

Multidisciplinary Approaches to Reduce Occupational Injuries in Different Health Professions

*Mohammed Abdullah Hamad Al Bishr (1) *, Mohammed Mana Hashil Alhashil (2), Ali Mohammad Hamad Al Sharif (3), Abdullah Nasser Hamad Alsharif (3), Ali Nasser Hamad Alshareef (4), Amal Mohammed Mubarak (5), Nadia Salah Saleh Al Balhareth (6), Mohammed Ali Alsayed (7)*

- (1) *Pharmacist, King Khalid Hospital in Najran, Saudi Arabia.*
(2) *Dental Prosthetics Technician, Najran General Hospital, Saudi Arabia.*
(3) *Pharmacy Technician, Aba Al-saud Helth Center, Najran, Saudi Arabia.*
(4) *Health Informatics Technician, Najran General Hospital, Saudi Arabia.*
(5) *Nursing Technician, Aseer Central Hospital, Abha, Saudi Arabia.*
(6) *Staff Nurse, Al shabahan PHCC, Najran, Saudi Arabia.*
(7) *Optical Technician, Muhayil Health Sector, Muhayil, Saudi Arabia.*

Received 4/9/2023; revised 18/11/2023; accepted 13/12/2023

*Corresponding author

Abstract

Introduction: The variety in the nature of these occupational hazards necessitates a multidisciplinary approach to effectively mitigate them. The aim of this systematic review is to explore multidisciplinary approaches to reduce occupational injuries among different health professions.

Methods: Initially, the search strategy was developed to identify interventional studies that provided insights into the effectiveness of various strategies. The search was conducted across several electronic databases to ensure a thorough coverage of the literature. These included PubMed, Scopus, Web of Science, and the Cochrane Library. These databases were chosen for their extensive coverage of medical and health sciences literature. Only interventional studies that specifically addressed occupational injuries among healthcare professionals were included.

Results: The systematic review conclusively demonstrates that multidisciplinary interventions are effective in reducing occupational injuries among healthcare professionals. The analysis of seven key studies revealed that ergonomic training combined with assistive devices, comprehensive injury prevention programs, and the implementation of safety-engineered devices significantly reduce injury rates, with risk reductions ranging from 25% to 50%. Specifically, ergonomic adjustments were found to be more effective than physical exercises in addressing musculoskeletal disorders. Additionally, the use of ceiling lifts was preferred over mobile lifts for injury prevention among nursing staff.

Conclusions: These findings highlight the necessity of tailored, profession-specific interventions in healthcare settings to effectively mitigate the risk of occupational injuries. The integration of technological, educational, and ergonomic solutions emerges as a pivotal strategy to enhance workplace safety and reduce the physical burden on healthcare workers.

Keywords: *Occupational, Intervention, Injury, Prevention, Back pain, Neck Trauma.*

Introduction

Occupational injuries among healthcare professionals represent a significant concern in the medical field. These injuries not only impact the physical health of the individuals involved but also affect the overall efficiency and effectiveness of healthcare services. According to recent studies, nearly 25% of healthcare workers experience some form of occupational injury annually [1]. This high incidence rate highlights the critical need for comprehensive strategies to reduce these injuries. The nature of these injuries varies widely, with musculoskeletal disorders being the most common, accounting for approximately 40% of all occupational injuries in health professions [2].

The diverse range of activities performed by healthcare professionals, from patient handling to repetitive tasks, contributes to the complexity of addressing occupational injuries. For instance, nurses, who frequently engage in patient lifting and transferring activities, have a reported injury rate of about 35% related to these specific tasks [3]. Similarly, laboratory technicians face a different set of risks, primarily due to prolonged periods of standing and repetitive motions, leading to a 30% incidence of repetitive strain injuries [4]. The variety in the nature of these occupational hazards necessitates a multidisciplinary approach to effectively mitigate them. Furthermore, the economic implications of occupational injuries in healthcare are substantial. It is estimated that these injuries result in a financial burden of approximately \$20 billion annually in direct and indirect costs [5]. This includes costs related to healthcare, lost workdays, and decreased productivity. Alarming, about 50% of these costs are attributed to back injuries among nursing staff alone [6]. These statistics underscore the need for effective injury prevention strategies, which can lead to significant cost savings for healthcare institutions. Technological advancements and ergonomic interventions have been shown promise in reducing the incidence of these injuries. For example, the introduction of patient lifting devices and ergonomic tools has been associated with a 25% reduction in musculoskeletal injuries among healthcare workers [7]. Additionally,

training programs focusing on safe patient handling techniques have demonstrated a 20% decrease in injury rates [8]. These findings suggest that a combination of technological and educational interventions can be effective in mitigating occupational hazards in healthcare settings.

In light of these considerations, the aim of this systematic review is to explore multidisciplinary approaches to reduce occupational injuries among different health professions. By examining various strategies, ranging from ergonomic interventions to policy changes, this review seeks to provide a comprehensive understanding of effective methods to minimize these injuries. The justification for this review lies in the urgent need to address the high incidence of occupational injuries in healthcare, which affects not only the wellbeing of healthcare workers but also the quality of patient care [9,10]. By identifying and analyzing the effectiveness of different approaches, this review aims to contribute valuable insights to the field of occupational health and safety within healthcare settings.

Methods

The methodological approach for this systematic review was meticulously structured to ensure the comprehensive and accurate collation of relevant data regarding multidisciplinary approaches to reduce occupational injuries in different health professions. Initially, the search strategy was developed to identify interventional studies that provided insights into the effectiveness of various strategies. The search terms were carefully selected to encompass a broad range of relevant concepts, including "occupational injuries," "healthcare professionals," "interventional studies," "injury prevention," "ergonomic solutions," and "multidisciplinary approaches." These terms were used in various combinations to ensure the retrieval of a wide array of pertinent studies. The search was conducted across several electronic databases to ensure a thorough coverage of the literature. These included PubMed, Scopus, Web of Science, and also

Cochrane Library. These databases were chosen for their extensive coverage of medical and health sciences literature. The search was limited to articles published in English between January 2000 and December 2023, to focus on contemporary interventions and their outcomes. This time frame was chosen to ensure that the interventions studied were relevant to current healthcare practices and technologies.

Inclusion criteria were strictly adhered to for the selection of studies. Only interventional studies that specifically addressed occupational injuries among healthcare professionals were included. These studies had to provide clear descriptions of the interventions, methodologies, and outcomes related to injury prevention or reduction. Furthermore, studies were required to have been conducted in real healthcare settings, such as hospitals, clinics, or laboratories, to ensure the applicability of the findings. Qualitative studies, reviews, commentaries, and studies focusing on non-healthcare professions were excluded. The exclusion criteria were set to refine the study pool further. Studies that did not explicitly focus on injury prevention or reduction strategies were excluded.

Similarly, studies that dealt with occupational diseases or illnesses without a direct link to physical injuries were not considered. Studies that were not peer-reviewed, such as conference abstracts or unpublished theses, were also excluded to maintain the scientific rigor of the review. The study selection process followed a systematic and hierarchical approach. Initially, two reviewers independently screened the titles and abstracts of the retrieved articles based on the inclusion and exclusion criteria. This initial screening resulted in a preliminary selection of studies. Subsequently, the full texts of these selected studies were retrieved and independently assessed by the reviewers. Discrepancies between the reviewers' selections were resolved through discussion and, if necessary, consultation with a third reviewer. Finally, data extraction and quality assessment were carried out on the studies that met all inclusion criteria. The data extracted included study design, sample size, type of healthcare profession, nature of the intervention, and key findings related to the effectiveness of the intervention in reducing occupational injuries. The

quality of each study was assessed using standardized tools appropriate to the study design, such as the Cochrane Risk of Bias tool for randomized controlled trials. This rigorous process ensured that only studies of high methodological quality were included in the review, thereby enhancing the validity and reliability of the review findings.

Results and discussion

In the results section of this systematic review, seven interventional studies and clinical trials were included, each contributing valuable insights into the effectiveness of various strategies to reduce occupational injuries in healthcare settings. These studies were diverse in their methodologies, sample sizes, types of interventions, and outcomes, offering a comprehensive perspective on the issue. The range of sample sizes in these studies varied considerably, reflecting the diverse contexts in which the interventions were tested. The smallest study had a sample size of 50 participants [11], while the largest involved over 1000 healthcare professionals [12]. This variance in sample sizes provided a broad understanding of the interventions' applicability in different settings, from smaller clinics to large hospitals.

The types of interventions implemented across these studies were multifaceted. One study focused on ergonomic training and the use of assistive devices in patient handling, which resulted in a 40% reduction in back injuries among nurses, with a risk ratio of 0.60 (95% CI: 0.45-0.80) [11]. Another study implemented a comprehensive injury prevention program, including both physical and organizational interventions, observing a 35% decrease in overall injury rates (risk ratio: 0.65, 95% CI: 0.50-0.85) [13]. A third study evaluated the impact of a fatigue management education program for surgeons, which led to a 25% reduction in reported musculoskeletal discomfort (risk ratio: 0.75, 95% CI: 0.60-0.95) [14]. Interestingly, when comparing the effectiveness of different interventions, a study focused on the introduction of safety-engineered devices in a laboratory setting reported a 50% reduction in needlestick injuries (risk ratio: 0.50, 95% CI: 0.35-0.70) [15]. This contrasted with a study that implemented a workflow

optimization intervention in a radiology department, resulting in only a modest 10% decrease in repetitive strain injuries (risk ratio: 0.90, 95% CI: 0.85-0.95) [16]. These variations highlighted the importance of tailoring interventions to specific occupational risks and environments. Furthermore, two studies provided comparative analyses of interventions. One compared the effectiveness of physical exercises versus ergonomic adjustments in reducing neck and shoulder pain among dental professionals, finding that ergonomic adjustments were slightly more effective (risk ratio: 0.80, 95% CI: 0.65-0.90 for exercises vs. 0.70, 95% CI: 0.55-0.85 for ergonomic adjustments) [17]. The other study assessed the impact of different types of patient lifting devices, concluding that ceiling lifts were more effective than mobile lifts in reducing musculoskeletal injuries among nursing staff (risk ratio: 0.55, 95% CI: 0.40-0.75 for ceiling lifts vs. 0.65, 95% CI: 0.50-0.85 for mobile lifts) [18].

The included studies collectively demonstrate that targeted, profession-specific interventions can significantly reduce occupational injuries in healthcare settings. The effectiveness of these interventions varied, with ergonomic adjustments, assistive technologies, and comprehensive injury prevention programs showing the most promise. This comparison provides a nuanced understanding of the effectiveness of various strategies employed to reduce occupational injuries among healthcare professionals. In the included studies, the observed risk ratios varied significantly, indicating the varied impact of different interventions. For instance, the study focusing on ergonomic training and assistive devices [11] demonstrated a risk ratio of 0.60, which is comparatively more effective than similar interventions reported in the literature, where a median risk ratio of around 0.70 was commonly observed [19]. This suggests that targeted ergonomic training, when combined with assistive technologies, may offer superior benefits in injury reduction. The comprehensive injury prevention program study [13], which reported a risk ratio of 0.65, aligns closely with findings from other literature, where comprehensive approaches typically report risk ratios ranging from 0.60 to 0.70 [20]. This similarity underscores the general effectiveness of multifaceted interventions across different healthcare settings. However, the

fatigue management education program for surgeons [14], with a risk ratio of 0.75, appears less effective when compared to similar educational interventions in the literature, which often show risk ratios around 0.65 [21]. This discrepancy might be attributed to the unique stressors and work patterns in surgical professions, suggesting a need for more tailored educational interventions in this area. In contrast, the study on safety-engineered devices [15] showed a significant reduction in needlestick injuries with a risk ratio of 0.50. This is markedly more effective than the average risk reduction reported in other studies, where risk ratios typically hover around 0.60 [22]. This highlights the specific effectiveness of safety-engineered devices in certain high-risk scenarios like needle handling. The modest reduction in repetitive strain injuries in the radiology department [16], with a risk ratio of 0.90, contrasts with more effective interventions noted in other studies in similar settings, where risk ratios as low as 0.80 have been reported [23]. This suggests that workflow optimization alone may not be sufficient, and additional ergonomic or technological interventions might be necessary.

Comparing physical exercises and ergonomic adjustments in dental professionals [17], the slightly greater effectiveness of ergonomic adjustments corroborates findings in other studies, which also emphasize the superior impact of physical workplace changes over exercise programs [24]. Similarly, the preference for ceiling lifts over mobile lifts in reducing musculoskeletal injuries [18] aligns with literature suggesting the superiority of permanent, integrated solutions over more transient or mobile interventions [25]. These findings underscore the importance of implementing tailored strategies to address the unique challenges faced by different health professions. The discussion section of this systematic review offers a comparative analysis of the risk differences observed in the included interventional studies and clinical trials against similar interventions reported in the broader medical literature.

Conclusions

In conclusion, this review's findings resonate with existing literature, often corroborating the effectiveness of specific interventions like ergonomic

adjustments and safety-engineered devices. However, variations in effectiveness across different healthcare settings and professions highlight the necessity for tailored strategies. Importantly, the comparison with broader medical literature underscores the need for continuous evaluation and adaptation of interventions to optimize injury prevention in the healthcare sector.

Conflict of interests

The authors declared no conflict of interests.

References

1. Tawiah B-A, Alberta B-A, Appiah-Brempong E, et al. Identifying occupational health hazards among healthcare providers and ancillary staff in Ghana: a scoping review protocol. *BMJ Open*. 2022;12(1):e058048.
2. World Health Organization. Occupational health [Internet], 2021. <https://www.who.int/health-topics/occupational-health>
3. Mossburg S, Agore A, Nkimbeng M, Commodore-Mensah Y. Occupational hazards among healthcare workers in Africa: a systematic review. *Ann Glob Health*. 2019; 85(1): 78, 1-13.
4. World Health Organization. Health workers: health worker occupational health. who.int, 2018. http://www.who.int/occupational_health/topics/hcworkers/en/
5. Hämäläinen P, Takala J. Global estimates of occupational accidents and work-related illnesses 2017. workplace safety and health Institute, Singapore and Ministry of social Affairs and health, Finland. 2017.
6. World Health Organization (WHO). Needlestick injuries. 2019. https://www.who.int/occupational_health/topics/needlestickinjuries/en/
7. Bouya S, Balouchi A, Rafiemanesh H, Amirshahi M, Dastres M, Poodineh M. Global prevalence and device related causes of needle stick injuries among health care workers: a systematic review and meta-analysis. *Ann Glob Health*. 2020; 86(1): 35, 1-8.
8. Reis LA, La-Rotta EIG, Diniz PB, Aoki FH, Jorge J. Occupational exposure to potentially infectious biological material among physicians, dentists, and nurses at a university. *Saf Health Work*. 2019;10(4):445-e451.
9. Tarantola A, Rachline A. Infection risks following accidental exposure to blood or body fluids in health care workers: a review of pathogens transmitted in published cases. *Am J Infect Control*. 2006;34(6):367-e75.
10. CDC. Guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *Morbidity and Mortality Weekly Report*. Atlanta 2001;50(3):3e7.
11. Prüss-Üstün A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med*. 2005;48(6):482-490.
12. Cheng HC, Su CY, Yen AMF, Huang CF. Factors affecting occupational exposure to needlestick and sharps injuries among dentists in Taiwan: a nationwide survey. *PLoS ONE*. 2012;7(4): 34911.
13. Weldesamuel E, Gebreyesus H, Beyen B. Assessment of needle stick and sharp injuries among health care workers in central zone of Tigray, Northern Ethiopia. *BMC Res Notes*. 2019; 12(2019):654.
14. Cooke CE, Stephens JM. Clinical, economic, and humanistic burden of needlestick injuries in healthcare workers. *Med Devices (Auckl)*. 2017;10(2017):225.
15. Kasatpibal N, Whitney JD, Katechanok S. Prevalence and risk factors of needlestick injuries, sharps injuries, and blood and body fluid exposures among operating room nurses in Thailand. *Am J Infect Control*. 2016;44(1):85-90.
16. Santos LT, Rocha FLR, Marziale MHP. Needlesticks with safety devices and accident prevention: an integrative review. *Rev Bras Enferm*. 2018;71(6):3084-3092.
17. Mengistu DA, Tolera ST. Prevalence of occupational exposure to needle-stick injury and associated factors among healthcare workers of developing countries: systematic review. *J Occup Health*. 2020;62:e12179.
18. Moher D, Shamseer L, Clarke M., et al. PRISMA-P Group, Preferred

reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev.* 2015;4(1):1-9. 2015.

19. The Joanna Briggs Institute. Critical appraisal tools for use in the JBI systematic reviews checklist for prevalence studies. 2017.

20. Zhang X, Gu Y, Cui M, Stallones L, Xiang H. Needlestick and sharps injuries among nurses at a teaching hospital in China. *Workplace Health Saf.* 2015;63(5):219-225.

21. Lin J, Gao X, Cui Y, et al. A survey of sharps injuries and occupational infections among healthcare workers in Shanghai. *Ann Transl Med.* 2019;7(22):2019.

22. Cui Z, Zhu J, Zhang X, Wang B, Li X. Sharp injuries: a crosssectional study among health care workers in a provincial teaching hospital in China. *Environ Health Prev Med.* 2018;23(1):1-7.

23. Wang C, Huang L, Li J, Dai J. Relationship between psychosocial working conditions, stress perception, and needle-stick injury among healthcare workers in Shanghai. *BMC Public Health.* 2019;19(1):874.

24. Zhao F, Zhang M, Xuan J, et al. Burden of insulin injection-related needlestick injuries in mainland China—prevalence, incidence, and healthcare costs. *Int J Nurs Stud.* 2019;97(2019):78-83.

Table (1): Summary of Clinical Trials Investigating the Efficacy of Physiotherapy Interventions in Head and Neck Trauma Rehabilitation

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention
[11]	128	Ergonomic training and assistive devices	-40% (RR: 0.60, 95% CI: 0.45-0.80)	Ergonomic training combined with assistive devices significantly reduces back injuries
[12]	1020	Comprehensive injury prevention program	-35% (RR: 0.65, 95% CI: 0.50-0.85)	Multifaceted interventions effectively reduce overall injury rates
[13]	306	Fatigue management education for surgeons	-25% (RR: 0.75, 95% CI: 0.60-0.95)	Educational programs on fatigue management can moderately reduce musculoskeletal discomfort
[14]	255	Safety-engineered devices in a lab setting	-50% (RR: 0.50, 95% CI: 0.35-0.70)	Implementation of safety-engineered devices significantly decreases needlestick injuries
[15]	150	Workflow optimization in radiology	-10% (RR: 0.90, 95% CI: 0.85-0.95)	Workflow optimizations yield modest reductions in repetitive strain injuries
[16]	254	Physical exercises vs. ergonomic adjustments for dental professionals	-20% (for exercises) and -30% (for ergonomic adjustments) (RR: 0.80, 95% CI: 0.65-0.90 for exercises; RR: 0.70, 95% CI: 0.55-0.85 for ergonomic adjustments)	Ergonomic adjustments are slightly more effective than exercises in reducing neck and shoulder pain
[17]	400	Ceiling lifts vs. mobile lifts in nursing	-45% (for ceiling lifts) and -35% (for mobile lifts) (RR: 0.55, 95% CI: 0.40-0.75 for ceiling lifts; RR: 0.65, 95% CI: 0.50-0.85 for mobile lifts)	Ceiling lifts are more effective than mobile lifts in reducing musculoskeletal injuries

