARZANI, 2015).

Chemical risks are another important set of occupational hazards. They include exposure to toxic chemicals in chemical industries, laboratories or agricultural sectors, which can lead to serious health problems such as cancer or irritation of the skin and mucous membranes. In addition, inhaling dust and fumes from substances such as silica or asbestos can cause serious respiratory damage. Biological risks are those related to exposure to pathogens, representing a danger for workers in fields such as health and laboratories, involving the risk of infection by viruses, bacteria or fungi. In Brazil, occupational chemical risks are regulated by Regulatory Standard 15 (NR 15), which sets limits for exposure to chemical agents (GARFIELD; PARIS; STOCK, 2006).

However, NR 15 is criticized for being out of date with recent advances in toxicology and occupational hygiene. In comparison, international standards such as those of the ACGIH (American Conference of Governmental Industrial Hygienists) are frequently updated on the basis of new research, offering stricter guidelines for the protection of workers. Therefore, adopting these international standards can provide a more up-to-date and effective basis for ensuring safer working environments.

Ergonomic risks are related to working conditions that can cause physical discomfort or injury. Inadequate handling of heavy loads, which can lead to spinal problems, and maintaining inappropriate postures for long periods, increase the risk of musculoskeletal disorders. Psychosocial risks, an area of cognitive ergonomics, have also become a growing concern. Occupational stress due to excessive workload, pressure for deadlines and conflicts in the workplace can damage workers' mental health, leading to conditions such as depression, anxiety and Burnout Syndrome. In addition, bullying, whether from colleagues or superiors, has a serious impact on workers' mental health (MULLER et al., 2016).

Accident risks include situations such as falls from height, especially in places without adequate protection, and accidents caused by faulty equipment, which can result in serious injuries such as amputations or crushing. To minimize these risks, it is crucial that employers and workers are vigilant and adopt effective preventive measures. This includes complying with occupational safety regulations and using personal protective equipment (PPE) correctly. Protecting the health and integrity of workers should be a priority in all work environments (SHUAIB et al., 2015).

The global health crisis has introduced unprecedented challenges to work environments, exacerbating existing risks and creating new dangers. Workers in various fields, especially in healthcare, have faced elevated exposure to the virus, increasing the need for strict infection control practices. In addition, the transition to remote working has brought to light ergonomic issues related to the home office, such as poor posture and an increase in musculoskeletal disorders. Workers' mental health has also been profoundly affected by social isolation, economic uncertainty and the continuous pressure to adapt to new ways of working, highlighting the need for integrated approaches to promoting well-being (Brigham; Allbright; Harris, 2020).

In English, there are two terms referring to occupational risks. Occupational risk means the possibility of a worker suffering a certain work-related injury. Diseases, pathologies or injuries suffered as a result of work or during work are considered work-related injuries. Occupational Hazard refers to the risk accepted as a consequence of a particular occupation (WALSH et al., 2018).

With the increasing availability of bibliometric analytical software, the use of citation analysis and other markers has become common to identify the main works and authors in a specific field (Shuaib et al., 2015; Muller et al., 2016; Walsh et al., 2018). The number of citations of an article is often used to measure its impact, with a high number of citations being indicative of greater relevance (Azer et al., 2015; Walsh et al., 2018). In addition, the analysis of bibliometric indicators, such as terms in titles, abstracts and keywords, also helps to assess the impact of research, revealing which authors, journals and topics are influencing or motivating the field (Garfield, Paris & Stock, 2006; Pendlebury, 2008).
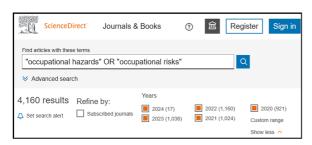
Using co-occurrence maps generated from bibliometric data, it investigates the interrelationships between topics such as ergonomic practices, workers' mental health, infection control measures and their implications for productivity and well-being. This methodology visualizes connections between keywords and themes in scientific literature, revealing emerging patterns and trends that are not evident in traditional analyses. The maps highlight thematic clusters and areas of interest, offering a detailed view of research dynamics and collaborations between researchers and institutions globally by analyzing keywords, titles and abstracts of studies (Amoadu et al., 2023).

Therefore, the aim of this paper is to present the results of a bibliometric analysis on occupational risks and to report on the characteristics of these studies, such as the main terms used in titles, abstracts and keywords, referenced between 2020 -2024. In addition, we sought to identify the emerging needs of work environments. Focusing on examining how the interrelationships revealed by the co-occurrence maps can inform future policies and practices in occupational health and infection control. Through this detailed analysis, it is hoped to provide valuable insights that can contribute to the creation of safer and healthier working environments, not only in response to current crises, but also for future health and occupational contingencies.

MATERIALS AND METHODS

DATA COLLECTION

A bibliographic survey was carried out using the ScienceDirect database, which identified articles on Occupational Hazards published between 2020 and 2024, as shown in Figure 1. The searches were carried out using the following descriptors: "Occupational Risk" and "Occupational Hazard", in which the titles, keywords and abstracts were analyzed to make correlations between the terms. The Boolean operator OR (or) was used to relate the descriptors. A total of 4160 publications were analyzed.

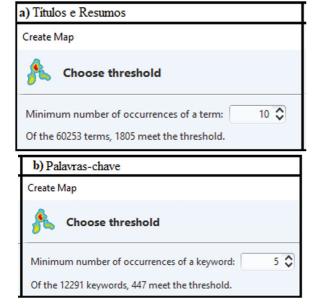**Figure 1** - Search and restrictions carried out on the ScienceDirect database

Source: Authors, 2024

ANALYTICAL TOOLS AND BIBLIOMETRIC INDICATORS

This study measured the impact of scientific research using standard bibliometric indicators available in the ScienceDirect database and the analytical software VOSviewer v.1.6.19. The VOSviewer software was used to visualize the co-occurrence networks of terms, which correlate the most frequent words present in titles, abstracts and keywords. Excel software was used to tabulate the data.

VISUALIZATION OF TERM CO-OCCURRENCE NETWORKS

To analyze the co-occurrence of terms, all the articles in the database between 2020 and 2024 were considered (search carried out in October 2023). VOSviewer v.1.6.19 software for Microsoft Windows was used to create bibliometric diagrams that visualize the correlation between terms in the titles, abstracts and keywords of the articles. VOSviewer is effective in dealing with large data sets and offers several options for analysis, creating intuitive visualizations that help interpret the data (Fahimnia, Sarkis, Davarzani, 2015). The software organizes the related terms into colored groups, with the size of the circles representing the frequency of occurrence and the proximity between the items indicating their degree of relationship (Van, Ness & Waltman, 2010). Terms with at least 10 occurrences in titles and abstracts and at least 5 occurrences in keywords were selected. This resulted in 1805 terms for titles and abstracts and 447 terms for keywords, as illustrated in Figure 2. To identify emerging trends, the VOSviewer text mining method was used (Fahimnia et al., 2015).
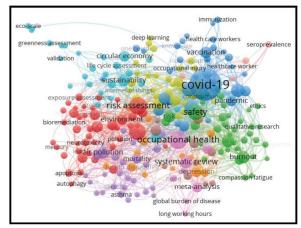
Figure 2 - Number of terms eligible for bibliometric analysis in a) Titles and Abstracts, and b) Keywords

Source: Authors, 2024

RESULTS

The resulting co-occurrence maps were created by analyzing and interconnecting the terms used in the keywords, titles and abstracts of the articles. The co-occurrence correlations presented in these maps were fed by 4160 articles published in the last 5 years (2020-2024) from the ScienceDirect database. Terms that appear repeatedly in different maps generated by the VOSviewer v.1.6.19 software will only be correlated on their first appearance, in order to reduce the repetition of ideas and avoid prolixity.
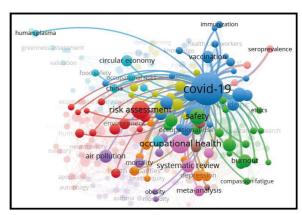
The general map is the first result generated by the software after analyzing 447 keywords, as can be seen in Figure 3. The main terms highlighted on this map are: COVID-19, "pandemic", "risk assessment", "safety", "occupational health", "mortality" etc. In this way, it is possible to observe a trend in the works published in the last 5 years on the reality before, during and after the pandemic, as well as its effects on workers' health. Each of the terms mentioned above will be discussed in more depth later.

Figure 3 - General co-occurrence map for the keywords

Source: Authors, 2024

The co-occurrence map centered on the term COVID-19 reveals important correlations for understanding the dynamics of the risks associated with the pandemic (Figure 4). COVID-19 has had a significant impact on occupational health and safety, resulting in a series of studies on exposure to the virus in a variety of environments, such as hospitals and industries. Research also focuses on prevention measures during the pandemic, including the use of PPE, physical distancing, ventilation and hygiene protocols (Ciccarelli; Papetti; Germani, 2023).
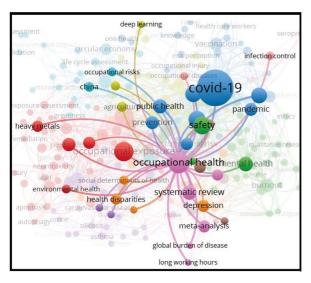

Figure 4 - Co-occurrence map centered on the term COVID-19

Source: Authors, 2024

Studies on risk assessment related to CO-VID-19 reflect concern about the seriousness of the pandemic scenario. Researchers have analyzed the spread of the virus in the workplace, identified vulnerable groups and developed strategies for prevention and mitigation. Occupational health has gained importance, with a focus on protecting workers through monitoring exposure to the virus, access to healthcare and creating safe working environments (De Perio; Kobayashi; Wortham, 2020).

Vaccination against COVID-19 has emerged as a crucial strategy for reducing occupational risks. Studies have evaluated the effectiveness of vaccines and vaccination policies in the workplace, highlighting how mass immunization has helped reduce the spread of the virus and the associated risks in the workplace.
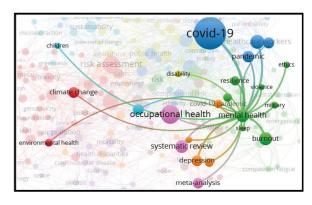

Figure 5 - Co-occurrence map centered on the term "occupational health"

Source: Authors, 2024

The map centered on "occupational health" (Figure 5) shows correlations with terms such as "health disparities", "environmental health", "public risks", "infection control", "long working hours" and "global burden of disease". Occupational health aims to protect and improve the health of workers, taking into account factors such as health disparities,

which reflect systematic differences in outcomes between population groups. These disparities can result from inequalities in exposure to risks and access to healthcare at work (Emmatty; Panicker, 2019).

Environmental health is crucial, as it assesses how environmental factors in the workplace, such as exposure to hazardous substances, affect workers' health. Public risks, which can originate from workplaces, also impact the community and are relevant to occupational health. Infection control is vital, especially in the post-pandemic context, encompassing measures such as hygiene, PPE and social distancing. Long working hours, in turn, are associated with fatigue and stress, affecting health. The global burden of disease refers to the prevalence and impact of diseases and injuries at a global level, with occupational health playing a significant role in mitigating these risks.

The map centered on "mental health" (Figure 6) reveals correlations with terms such as "resilience", "depression", "burnout", "sleep", "disability", "ethics" and "violence". Mental health is a state of emotional and psychological well-being that allows you to cope with stress, maintain healthy relationships and make informed decisions. Resilience is fundamental to maintaining mental health, helping people to face and overcome adversity.
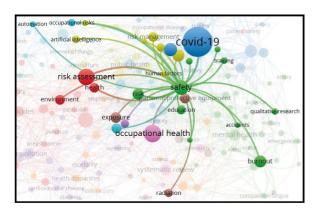

Figure 6 - Co-occurrence map centered on the term "mental health"

Source: Authors, 2024

Mental health is a state of emotional and psychological well-being that allows you to cope with stress, maintain healthy relationships and make informed decisions. Resilience, which is crucial for mental health, helps to cope with adversity and emotional challenges, allowing for recovery and personal growth. The prevention of depression is important, as resilience can mitigate the impact of mental disorders (Gandhi et al., 2023).

Burnout, or Burnout Syndrome, is mental and physical exhaustion caused by stress, especially at work, and was recognized by the WHO in 2022 as an occupational disease. The syndrome can precede depression and requires appropriate prevention and treatment. Sleep disorders affect mental health, making it essential to promote healthy sleep. Mental health-related disability requires support and inclusion, ensuring support for full participation in society. Ethics are fundamental in the treatment and support of people with mental health challenges, ensuring fair and respectful practices. Violence has severe impacts on mental health, and it is crucial to address prevention and support for victims.

Figure 7 - Co-occurrence map centered on the term "safety"

Source: Authors, 2024

The map centered on "safety" (Figure 7) reveals correlations with terms such as "education", "risk", "risk management", "human factors", "accidents", "training" and "personal protective equipment" (PPE). Safety in the workplace aims to protect individuals from risks and dangers that could harm their health and integrity.

Education is key to promoting safety, informing workers about risks and critical procedures. Training is essential for risk management and the proper use of PPE, raising awareness of specific risks and preventing accidents. In addition, training helps ensure compliance with safety regulations, promoting a culture of safety and creating safer and more productive work environments (Kalliny; Mckenzie, 2017).

Risk assessment and management are common practices for identifying and controlling risks, developing policies and protocols to prevent accidents. Human factors, which include how actions and behaviors affect safety, are also important. Human factors training improves workers' ability to make safe and effective decisions in the workplace.

CONCLUSIONS

The initial analysis revealed important trends in the scientific literature, highlighting the growing emphasis on ergonomic practices to reduce infection risks and the adaptation of work environments to the new health requirements of the pandemic. There has also been a significant increase in publications on workers' mental health and the impact of infection control measures on productivity and well-being. The data indicates intense international and interdisciplinary collaboration, reflecting the urgency and complexity of the challenges posed by COVID-19 in the workplace.

The COVID-19 pandemic raised the profile of occupational health and safety, highlighting the need to understand and analyze the risks to which workers were exposed. Exposure to the virus became a central concern, leading to the implementation of preventive measures such as social distancing, the use of

PPE and strict hygiene protocols. Risk assessment and adequate training became essential to ensure safe working environments.

In addition, the pandemic has intensified mental health challenges, with increased anxiety and depression due to uncertainty and social isolation. Promoting mental health at work has become a priority, with a focus on psychological support, resilience and stress management. Healthy habits, such as exercise and adequate rest, were highlighted as essential for well-being and performance at work.

Ethical issues also emerged, particularly in the allocation of limited health resources and access to treatments. Ethics was crucial in making decisions about resources and patient treatment. Considering all these interconnected aspects is key to ensuring safe working environments, supporting workers' mental health and making ethical decisions during the pandemic.

Bibliometric research is an essential tool for researchers in the field of occupational health and safety, as it makes it possible to identify trends and gaps in scientific research. By mapping academic production and analyzing the relevance of studies, these methodologies provide a detailed overview of the current state of knowledge, facilitating the identification of emerging themes, the prioritization of critical issues and the promotion of evidence-based policies.

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