Proceedings of The 3rd International Conference on Science and Islamic Studies
ISSN: 3024-9058 (Online - Elektronik)
Volume: 3, 2025
Publisher: Program Pascasarjana, UIN Alauddin Makassar

THE DYNAMICS OF OCCUPATIONAL HEALTH AND SAFETY RESEARCH IN HOSPITALS: A BIBLIOMETRIC ANALYSIS (2014–2024)

Ilham A Rifai[1], Hasbi Ibrahim[2], & Fatmawaty Mallapiang[3]

[1,2,3]Universitas Islam Negeri Alauddin Makassar, Indonesia
Correspondence Email: Ilhamarifai79@gmail.com

ABSTRACT

This study aims to map the development of research related to Hospital Occupational Safety and Health (K3RS) through a bibliometric study based on the keywords "hospital" AND "OHS" using data from PubMed without time restrictions. Data were collected using Publish or Perish (PoP) software and analyzed with Microsoft Excel for publication trends and VOSviewer for author collaboration network analysis and keyword relevance. The results of the analysis show fluctuations in the number of publications, with a peak in 2022, the dominance of topics such as clinical outcome evaluation, risk management, and public health interventions, and the formation of three main clusters of interrelated research. This study concludes that OHS research is multidisciplinary and continues to evolve, but collaboration, innovation, and policy integration still need to be strengthened to improve the effectiveness of the OHS system in hospitals.

Keywords: Occupational health and safety; Hospital; Bibliometrics; VOSviewer

1. INTRODUCTION

Occupational Safety and Health in Hospitals (OSH) is a central issue in modern hospital management, given the high risk of exposure to hazards faced by healthcare workers, patients, and visitors. Recent studies highlight that the hospital environment has a higher complexity of risks compared to other sectors, ranging from exposure to chemical, biological, and ergonomic hazards to psychosocial risks such as stress and burnout. This requires the implementation of an effective and adaptive OSH management system that responds to the dynamics of the healthcare sector (Astnell et al., 2016).

Since the COVID-19 pandemic, attention to patient and healthcare worker safety culture has increased significantly. Bibliometric studies show a surge in publications related to patient safety culture and occupational health in the 2020–2024 period, with a tendency to use quantitative approaches and multidisciplinary collaboration in OSH research. This increase is driven by the need for optimal protection for healthcare workers amid increasingly complex workloads (Gallo & de la Cruz, 2025).

Copyright © 2025: the Author(s)

The implementation of OHS management systems in hospitals has evolved by adopting multi-criteria-based models such as AHP and DEMATEL, which prioritize management system improvements, institution-specific risk assessments, and the determination of contextual control measures. Recent research confirms that hospital leadership involvement and the application of Total Quality Management (TQM) play a crucial role in strengthening safety culture and the effectiveness of OSH programs, especially in hospitals with limited resources (Yeşilgöz & Arga, 2025). However, challenges in implementing K3RS are still frequently encountered, such as low compliance with the use of personal protective equipment, lack of continuous training, and suboptimal supporting infrastructure. Studies in several hospitals in Indonesia and other developing countries show that the success of OSH programs is greatly influenced by management commitment, facility availability, and the active participation of all hospital elements (Damayanty et al., 2022).

The positive impact of good OSH implementation not only improves the safety of health workers but also contributes to the overall quality of hospital services. Hospitals that are accredited and consistently implement OSH standards have been shown to have lower rates of workplace accidents and higher workforce productivity. However, gaps in the implementation of OSH standards still exist, indicating the need to strengthen regulations and integrate OSH into hospital quality management systems (Latuconsina & Liklikwatil, 2024). In addition, technological advances have also encouraged innovation in OSH management, such as the use of the Internet of Things (IoT) for risk monitoring and the development of digital applications to support incident reporting and online training for health workers. These innovations are expected to improve the effectiveness of monitoring and response to potential hazards in the hospital environment (Nasution & Mahyuni, 2020).

In recent years, the knowledge gap regarding chemical exposure in the workplace in low- and middle-income countries (LMICs) has continued to be a major concern. Exposure to hazardous substances such as vapors, gases, dust, metals, pesticides, and particles is still prevalent in the manufacturing, mining, and agricultural sectors in these countries, but quantitative data on exposure levels and health impacts are still very limited. The latest global mapping study confirms that the lack of data and monitoring systems in several regions means that the risk of occupational diseases due to chemical exposure has not been fully identified and addressed, requiring efforts to optimize research and exposure assessment systems to reduce the incidence of occupational diseases in developing countries (Quintero Santofimio et al., 2024).

Based on the above description, this study aims to map OHS research through bibliometric analysis based on the keywords "hospital" and "OHS" to determine trends, network visualization, overlay visualization, and density visualization.

2. METHODS

The data in this study were collected using the Publish or Perish (PoP) software version 8, with PubMed selected as the primary search source. The keywords used were "hospital" AND "OHS," with no start year restriction until the end of 2024. The inclusion criteria applied encompassed publication types in the form of journal articles, while the exclusion criteria included publication types such as case reports, comparative studies, evaluation studies, English abstracts, controlled clinical trials, randomized controlled trials, case reports, and observational studies. The data obtained from PoP, consisting of 173 journal articles, were exported in RIS and .csv formats. They were then analyzed using Microsoft Excel to compile publication trend charts and VOSviewer

to conduct bibliometric analysis covering co-authorship relationships and keyword co-occurrence linkages.

3. RESULTS AND DISCUSSION

Based on the PubMed search results using the PoP application with the keywords "hospital" AND "OHS" entered in the keyword search tab field without setting a start year until 2024, 197 published journal articles from 2012 to 2024 were obtained. After filtering based on inclusion and exclusion criteria, the final number of articles was 167.

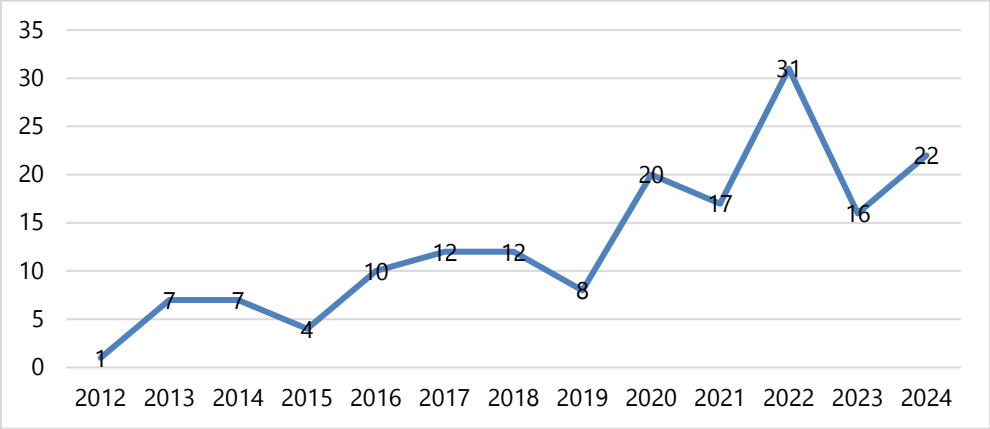


Figure 1. Publication Quantity Distribution

Based on the chart above, it can be observed that the number of journal article publications with the keywords "hospital" AND "OHS" fluctuated from 2012 to 2024. The highest number of publications occurred in 2022 with a total of 31 publications, then dropped drastically in 2023 to 16 publications, and rose again in 2024 to 22 publications.

Table 1. Article Sources Based on the Highest Number of Journals Published on PubMed

No.	Source	Number of Articles	%
1	Cureus	6	3,56
2	BMJ open	4	2,4
3	Chest	4	2,4
4	Hip international: the journal of clinical and experimental research on hip pathology and therapy	4	2,4
5	PloS one	4	2,4
6	Acta orthopaedica Belgica	3	1,8
7	Journal of clinical medicine	3	1,8
8	Journal of clinical sleep medicine: JCSM : official publication of the American Academy of Sleep Medicine	3	1,8
9	The bone & joint journal	3	1,8
10	Jurnal lainnya (≤ 2)	133	79,64
	Total	**173**	**100**

Based on Table 1 above, the journal "Cureus" dominated publications with 6 journal articles (3.56%), followed by "BMJ Open", "Chest", "Hip International", and "PloS One" with 4 journal articles each (2.4%), while 133 journal articles (79.64%) were spread across various other journals with contributions of 1-2 journal articles each.

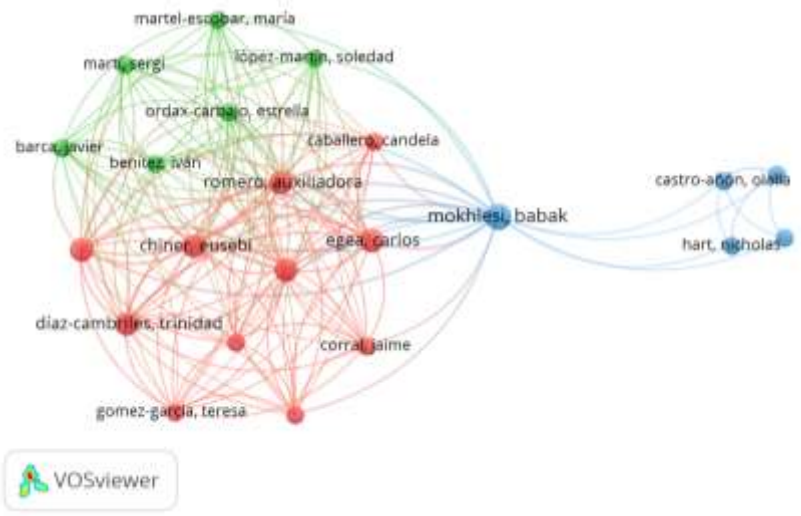


Figure 2. Co-Authorship

This co-authorship network visualization shows collaboration among researchers in publications related to "hospital" and "OHS" (2012–2024) by setting a minimum of 2 documents per author. From the 67 identified authors, analysis by VOSviewer revealed that 22 authors are interconnected, forming 3 clusters with a total link strength of 305.

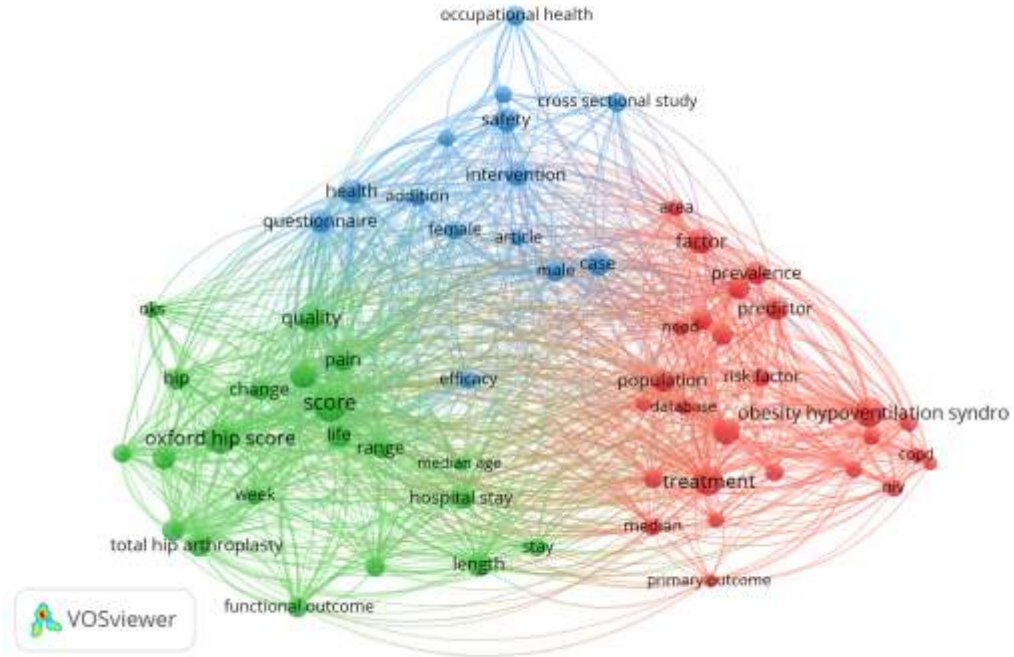


Figure 3. Network Visualization Analysis Results

The figure above shows the network visualization of keyword co-occurrence. The researcher set a threshold at this stage, where the minimum number of co-occurrences was 10. Out of 5872 keywords, 61 met this threshold. The keyword "score" ranked first with 56 occurrences and a total link strength of 443. In second place was the keyword "oxford hip score," followed in order by "treatment," "obesity hypoventilation syndrome," "quality," "improvement," "mortality," "factor," "safety," "health," and so on.

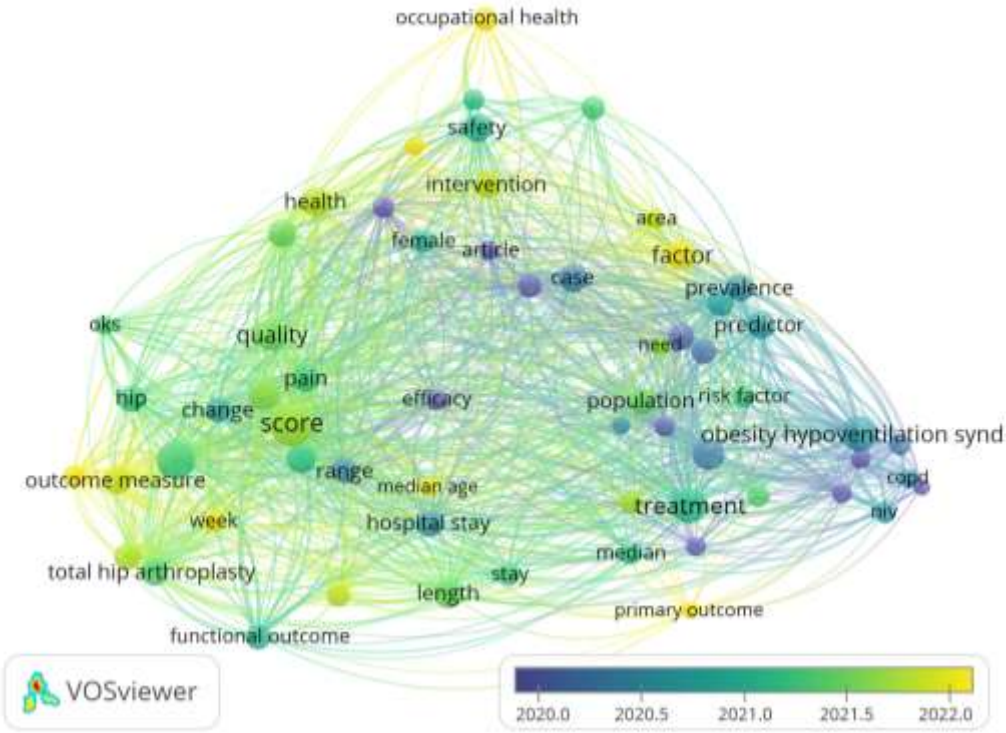


Figure 4. Overlay Visualization Analysis Results

Figure 4 above shows the keyword co-occurrence data with an overlay visualization. The color yellow represents the most recent keywords, meaning the keywords *occupational health*, *factor*, *median age*, *primary outcome*, and *prom* are keywords from articles published more recently, around 2021-2022.

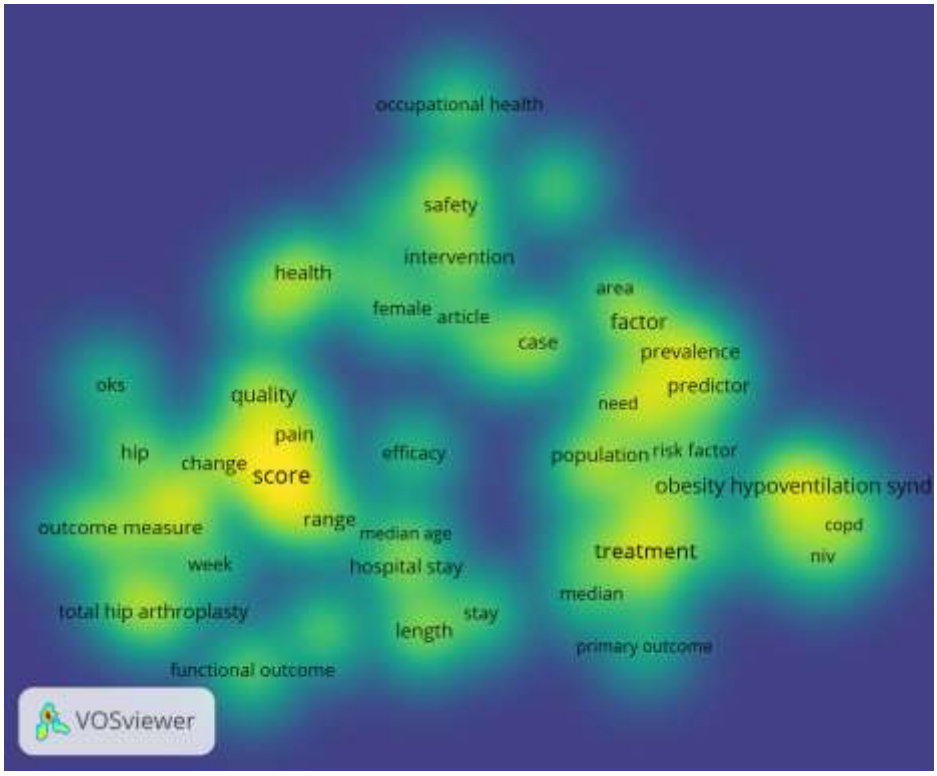


Figure 5. Density Visualization Analysis Results

In Figure 5 above, we can see how frequently or infrequently the keywords "hospital" AND "OHS" are discussed. This density visualization displays the frequency of topic discussion using a heatmap. The more frequently a topic is discussed, the more yellow its color becomes, while infrequently discussed topics appear more blue. Based on the figure above, it can be seen that the most frequently discussed keywords are "score," "treatment," "obesity hypoventilation syndrome," "oxford hip score," "quality," "improvement," and "mortality." Meanwhile, the three least discussed topics are "oks," "and," and "primary outcome."

Based on the VOSviewer analysis results of journal articles using the keywords "hospital" AND "OHS," 3 clusters with 61 items were identified. Cluster 1 contains terms related to diseases, risk factors, and clinical outcomes such as "comorbidity," "copd," "obesity," "mortality," and "risk factor," reflecting a focus on epidemiological and observational studies. Cluster 2 displays terms like "functional outcome," "hip," "pain," "score," and "significant difference," indicating themes around evaluating clinical outcomes post-medical or surgical procedures, particularly in orthopedics and rehabilitation. Meanwhile, Cluster 3 contains words such as "health," "intervention," "questionnaire," "participant," and "safety," pointing towards studies in public health, social interventions, and psychosocial aspects. These three clusters are interconnected within the healthcare service context but differ in their approaches: Cluster 1 focuses on identifying health problems, Cluster 2 on evaluating medical interventions, and Cluster 3 on the impact of interventions and community perception. This division helps in understanding the direction and scope of scientific research in the medical field more systematically.

A bibliometric study with the keywords "hospital" AND "OHS" (Occupational Health and Safety) shows that this topic has become a major focus in various countries with diverse challenges and approaches. In the health sector, OHS is crucial because hospitals are high-risk

work environments for occupational accidents and work-related illnesses, including exposure to chemical, biological, ergonomic, and psychosocial hazards (Molewa et al., 2021; Taskingul et al., 2024). Various studies highlight the importance of developing OHS management systems specifically tailored for the healthcare sector. These systems must be able to identify hazards unique to hospital environments, assess risks, and determine appropriate control measures. The development of OHS management models based on multi-criteria methods, such as AHP and DEMATEL, has been proposed to ensure that every aspect of risk in hospitals can be addressed in a structured and measurable way. The main priority criteria include improving the management system, determining control measures, and assessing institution-specific risks and hazards (Yeşilgöz & Arga, 2025).

However, the implementation of Hospital OHS programs often faces various challenges. These include a lack of worker understanding of hazard concepts, low compliance with the use of personal protective equipment, and suboptimal ongoing training and supervision. Studies in several hospitals reveal that the level of OHS knowledge and practices among workers still needs to be improved through routine training, supervision, and the development of a strong safety culture. Furthermore, strategic leadership and the application of Total Quality Management (TQM) have also proven to be crucial in strengthening the Hospital OHS system, especially in resource-limited hospitals (Fadhel & Alqurs, 2025; Karasu et al., 2025).

The positive impact of good Hospital OHS implementation is not only felt by healthcare workers but also directly contributes to improving the overall quality of hospital services. Research shows that accredited hospitals tend to have better OHS performance compared to non-accredited ones. Nevertheless, gaps remain in the implementation of OHS standards, indicating the need to strengthen regulations, provide incentives, and fully integrate Hospital OHS into the hospital's quality management system. This step is considered capable of increasing the intensity of health promotion and OHS activities within the hospital environment (Astnell et al., 2016; Habib et al., 2016).

Overall, the research landscape of Hospital OHS based on bibliometric analysis shows an increasing trend in publications over the last decade. The main focus is on management model development, risk evaluation, program implementation, and policy strengthening. These findings affirm that Hospital OHS is a multidisciplinary field requiring collaboration between hospital management, healthcare workers, regulators, and researchers. Moving forward, research in this field is expected to grow further with systematic and evidence-based approaches to support the creation of a safe and healthy working environment in hospitals for all parties.

Meanwhile, work-related illnesses associated with exposure to chemicals and carcinogens remain a major challenge, especially in developing countries. According to the International Labour Organization (ILO) report, more than one billion workers worldwide are exposed to hazardous chemicals every year. This indicates that the risk of occupational diseases remains high, particularly in countries with suboptimal monitoring systems. Weak regulatory mechanisms for new chemicals and limited use of effective occupational exposure limits also exacerbate the situation (ILO, 2021).

The knowledge gap regarding the risks and impacts of chemical exposure also hinders the formulation of evidence-based policies and adaptive protection strategies suited to local cultural contexts. This situation is common in sectors such as agriculture and manufacturing, where data on worker exposure, health records, and worker education are still very limited. Consequently, integrated interventions to prevent and manage occupational diseases are difficult to implement effectively (M. Zhang & Kim, 2025).

Global trends show that the burden of cancer due to workplace carcinogen exposure varies significantly between regions. Recent global studies note that regions with medium to low socio-economic indices, such as South Asia, Sub-Saharan Africa, and some countries in Latin America, show increased mortality and healthy years lost (DALYs) due to carcinogen exposure, particularly from asbestos, diesel exhaust, and other industrial chemicals. This is exacerbated by weak regulations and oversight in the informal sector (H. Zhang et al., 2025; Zou et al., 2025).

Furthermore, carcinogen exposure in the work environment not only increases the risk of lung and laryngeal cancer but is also closely linked to nasopharyngeal cancer incidence in East Asia and liver cancer in Sub-Saharan Africa due to aflatoxin exposure in the agricultural sector. In many developing countries, weak industrial oversight, low access to personal protective equipment, and the dominance of the informal sector make workers highly vulnerable to unprotected exposure (Elebo et al., 2024).

Other challenges in occupational health research in developing countries include data limitations, minimal funding, a shortage of trained experts, and high exposure variability in the informal and agricultural sectors, making it difficult to generalize research findings. Policy advocacy is often suboptimal because available research results have not been effectively utilized as references in formulating or revising national policies (Joseph & Arasu, 2023). Barriers to implementing occupational health surveillance and monitoring systems are also very significant, especially in low- to middle-income countries. National surveillance generally only covers the formal sector and large companies, while workers in the informal sector and migrant laborers are not reached. This leads to high underreporting and a failure to comprehensively detect various work-related health problems (Gaiotto et al., 2020).

To address these challenges, strengthening policies and institutional capacity, comprehensive worker education, responsive regulatory advocacy, and strong multidisciplinary collaboration are needed. Global efforts such as harmonizing chemical exposure assessment methods, developing integrated monitoring systems, and integrating community-based research with policy interventions are crucial to raising more inclusive and locally adaptive occupational safety and health standards (OECD, 2025).

4. CONCLUSION

This research indicates that the trend in studies related to Hospital Occupational Health and Safety (K3RS) has experienced a significant increase in the past decade, with an emphasis on developing OHS management models, risk evaluation, program implementation, and evidence-based policy strengthening. However, various challenges persist, such as resource limitations, low workforce compliance, and suboptimal integration of K3RS into the overall hospital management system. These findings underscore the importance of strengthening K3RS management and policies to support the sustainability of safe and high-quality healthcare services.

As a follow-up to these findings, strong commitment from hospital management and strategic leadership is required to implement K3RS programs. This effort needs to be accompanied by continuous training, supervision of healthcare workers, and the development of technological innovations to support monitoring and reporting processes. Integrating K3RS into the hospital's quality management system is also a crucial step towards creating a healthy and safe work environment. The results of this research are expected to serve as a reference for formulating more effective and sustainable K3RS policies and practices for all stakeholders within the hospital environment.

REFERENCES

Astnell, S., von Thiele Schwarz, U., Hasson, H., Augustsson, H., & Stenfors-Hayes, T. (2016). Integrating Health Promotion with Quality Improvement in A Swedish Hospital. *Health Promotion International*, *31*(3), 495–504. https://doi.org/10.1093/heapro/dav027

Damayanty, S., Susanto, A., & Hipta, W. F. (2022). Implementation of Hospital Occupational Health and Safety Standards at General Hospitals in Kendari City. *Kemas: Jurnal Kesehatan Masyarakat*, *18*(1), 10–19. https://doi.org/10.15294/kemas.v18i1.26394

Elebo, N., Mpinganjira, M. G., Baichan, P., Devar, J., Omoshoro-Jones, J., Francis, J. M., Smith, M., & Nweke, E. E. (2024). The Need for Research Targeting the Link Between Occupational Carcinogens and Hepatopancreatobiliary Cancers in Africa: A Systematic Review. *Translational Oncology*, *47*, 102036. https://doi.org/10.1016/j.tranon.2024.102036

Fadhel, R., & Alqurs, A. (2025). Enhancing Occupational Health and Safety Through Strategic Leadership: The Mediating Role of Total Quality Management in Hodeida Hospitals, Yemen. *Risk Management and Healthcare Policy*, *18*(March), 823–842. https://doi.org/10.2147/RMHP.S506296

Gaiotto, E. M. G., Godoy Vieira, A., & Soares, C. B. (2020). Workers' Occupational Health Surveillance Systems in Low- and Middle-Income Countries: A Scoping Review Protocol. *JBI Evidence Synthesis*, *18*(9). https://journals.lww.com/jbisrir/fulltext/2020/09000/workers__occupational_health_surveillance_systems.17.aspx

Gallo, E. B. R., & de la Cruz, S. G. T. (2025). Bibliometric Analysis of Publications in Scopus on the Evaluation of Patient Safety Culture. *Enfermeria Global*, *24*(1), 1–13. https://doi.org/10.6018/eglobal.621031

Habib, R. R., Blanche, G., Souha, F., El-Jardali, F., & Nuwayhid, I. (2016). Occupational Health and Safety in Hospitals Accreditation System: The Case of Lebanon. *International Journal of Occupational and Environmental Health*, *22*(3), 201–208. https://doi.org/10.1080/10773525.2016.1200211

ILO. (2021). *Exposure to Hazardous Chemicals at Work and Resulting Health Impacts: A Global Review*. https://doi.org/978-922-034219-0

Joseph, B., & Arasu, S. (2023). Occupational Health Research: Challenges and Opportunities in Developing Countries. In *Indian journal of occupational and environmental medicine* (Vol. 27, Issue 1, pp. 1–3). https://doi.org/10.4103/ijoem.ijoem_74_23

Karasu, E., Karasu, L., & Unalan, D. (2025). Occupational Health Literacy and Affecting Factors on Healthcare Workers. *Occupational Medicine (Oxford, England)*, *75*(2), 121–127. https://doi.org/10.1093/occmed/kqaf014

Latuconsina, N. A., & Liklikwatil, N. (2024). Analysis of the Implementation of the K3 Management System on Employee Productivity in Private Hospitals in Maluku. *Indonesian Journal of Global Health Research*, *6*(S5 SE-Articles). https://doi.org/10.37287/ijghr.v6iS5.4653

Molewa, M. L., Mbonane, T. P., Shirinde, J., & Masekameni, D. M. (2021). Assessment of Occupational Health and Safety Practices at Government Mortuaries in Gauteng Province: A Cross-Sectional Study. *The Pan African Medical Journal*, *38*, 76. https://doi.org/10.11604/pamj.2021.38.76.21699

Nasution, A. D., & Mahyuni, E. L. (2020). Hospital Occupational Safety and Health Management System based on Internet of Things (IoT). *SCITEPRESS – Science and Technology Publications*, *Icosteerr 2018*, 495–499. https://doi.org/10.5220/0010076004950499

OECD. (2025). *Chemical Safety and Biosafety Progress Report*. https://www.oecd.org/content/dam/oecd/en/topics/policy-issues/chemical-safety-and-biosafety/progress-report-june-2025.pdf

Quintero Santofimio, V., Amaral, A. F. S., & Feary, J. (2024). Occupational Exposures in Low- and Middle-Income Countries: A Scoping Review. *PLOS Global Public Health*, *4*(11), e0003888. https://doi.org/10.1371/journal.pgph.0003888

Taskingul, A. B., Kiran, S., & Emerce, E. (2024). Comparison of Health Complaints, Occupational Risks, and Occupational Health Practices of Healthcare Workers According to Professions and Departments in the Hospital. *Cureus*, *16*(7), e65614. https://doi.org/10.7759/cureus.65614

Yeşilgöz, P., & Arga, K. Y. (2025). A Health-Sector-Specific Occupational Health and Safety Management System Model. *Healthcare (Switzerland)*, *13*(3), 1–16. https://doi.org/10.3390/healthcare13030271

Zhang, H., Xue, R., Kong, X., Zhao, M., & Jin, Z. (2025). Global, Regional, and National Burden and Projections to 2050 of Occupational Carcinogen-Attributable Nasopharyngeal and Laryngeal Cancer: A Comprehensive Analysis from The GBD 2021 Study. *Frontiers in Public Health*, *Volume 13*. https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2025.1615378

Zhang, M., & Kim, R. (2025). Occupational Health in Agriculture: A Re-Emerging Frontier in Worker Protection. *Global Health Journal*. https://doi.org/https://doi.org/10.1016/j.glohj.2025.06.001

Zou, B., Wu, P., Chen, J., Luo, J., Lei, Y., Luo, Q., Zhu, B., & Zhou, M. (2025). The Global Burden of Cancers Attributable to Occupational Factors, 1990-2021. *BMC Cancer*, *25*(1), 503. https://doi.org/10.1186/s12885-025-13914-6