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Musculoskeletal Disorders and Psychological Well-being among Indian Nurses: A Narrative Review of Impacts and Interventions (2024)

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Abstract

Background: A prevalent occupational health issue that may have a detrimental effect on nurses' mental health and general well-being is musculoskeletal problems. This narrative review aimed to explore the social, economic, and personal implications of Musculoskeletal Disorder on nurses in India, and examine support, and intervention strategies available for them.

Material & Methods: A comprehensive literature search was conducted in electronic databases, including PubMed, Scopus, and Google Scholar, using relevant keywords related to Musculoskeletal Disorder, mental health, nurses, social, personal, support, and intervention. The inclusion criteria were articles published in English and focused the nursing workforce in India.

Results: A total of 15 articles were selected for review synthesis. According to the summary, nurses in India who suffer from musculoskeletal disorders deal with serious social and personal repercussions that impact their everyday life and general well-being. Musculoskeletal Disorder can lead to decreased social connections, reduced job satisfaction, and physical and emotional distress. However, limited interventions are available that address Musculoskeletal Disorder and the mental health of nurses in India.

Conclusion: There is a significant effect of Musculoskeletal Disorder on the mental health, quality of life, and economic well-being of nurses in India. However, limited scientific research exists exploring the prevalence and psychosocial implications of Musculoskeletal Disorder in the Indian nursing population. Consequently, additional research is essential to comprehend the scope and ramifications of this occupational health concern. To create interventions and support systems that are effective in the unique cultural and occupational context of nursing in India, it is imperative to engage in interdisciplinary collaboration.

Keywords: Musculoskeletal Disorder, Prevalence, Risk-Factors, Nurses, India

Introduction

Musculoskeletal disorders (MSDs) are a pervasive and debilitating occupational hazard for nurses worldwide, affecting their physical health, mental well-being, and overall quality of life [1]. These illnesses, which include various problems impacting muscles, tendons, ligaments, nerves, and joints, often result from the physically strenuous demands of nursing job [2]. Nurses routinely engage in activities, such as lifting and transferring patients, maintaining awkward postures for extended periods, and performing repetitive tasks, all of which contribute to the development and exacerbation of MSDs [3].

India, with its rapidly growing healthcare sector and a significant nursing workforce, is not immune to this global issue. Research has shown that the incidence of musculoskeletal disorders among Indian nurses is very high [4]. Research undertaken in India indicates that more than 66% of nurses suffer from work-related musculoskeletal disorders (MSDs) [5]. This figure

aligned with global trends, as studies from China [6], Malaysia [7], and Brazil [8] have also found high rates of MSDs among nurses, ranging from 70% to 95%.

The consequences of MSDs extend beyond physical health. Chronic pain and discomfort can lead to psychological distress, including anxiety, depression, and burnout [9]. These mental health challenges can, in turn, impair work performance, job satisfaction, and overall well-being. Moreover, MSDs can have broader social and economic implications, affecting nurses' personal lives, financial stability, and career prospects [10]. Considering the substantial influence of musculoskeletal disorders on Indian nurses and the healthcare system overall, there is an urgent need for thorough research and efficacious therapies. Although many studies have examined the incidence and risk factors of musculoskeletal disorders (MSDs) in India, there is a deficiency of research addressing the comprehensive psychological and experiential aspects of these illnesses. Furthermore, there is a need for more evidence-based interventions tailored to the specific needs of Indian nurses [11].

This narrative review aimed to address this knowledge gap by synthesizing the available evidence on the multidimensional impacts of MSDs on Indian nurses. The review focuses both physical, psychological, and social implications of these disorders. The review explored existing and potential support strategies for nurses with MSDs, with a focus on the Indian context. This study aimed to guide the creation of evidence-based policies and practices to lessen the burden of MSDs and enhance the wellbeing of Indian nurses by offering a thorough overview of this important problem.

Materials and Methods

This narrative review aimed to examine the interplay of musculoskeletal disorders (MSDs) and mental health in the Indian nursing population, encompassing the broader implications of MSDs, and the potential support strategies available. A search strategy was employed to identify relevant literature from 2010 to 2023. Electronic databases, namely PubMed, CINAHL, Scopus, and PsycINFO, were searched using keywords, such as "musculoskeletal disorders," "mental health," and "nurses," along with their variations. To supplement this, a manual search of reference lists and pertinent journals was conducted.

Inclusion and Exclusion Criteria: Studies were included if they met following criteria: (a) published in English, (b) conducted among nurses in India, (c) focused on the intersection of MSDs and mental health, (d) explored the broader impact of MSDs on various aspects of life, and (e) interventions, and its effectiveness. Conversely, the exclusion criteria for the review specified that studies, articles, and other sources would be excluded if they: (a.) were not representing Indian Nurses and (d.) did not discuss support strategies for addressing the challenges of musculoskeletal disorders among nurses.

Study Selection: The preliminary search produced a collection of 345 prospective studies. Following a comprehensive evaluation of titles, abstracts, and full texts, only 15 papers were considered appropriate for inclusion in this review. These studies were selected for their relevance to the research question and their adherence to the inclusion criteria outlined above. Among selected studies, 11 focused on the prevalence, risk factors, and psychological impact of MSDs, providing a comprehensive overview of the current state of knowledge in this area. Fig. 1 illustrates the process of article selection for this study.

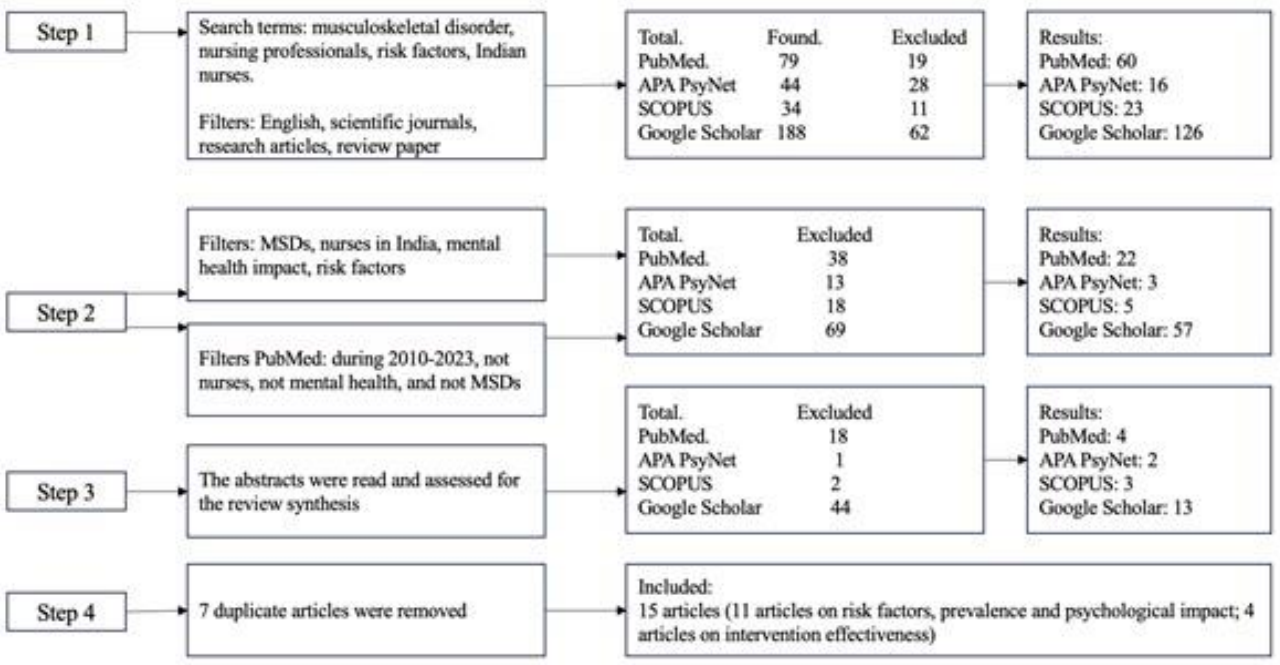

Fig.1. Flowchart of Article Selection for Review Synthesis

Results

The narrative review identifies 15 primary articles of which 11 articles focuses different components that explain the intersection of MSD and the Mental Health of nurses (Table 1) and 4 articles emphasize on the effectiveness of MSD intervention (Table 2) in India. The results delineate the frequency and incidence of musculoskeletal disorders (MSDs) among nurses, the related risk factors impacting MSDs and well-being, the psychological ramifications of MSDs, and the techniques used to mitigate MSDs among nurses in India.

Prevalence and Incidence of MSK Disorder: Numerous studies have shown high incidence of musculoskeletal diseases (MSDs) among Indian nurses across a range of contexts and experience levels, which is cause for serious worry. Recent studies found that over 60% of nurses experience MSDs within a seven-day period, with the lower back being the most commonly affected area [12, 13].

A survey of tertiary care nurses showed an even higher prevalence of 81.2%, although this was based on self-reported symptoms and may differ from prevalence based on clinical examination (32.4%) [12]. Similarly, other studies reported prevalence rates of 73.9% among nursing personnel [14], and 73% among nurses within a 12-month period [5]. Notably, the lower back and neck were consistently identified as the most affected areas across these studies. Specialization also affects the occurrence of MSDs. Dentistry nurses were the most common (81.25%), followed by orthopedics nurses (62.5%) and surgery nurses (57.78%), according to Alam et al. (15). Even nursing students are not immune, with a study reporting a 60% prevalence of MSDs among this group [16].

Previous research highlighted the effect of specific work-related factors on MSD prevalence. Nair & Aithala [17] found a 73.8% prevalence, with long durations of work and lifting patients being significant contributors. Goswami et al. [18] reported an 89.5% prevalence, with the legs and lower back most affected. Furthermore, the type of patient handled can influence MSD prevalence, as Kulkarni & N [19] observed higher rates among nurses handling semi-cooperative (75%), and non-cooperative patients (71.42%).

Risk Factors for MSK Disorder among Nurses: Numerous risk factors contribute to the development of musculoskeletal disorders (MSDs) in tertiary care nurses. Physical requirements, including repeated motions, uncomfortable postures, and substantial lifting, are crucial factors. These activities are intrinsic to nursing responsibilities such as patient care and administrative functions, resulting in strain and overuse injuries [15, 20]. Manual patient handling and instrument manipulation significantly increase the risk, especially for the lower back (14, 18).High workload and limited staffing significantly contribute to MSDs. Long working hours, inadequate breaks, and high patient-to-nurse ratios were linked to an increased prevalence of these disorders [5,14,19]. Time pressures and rushed work patterns often lead to unsafe practices, further elevating the risk of musculoskeletal strain and injury. Demographic and occupational factors play a role. Older, female, and married nurses are more susceptible to MSDs [11,15]. Thus, nurses specializing in certain departments, such as orthopedics and dentistry, reported higher risks in terms of the specific demands of their work [15]. Employment duration and exercise habits also influence MSD risk [15]. Environmental and infrastructural factors within healthcare settings further compound the problem. Limited access to ergonomic equipment and insufficient training in proper lifting techniques, and ergonomic principles increased the risk of MSDs [18]. The necessity of comprehensive preventive measures and interventions is underscored by the challenging work environment that these factors collectively generate, which predisposes nurses to MSDs.

Psychological Impact of MSK Disorder: The psychological effect of musculoskeletal disorders (MSDs) on tertiary care nurses is significant, extending beyond physical discomfort to affect mental well-being and overall quality of life. Nurses with MSDs frequently report heightened levels of occupational stress and anxiety in terms of the combination of physical pain, limited mobility, and the demands of their profession [12]. The chronic nature of MSDs and the challenges of managing patient care can lead to feelings of apprehension and anxiety about job performance and future career prospects [17]. Furthermore, the burden of musculoskeletal disorders might present as signs of sadness and emotional fatigue. Chronic pain and physical constraints might undermine nurses' resilience and coping strategies, resulting in feelings of helplessness and despair [14]. The struggle to maintain a positive outlook and engage in self-care can further exacerbate emotional exhaustion and contribute to burnout [5]. MSDs have a detrimental impact on nurses' job satisfaction and quality of life. The inability to perform work duties effectively in terms of pain and limitations, coupled with the constant discomfort, can lead to decreased job satisfaction and overall morale [13,16]. Furthermore, when MSDs interfere with activities of daily living outside of work, the overall quality of life and life satisfaction are further diminished [11]. The existence or lack of social support and a constructive work culture significantly influences the psychological effects of musculoskeletal disorders (MSDs). Nurses who recognize sufficient support from peers and superiors often encounter less psychological discomfort and exhibit enhanced resilience [17]. Conversely, a lack of support and a negative work environment can exacerbate the psychological burden of MSDs, leading to feelings of isolation and alienation [14].

Table 1. Studies in India describing nurses experiencing MSD, its risk factors and psychological impact (N=11)

Authors (Date)	Research Design	Sample Size	Age (Mean)	Findings	Risk Factors	Psychological Impact
Raithatha & Mishra, (2016)	Cross-Sectional Survey	296 Nurses	30.4	60.5% prevalence with low back pain being the most common, and elbow pain the least common.	Age, number of children, working hours at home, BMI, and total work experience, excessive repetition, awkward postures, and heavy lifting	Occupational Stress, Poor Job satisfaction, Quality of Life and Work life balance
Chandralekha et al., (2022)	Cross-Sectional Survey	207 Nurses	27.7	Survey reported 81.2% prevalence of MSD Prevalence based on clinical Examination was 32.4%	Repetitive movements at work, working in abnormal postures for prolonged periods, and working even when sick	Occupational Stress
Chowdhury et al., (2023)	Cross-Sectional Survey	88 Nurses	33	73.9% reported prevalence of WMSDs** symptoms in atleast one part of their body with lower back being the highest. Positive correlation of WMSD and pandemic stress	High work load, long sifts and limited work staff	Occupational Stress, Uncertainty, exhaustion, poor work culture
Saini et al., (2021)	Cross-Sectional Survey	270 Nurses	35	64.4% of nursing officers suffered from MSDs, such as ache, pain Low back (45.1%) and the neck (22.2%) were highest, followed by upper back (14.0%), ankles (13.7%), knees (10.7%), shoulder (10.3%), hip/thighs (5.9%), wrists (4.4%), and elbows (3.3%). Around 49.2% complained that MSDs limit their work	Manual lifting and moving of the instruments and handling the patient	Stress and Anxiety, Fear of injury, and poor work quality of life.
Mahajan et al., (2023)	Cross-Sectional Survey	190 Nurses	29.9	73% had MSD with approximately 41.6% suffering from MSDs in the previous seven days of survey. The LBP* (49.7%) and the neck (36.5%) were the most affected sites.	Working in the same position for a long time (43.5%) and not taking adequate breaks (31.3%)	Poor sleep quality, Increased stress and decreased productivity
Alam et al., (2023)	Cross-Sectional Survey	200 Nurses	29.01	LBP (79%) followed by the right shoulder and neck (67%), and knee pain (63%) was highest among female nurses. The prevalence of MSD was highest in dentistry nurse (81.25%), followed by orthopaedics nurses (62.5%) and surgery nurses (57.78%) department.	Posture, workload, employment duration, manual lifting, gender, exercise habits	Work pressure and occupational stress

Rajpurohit et al., (2024)	Cross-Sectional Survey	100 Student Nurses	21.15	60% prevalence of MSDs among the nursing students, with highest in lower back (46%) followed by neck (12%) and shoulder (10%), ankle/feet(17%).	Repetition, force and awkward postures and inadequate breaks	Work stress and quality of life
Nair & Aithala, (2020)	Cross-Sectional Survey	84 nurses	25.6	73.8% reported high prevalence in MSDs. Nurses with night shifts reported higher incidence of LBP. Medicine, orthopaedics and intensive care unit (ICU) nurses reported higher lower back pain.	Longer Night Shift, Heavy lifting, infrastructure limitation	Anxiety, depression, poor job satisfaction, low social support at work and poor working condition.
Goswami et al., (2017)	Cross-Sectional Survey	220 nurses	29.4	89.5% reported Work related MSDs. Affected body parts includes legs (72.5%), LBP (67.5%), neck (57.5%), knee and ankle (52.5% each) and shoulder (35.5%).	Limited access to infrastructure support, patient handling	Stressful awkward postures
Kulkarni & N, (2013)	Cross-Sectional Survey	25 nurses	27.8	Nurses working with semi-cooperative patients (75%) reported high prevalence of MSDs followed by non-cooperative patients (71.42%). Major discomfort reported during manual handling was LBP (44%).	Patient handling, inadequate nursing patient ratio, and frequency of handling patients.	Work stress and poor job satisfaction
Majumdar et al., (2014)	Cross-Sectional Survey	627 nurses	34.8	67% reported LBP followed by neck (47.7%) and ankles/feet (36%). Middle age group (31-40 years) reported high MSDs closely followed by youngest group (21-25 years). Married nurses reported high MSDs compared to single ones	Heavy lifting, nursing patient ratio and long night shift	Job Dissatisfaction

* LBP = Lower Back Pain, ** MSDs = Musculoskeletal Disorders

Table 2. Studies measuring effectiveness of intervention for MSDs among Nurses in India (N=4)

Authors (Date)	Research Design	Sample Size	Interventions	Outcome	Limitation
Paul, (2012)	Cross Sectional - Observational Study	34 Nurses	Awareness programme	53 % not aware about ergonomics, and safety measures. 75 % did not following ergonomics principles	Limited awareness and inadequate strategies with poor implementation
Parekh & Mehta, (2015)	Experimental Design	30 Nurses	Physiotherapy + Ergonomic Awareness	Physiotherapy + ergonomic intervention improved pain, and functional performance in chronic low back pain among nurses.	Psychological and environmental factors were not considered and no electrotherapy modalities were included
Hijam et al., (2020)	Quasi Experimental Non Equivalent Control Group Pre-test and Post-test Design	80 nurses	Ergonomics Training Program	Improvement in knowledge, self-efficacy and practice of staff nurses regarding prevention of work related low back pain.	No diversity in nursing department Small Sample Size
Sharma, (2016)	Experimental Design	70 Nurses	Planned teaching programme on prevention and management of back pain	Increased awareness and knowledge from preventing MSDs and management symptoms during work	Small Sample Size

Existing Interventions and Effectiveness: Studies on interventions to address MSDs among Indian nurses have primarily focused ergonomic education and physiotherapy. Paul [21] conducted a pilot study examining awareness of ergonomics, and the prevalence of MSDs among nursing professionals. According to the research, there is a need for educational interventions since 75% of nurses did not follow ergonomic practices and 53% of nurses were not aware of ergonomic concepts. Parekh & Mehta [22] studied the effectiveness of ergonomic advice combined with physiotherapy interventions for nurses with chronic low back pain. This combined approach resulted in the improved pain, function, and psychological well-being among participants. However, the study was limited by its small sample size and lack of consideration for environmental factors and electrotherapy modalities.

Hijam et al. [23] assessed the effect of an ergonomic training program on knowledge, self-efficacy, and practice regarding the prevention of work-related low back pain. Although the program demonstrated notable progress in these areas among staff nurses, the small sample size and lack of diversity in the nursing department hampered the study's generalizability. Sharma [24] examined the effectiveness of an educational and exercise program for reducing back pain in staff nurses. The intervention resulted in increased awareness, and knowledge about MSD prevention and management, with a reduction in reported back pain symptoms during work. However, the study was limited by its small sample size.

Discussion

The findings of this narrative review underscored the substantial burden of musculoskeletal disorders (MSDs) among Indian nurses, aligning with global trends indicating a high prevalence of these debilitating conditions among nursing professionals. The reported prevalence rates, exceeding 60% in recent studies, highlight the urgency of addressing MSDs as a major occupational health issue in India [12,13].

According to worldwide studies, the lower back and neck are consistently identified as the most afflicted regions. This suggests that the physical demands of nursing, such as handling patients and uncomfortable postures, have a substantial role in the development of MSDs [5,25]. Moreover, the variation in prevalence based on specialization, with dentistry nurses reporting the highest rates, emphasizes the effect of specific work-related tasks on MSD risk [15].

The risk factors identified in this review underscored the multifactorial nature of MSDs. Physical factors like repetitive movements, awkward postures, and manual lifting have been consistently linked to MSD development in Indian and international studies [5,11,19,26]. Notably, the effect of psychosocial factors, including high workload, stress, and job dissatisfaction, is a significant concern in the Indian context [12,14,15,18]. These factors can exacerbate the physical demands of nursing and contribute to the development and persistence of MSDs.

According to this review, the psychological effects of MSDs are a crucial topic that needs further research. The necessity for a comprehensive approach to MSD treatment is highlighted by the considerable correlations shown between MSDs and decreased quality of life, anxiety, depression, and occupational stress [20,27]. While the physical symptoms of MSDs are readily apparent, psychological toll often goes unrecognized and untreated, leading to a vicious cycle of pain, distress, and reduced work capacity [28,29].

The current literature on interventions for MSDs among Indian nurses showed a focus on the ergonomic education and physiotherapy. These interventions have shown promise in improving pain, function, and psychological well-being [23,24], but their long-term effectiveness, and generalizability remain unclear. Moreover, there is a scarcity of research exploring other potentially beneficial interventions, such as mindfulness-based stress reduction, cognitive-behavioral therapy, and exercise programs.

The development and treatment of MSDs among nurses may be made worse by the particular difficulties that the Indian environment brings. The physical demands on nurses are increased by resource limitations in many healthcare settings, especially in rural regions, which often restrict access to ergonomic equipment and sufficient staffing levels [4]. Cultural factors, such as the prioritization of patient care over personal well-being, may discourage nurses from seeking help for MSDs or taking breaks to rest and recover [30,31]. Thus, the hierarchical structure in most healthcare settings hinder nurses from voicing concerns about their health or advocating for better working conditions [32]. These factors highlight the need for culturally sensitive interventions that address specific challenges faced by Indian nurses and promote a culture of safety and well-being in the workplace.

The comparison of the results of this review with the global literature reveals both similarities and differences. The global nature of this issue is underscored by the fact that the prevalence rates of MSDs in Indian nurses are consistent with those reported in other countries [7,20,33]. However, the specific risk factors, and their relative importance may vary depending on the cultural and occupational context. For instance, the emphasis on manual patient handling in Indian healthcare settings may contribute to the high prevalence of lower back pain among Indian nurses [17,20].

MSDs pose a significant challenge to health, and well-being of Indian nurses. This review highlighted the need

for an evidence-based approach to MSD prevention and management, encompassing ergonomic interventions, psychosocial support, and culturally tailored educational programs. By addressing physical, psychological, and occupational factors contributing to MSDs, healthcare organizations can improve the well-being of their nursing workforce and enhance the quality of patient care.

Need for Evidence-based Interventions

The pervasive nature and significant effect of MSDs on Indian nurses underscore the urgent need for comprehensive, and evidence-based interventions. While existing studies have explored the effectiveness of ergonomic education and physiotherapy [23,24], there remains a paucity of research on other potentially beneficial interventions, such as mindfulness-based stress reduction [35], cognitive-behavioral therapy, and exercise programs. These interventions have shown promise in international studies for reducing pain, improving function, and enhancing psychological well-being in individuals with MSDs [35]. Furthermore, the recent emergence of Artificial Intelligence, Machine Learning, and the Internet of Things (IoT) has resulted in the identification of an effective technique for individuals with neck and lower back discomfort. This technique is facilitated by AI-based self-management applications. However, these interventions were tested only in the western context [36, 37]. Therefore, it is essential to investigate their applicability and effectiveness in the Indian nursing context.

Moreover, the psychological effect of MSDs necessitates an effective approach to intervention. Interventions should address the physical symptoms of MSDs, along with the associated psychological distress, such as anxiety, depression, and burnout. Integrating psychological support into MSD management can significantly improve the overall well-being and work performance of nurses [38].

The implementation of Indian Occupational Health and Safety (OSH) Code 2020 provides a legislative framework to enhance workplace safety and health in India. This code requires employers to implement measures to safeguard employees from occupational hazards, such as multiple sclerosis (MSDs). It underscores the significance of ergonomic assessments, secure work practices, and the provision of personal protective equipment [39]. OSH Code mandates the establishment of safety committees and the appointment of safety officers in workplaces, ensuring a structured approach to addressing occupational health issues. However, the successful implementation of OSH Code requires a concerted effort from employers and employees. By making investments in ergonomic equipment, offering training on safe work practices, and cultivating a positive work atmosphere, healthcare companies may emphasize the health and well-being of their nursing staff. Nurses, in turn, need to be aware of their rights under OSH Code and actively participate in safety committees and training programs.

This review had several limitations. The majority of included studies were cross-sectional, limiting the ability to establish causal relationships between risk factors and MSDs. Furthermore, the heterogeneity of study designs and outcome measures posed a challenge for direct comparisons between studies. The experiences of nurses in other healthcare contexts may not be completely represented by the emphasis on tertiary care settings. Despite these limitations, this review highlighted the significant burden of MSDs among Indian nurses and underscores the need for comprehensive, and culturally relevant interventions. Future research should prioritize longitudinal studies to investigate the long-term trajectory of MSDs and evaluate the effectiveness of various interventions. Furthermore, qualitative studies can provide valuable insights into the lived experiences of nurses with MSDs, informing the development of more patient-centered care.

Conclusion

The study highlighted that nurses with Musculoskeletal Disorders in India face significant social and personal challenges affecting their daily lives and well-being. Musculoskeletal disorders can lead to decreased social connections, reduced job satisfaction, and physical and emotional distress. The consequences encompass economic well-being, mental health, and quality of life. Consequently, additional research is essential to comprehend the scope and ramifications of this occupational health concern in the Indian nursing community.

Conflict of interest

None declared.

Authors' Contributions

Patangia Bishal: Performed the literature review, drafted the manuscript and prepared the figure. Priyadarshini MS: Reviewed the final manuscript and supervised the project.

References

1. Munabi IG, Buwembo W, Kitara DL, Ochieng J, Mwaka ES. Musculoskeletal disorder risk factors among nursing professionals in low resource settings: a cross-sectional study in Uganda. BMC Nurs. 2014;13(1):7.
2. Sun W, Yin L, Zhang T, Zhang H, Zhang R, Cai W. Prevalence of Work-Related Musculoskeletal Disorders among Nurses: A Meta-Analysis. Iran J Public Health. 2023;52(3):463-75.

3. Aleid AA, Eid Elshnawie HA, Ammar A. Assessing the Work Activities Related to Musculoskeletal Disorder among Critical Care Nurses. Crit Care Res Pract. 2021;2021:8896806.
4. Chhugani M, James MM. Challenges faced by Nurses in India-the major workforce of the healthcare system. Nurs Care Open Access J. 2017;2(4):112-4.
5. Mahajan D, Gupta MK, Mantri N, Joshi NK, Gnanasekar S, Goel AD, et al. Musculoskeletal disorders among doctors and nursing officers : an occupational hazard of overstrained healthcare delivery system in western Rajasthan, India. BMC Musculoskelet Disord. 2023;24(1):349.
6. Tang L, Wang G, Zhang W, Zhou J. The prevalence of MSDs and the associated risk factors in nurses of China. Int J Ind Ergon. 2022;87:103239.
7. Krishnan KS, Raju G, Shawkataly O. Prevalence of Work-Related Musculoskeletal Disorders: Psychological and Physical Risk Factors. Int J Environ Res Public Health. 2021;18(17):9361.
8. Moodley M, Ismail F, Kriel A. Work-related musculoskeletal disorders amongst undergraduate nursing students at the University of Johannesburg. Health SA. 2020;25:1460.
9. Viertiö S, Kiviruusu O, Piirtola M, Kaprio J, Korhonen T, Marttunen M, et al. Factors contributing to psychological distress in the working population, with a special reference to gender difference. BMC Public Health. 2021;21(1):611.
10. Qiu D, Li R, Li Y, He J, Ouyang F, Luo D, et al. Job Dissatisfaction Mediated the Associations Between Work Stress and Mental Health Problems. Front Psychiatry. 2021;12:711263.
11. Majumdar D, Pal MS, Majumdar D. Work-related Musculoskeletal Disorders in Indian Nurses: A Cross-sectional Study. J Nov Physiother. 2014;4(3):1000207.
12. Chandralekha K, Joseph M, Joseph B. Work-related Musculoskeletal Disorders and Quality of Life among Staff Nurses in a Tertiary Care Hospital of Bangalore. Indian J Occup Environ Med. 2022;26(3):178-82.
13. Saini SK, Pandey V, Kumar A, Elhence A. Musculoskeletal problems and expressed practices of body mechanics among nursing officers at All India Institute of Medical Sciences Jodhpur, Rajasthan, India. J Integr Nurs. 2021;3(3):128-34.
14. Chowdhury U, Das T, Mazumder S, Gangopadhyay S. Work-Related Musculoskeletal Disorders and Mental Health among Nursing Personnel in the Context of COVID-19 Pandemic in West Bengal, India. Int J Occup Saf Health. 2023;13(2):234-44.
15. Alam MM, Ali AM, Rafey M, Sufyaan M, Ahmad I, Zarrin S. Work-Related Risk Factors for Musculoskeletal Disorder among Nurses in Indian Hospitals. Muscle Ligaments Tendons J. 2023;13(2):273-82.
16. Rajpurohit P, Landge P, Kayasth J. A Study to Assess Prevalence of Developing Work Related Musculoskeletal Disorders Among Nursing Students at KPGU University - A Cross Sectional Study. Indian J Physiother Occup Ther. 2024;18(1):72-6.
17. Nair RS, Aithala PJ. Prevalence and risk factors associated with low back pain among nurses in a tertiary care hospital in south India. Int J Orthop Sci. 2020;6(1):301-6.
18. Goswami S, Ghosh S, Sahu S. Evaluation of ergonomic risk factors in manual patient handling tasks of Indian nurses. Ergon SA : J Ergon Soc S Afr. 2017;29(1):2-10.
19. Girish N, Girish Darsana N. Musculosleketal risk assesment among nurses in pateint manual handling in hospital wards – a cross sectional study. Cureus. 2013;5(8):e137.
20. Raithatha AS, Mishra DG. Musculoskeletal Disorders and Perceived Work Demands among Female Nurses at a Tertiary Care Hospital in India. Int J Chronic Dis. 2016;2016:5038381.
21. Paul A. A pilot study on awareness of ergonomics and prevalence of musculoskeletal injuries among nursing professionals. Int J Nurs Educ. 2012;4(1):1-4.
22. Parekh S, Mehta E. Effectiveness of Ergonomic Advice and Physiotherapy Intervention in Indian Nurses with Low Back Pain. Int J Recent Sci Res. 2015;6(9):6255-9.
23. Hijam S, Deaver U, Kanika, Sarin J. Effectiveness of Ergonomic Training Program on Knowledge, Self-efficacy and Practice on Prevention of Work Related low Back Pain among Staff Nurses. Indian J Forensic Med Toxicol. 2020;14(4):551-6.
24. Sharma R. Effectiveness of Educational and Selected Exercise Programme to Reduce Back Pain in Staff Nurses. Int J Nurs Educ. 2016;8(2):62-7.
25. Kim WJ, Jeong BY. Exposure Time to Work-Related Hazards and Factors Affecting Musculoskeletal Pain in Nurses. Appl Sci. 2024;14(6):2468.
26. Soares CO, Pereira BF, Pereira Gomes MV, Marcondes LP, de Campos Gomes F, de Melo-Neto JS. Preventive factors against work-related musculoskeletal disorders: narrative review. Rev Bras Med Trab. 2020;17(3):415-30.
27. Alharbi S, Alghafes NJ, Alfouzan YA, Alhumaidan RI, Alassaf F, Aldhuwyan A, et al. Musculoskeletal Disorders and Their Impact on Job Performance Among School Teachers in Buraydah City. Cureus. 2023;15(12):e50584.
28. Mossey JM, Gallagher RM. The Longitudinal Occurrence and Impact of Comorbid Chronic Pain and Chronic Depression over Two Years in Continuing Care Retirement Community Residents. Pain Med. 2004;5(4):335-48.
29. Reme SE, Dennerlein JT, Hashimoto D, Sorensen G. Musculoskeletal Pain and Psychological Distress in Hospital Patient Care Workers. J Occup Rehabil. 2012;22(4):503-10.
30. Abdelaliem SMF, Alsenany SA. Factors Affecting Patient Safety Culture from Nurses' Perspectives for Sustainable Nursing Practice. Healthcare (Basel). 2022;10(10):1889.
31. Lee SJ, Faucett J, Gillen M, Krause N, Landry L. Factors Associated With Safe Patient Handling Behaviors Among Critical Care Nurses. Am J Ind Med. 2010;53(9):886-97.

32. Malik E, Shankar S. Empowering nurses: exploring self-managed organizations in Indian healthcare. BMC Nurs. 2023;22(1):477.
33. Naoum S, Mitseas P, Koutsouleris C, Spinhoven M, Kalom I, RAPTIS K, et al. Musculoskeletal Disorders and Caring Behaviors among Nursing Staff in Greek Hospitals: a Prospective Multicenter Study. Maedica (Bucur). 2022;17(1):52-63.
34. OBrien WH, Chavanovanich J, Jarukasemthawee S, Pisitsungkagarn K, Kalantzis MA. Mindfulness-Based Approaches to Reduce Injuries among Nurses and Nursing Aides. In: Bowers CA, Beidel DC, Marks MR, Horan K, Cannon-Bowers J, editors. Mental Health and Wellness in Healthcare Workers: Identifying Risks, Prevention, and Treatment. Pennsylvania, United States of America: IGI Global; 2022.
35. Gideon Asuquo E, Tighe SM, Bradshaw C. Interventions to reduce work-related musculoskeletal disorders among healthcare staff in nursing homes; An integrative literature review. Int J Nurs Stud Adv. 2021;3:100033.
36. Marcuzzi A, Nordstoga AL, Bach K, Aasdahl L, Nilsen TIL, Bardal EM, et al. Effect of an Artificial Intelligence–Based Self-Management App on Musculoskeletal Health in Patients With Neck and/or Low Back Pain Referred to Specialist Care: A Randomized Clinical Trial. JAMA Netw Open. 2023;6(6):e2320400.
37. Hasan F, Mudey A, Joshi A. Role of Internet of Things (IoT), Artificial Intelligence and Machine Learning in Musculoskeletal Pain: A Scoping Review. Cureus. 2023;15(4):e37352.
38. Afsharian A, Dollard MF, Glozier N, Morris RW, Bailey TS, Nguyen H, et al. Work-related psychosocial and physical paths to future musculoskeletal disorders (MSDs). Saf Sci. 2023;164:106177.
39. Ministry of Labour and Employment. The Occupational Safety, Health and Working Conditions Code, 2020. New Delhi, India: Ministry of Labour and Employment; 2020 Oct. Report No.:37.