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Musculoskeletal Disorder among Nurses

A Systematic Literature Review

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Abstract

This systematic literature review aims to explore the impact of work-related musculoskeletal disorders (WRMSDs) on nurses and identify effective strategies for their prevention and management. A systematic literature review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. EBSCOHost (CINAHL) and PubMed databases were systematically searched. After an initial search yielded 211 studies, 10 studies met the inclusion criteria and were included in the review. The review highlighted lower back pain as a major impact of MSDs among nurses, with a high prevalence observed across the studies. Additionally, MSDs were found to contribute to stress, work-family conflict, and decreased quality of life, affecting mental well-being. Effective interventions included educational programs, ergonomic equipment (belts), acupressure, circadian rhythm stability, coping strategies, and multi-component interventions. Education programs, particularly those incorporating ergonomic training, patient handling techniques, and posture awareness, were mostly identified in the review as effective in reducing MSD prevalence. This review demonstrates the importance of addressing MSDs as a critical health and safety issue for nurses, highlighting the need for proactive intervention strategies. The lack of strong evidence supporting a single, definitive prevention strategy emphasizes the need for more robust research. Collaborative efforts among nurses, healthcare administrators, and other healthcare professionals are crucial in addressing MSDs from a multidisciplinary perspective, prioritizing worker health and wellbeing.

Language: English Key words: musculoskeletal disorders, nurses and prevention.

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1 Introduction

Musculoskeletal disorders (MSDs) are soft-tissue traumas resulting from sudden or extended exposure to force, vibration, uncomfortable postures, and repetitive motion. The muscles in an individual's upper and lower limbs, joints, cartilage, tendons, nerves, and neck can all be affected by these disorders. The most common cause of MSDs is overexertion, which can impair an employee's capacity to carry out a variety of job-related duties such as lifting, tugging, pushing, and keeping a normal posture as well as enduring low temperatures and torque reactions and vibrations from tools and machinery. Elderly employees may be more prone to MSDs (particularly back pain), more likely to require hospitalisation for MSDs, and more likely to require longer hospital stays for MSDs. MSDs, which are prevalent in older workers, have led to a misuse of opioids and are a major contributing factor to the pain epidemic. (CDC, 2022)

Around 1.71 billion individuals worldwide suffer from musculoskeletal disorders, which include osteoarthritis, rheumatoid arthritis, fractures, various injuries, low back pain, neck discomfort, and amputation, according to a recent analysis of Global Burden of Disease 2019 statistics. Although the frequency of musculoskeletal disorders varies according to diagnosis and age, they affect people worldwide. With over 149 million years lived with disability —or 17% of all years lived with disability worldwide—musculoskeletal disorders are also the leading cause of years lived with disability globally. (WHO, 2022)

For most working groups, musculoskeletal problems are seen as a significant occupational issue. Symptoms brought on by or made worse by employment are collectively referred to as work-related musculoskeletal diseases (WRMSDs). Discomfort, impairment, disability, or chronic pain are the characteristics of these illnesses. Indeed, it has been claimed that they have a substantial impact on living quality, leading to varying degrees of disability, chronic illnesses, limitations on one's ability to work, exorbitant medical expenses, absenteeism, or even changes in employment. (Clari, Godono, Garzaro, *et al.,* 2021)

MSDs are a major occupational health concern that affect nurses' quality of life, job performance, and general well-being. According to an analysis of research conducted in developing nations, the prevalence of MSDs among general workers was 37%, whereas it

was as high as 92% among nurses. An estimated 33% of all nurses' sick leave cases are thought to be related to MSDs. (Zare, Choobineh, Hassanipour, *et al.* 2021)

In the crucible of my first nursing practice, I was confronted with a poignant reality: the silent battle waged by nurses against pain, even as they tirelessly tended to the needs of others. Witnessing their unwavering dedication amidst their own palpable suffering ignited within me a fervent passion to delve deeper into this profound challenge. Nurses, as caregivers, embody the epitome of compassion and selflessness, yet behind their professional facade lies a stark reality: the daily struggle with physical and emotional pain. The demands of nursing often entail long hours, physically strenuous tasks, and exposure to emotionally taxing situations, leading to chronic conditions such as MSDs, and mental fatigue, which remain largely unseen. Despite these challenges, nurses persist in their vocation, driven by an unwavering commitment to patient care. Yet, amidst this struggle, nurses persevere with a resilience born of passion and commitment, navigating the demands of their vocation with grace and fortitude. This was my motivation to write on this topic.

2 Background

Musculoskeletal disorders (MSDs) encompass injuries or diseases affecting muscles, nerves, or other soft tissues, stemming from workplace risk factors (Sun, Yin, Zhang, Zhang, Zhang, & Cai, 2023). The National Institute for Occupational Safety and Health (NIOSH) defines MSDs as damage to the musculoskeletal system, including bones, spinal discs, tendons, joints, ligaments, cartilage, nerves, and blood vessels. Work-related musculoskeletal disorders (WRMSDs) are specifically conditions where workplace environments and tasks significantly contribute to the disorder (Suganthirababu et al., 2023). These disorders manifest as syndromes characterized by soft tissue pain, stiffness, swelling, fatigue, irritation, and a lack of control (Suganthirababu et al., 2023). Alternative terms for MSDs include cumulative trauma disorders, repetitive strain injuries, overuse syndrome, regional musculoskeletal disorders, repetitive motion injuries, and soft tissue diseases (Krishnan, Raju, & Shawkataly, 2021). MSDs affecting the spine, shoulders, and back account for a substantial portion (approximately one-third) of sick leave among healthcare staff, largely due to the inherent physical demands of the profession (Yizengaw, Mustofa, Ashagrie, & Zeleke, 2021).

2.1 **Prevalence and Trend of MSDs among Nurses**

Critical care nurses, due to the specific nature of their tasks, including unusual movements, static postures, repetitive motions, and the handling of heavy instruments, exhibit an even higher risk of developing MSDs compared to other nursing specialties (Aleid et al., 2021). MSDs are a major occupational health concern that affect nurses' quality of life, job performance, and general well-being. According to an analysis of research conducted in developing nations, the prevalence of MSDs among general workers was 37%, whereas it was as high as 92% among nurses. An estimated 33% of all nurses’ sick leave cases are thought to be related to MSDs (Zare, Choobineh, Hassanipour, et al. 2021).

The burden of musculoskeletal disorders (MSDs) on health and work capacity is evident. Nurses with musculoskeletal diseases have a higher turnover tendency, a higher risk of depression, and a lower quality of life. WRMSDs are also an important cause of sick leaves, patient safety issues, and decreased quality of care. In the long run, the existing predominance of WMSDs is not predicted to be helpful to the stability and development of

the nursing team, and is likely to risk patient safety (Zhang, ElGhaziri, Nasuti, & Duffy, 2020). Despite a decreasing trend, MSDs still account for most of the sickness-related leave. In Finland, 14 million sick days were compensated in 2015, of which one-third were due to MSD-related problems. The cost of compensation for work disability due to MSD-related problems was approximately EUR 280 million. In Finland, 26% of sick days lasting at least 11 calendar days in 2020 were due to MSDs (Sormunen, Ylisassi, Mäenpää-Moilanen, Remes, & Martimo, 2020). In addition to sick days, the loss of work productivity of workers with MSDs is a significant additional economic cost. The focus of the Finnish Occupational Health Service (OHS) has been on maintaining and promoting the health and work capacity of employees in collaboration with employers. Collaboration between occupational health and safety personnel is considered to strengthen the process of improving the work capacity of workers with MSDs (Sormunen et al., 2020).

2.2 **Risk Factors of Musculoskeletal Disorders**

In both nursing and other healthcare professions, there are correlations between psychosocial and musculoskeletal disorders. However, nursing workers are often identified as high risk for such injuries. This increased risk is attributed to physical and psychosocial demands inherent in their work. Therefore, it is crucial to consider physical and psychosocial factors when addressing the prevention and management of musculoskeletal disorders in nursing workers (Valim, de Sousa, da Silva Santos, Alvim, 2024). Nursing work often involves high levels of psychosocial stressors such as double or triple shifts, high workloads, inadequate support, and emotional demands, which can contribute to the development of psychosocial disorders. These psychosocial disorders can favour the development of musculoskeletal disorders due to their impact on physical symptoms such as muscle tension and fatigue (Davey, Sharma, Davey, & Shukla, 2019).

Yasobant and Rajkumar (2014) investigated work-related musculoskeletal disorders (WMSDs) among five healthcare professional groups in a tertiary Indian hospital. The study observed a significant prevalence of MSDs across all groups, with low back pain being the most frequent symptom. Nurses exhibited the highest risk, followed by physiotherapists and dentists, while laboratory technicians and physicians showed the lowest. Key job risk factors, as self-reported by participants, included prolonged static postures, awkward work positions, and high patient/sample loads. Mirmohammadi, Yazdani, Etemadinejad, &

Asgarinejad (2015) investigated the prevalence and risk factors of WMSD's among 110 hospital healthcare staff. The study identified patient handling/transferring and relocating as high-risk activities, especially for female healthcare staff. This correlation was particularly evident in the neck, low back, and knee regions. According to Taghinejad, Azadi, Suhrabi, & Sayedinia (2016) physically demanding tasks, such as bending/twisting at the waist for patient handling and working with hands above shoulder height, were significantly associated with MSD prevalence. Additionally, single marital status and participation in any physical activity were also significantly linked to MSDs. However, age, weight, height, BMI, and gender were not found to be statistically significant predictors. Yang, Lu, Zeng, Wang, & Li (2019) in a cross-sectional study investigated the prevalence and risk factors of work-related musculoskeletal disorders (WRMDs) among intensive care unit (ICU) nurses in Hunan Province, China. A substantial 97.1% of the 679 participating nurses reported experiencing at least one WRMD in the previous year, with low back pain being the most prevalent symptom (80.1%). The study showed that gender and a greater perceived risk of injury and a perceived lack of a safe work environment were also independently associated with higher WRMD prevalence. Lin et al. (2020) investigated musculoskeletal disorders (MSDs) among 1,803 nurses in a northern Taiwanese medical center. The study through a multivariate analysis identified specific risk factors for discomfort in different body parts. Age, work seniority, and department type emerged as significant predictors for several MSD locations, while exercise habits and job title were also implicated in shoulder and neck pain, respectively.

There is also research evidence that show that psychological and psychosocial factors cause and result in chronicity of musculoskeletal pain and associated disability. Psychosocial stressors including high workloads, time pressure, emotional stress, inadequate support, and irregular work schedules combines with substantial physical demands to exacerbate the prevalence of MSDs in nurses (Soylar & Ozer, 2018; Davey et al., 2019; Zhang et al., 2020). These psychosocial factors can contribute to increased muscle tension and fatigue, potentially increasing the risk of MSDs (Davey et al., 2019). Vargas-Prada & Coggon (2015) indicate in their study that low mood, somatization tendency which is a predisposition to worry about somatic symptoms, and adverse health beliefs significantly impact the occurrence and persistence of musculoskeletal pain, as well as associated disability. Crofford (2015) in a literature review demonstrates a significant relationship between pain and psychological distress, particularly depression, anxiety, and post-traumatic stress

disorder. Based on the study, it is important to identify and address psychological comorbidities in patients with chronic pain. According to Vieira, Mininel, & Sato (2023), there is a significant association between burnout and stress with multisite musculoskeletal pain among healthcare workers. However, Hämmig (2020) in a cross-sectional study found a weak association between MSD and sleep disorders.

2.3 **Interventions for Musculoskeletal Disorders in Healthcare**

Numerous studies have explored interventions aimed at reducing WRMSDs among healthcare workers, with a high prevalence observed among nurses. Sirisawasd, Taptagaporn, Boonshuyar, & Earde (2018) in a literature review examined work-related musculoskeletal disorders (WMSDs) among healthcare workers (HCWs), analysing 23 studies published between 1990 and 2017. Based on the review, nurses experienced the highest WMSD prevalence, primarily affecting the shoulder and lower back, with overall rates ranging from 55.6% to 91.7%. Risk factors included patient handling, prolonged standing, repetitive movements, and awkward postures, varying by profession. According to the study, interventions like ergonomic workstation redesign, assistive devices, and guidelines showed promise in reducing WMSD risk factors. Asuquo, Tighe, & Bradshaw (2021) in an integrative literature review examined interventions to reduce work-related musculoskeletal disorders (WMSDs) among healthcare staff in nursing homes. Synthesizing data from fifteen peer-reviewed primary studies published between 2000 and 2020, four major themes emerged. First, specialized equipment, particularly ceiling lifts, demonstrated effectiveness in reducing WMSDs compared to floor lifts, due to reduced physical strain. Second, staff training programs, especially those developed and implemented by management, yielded positive outcomes, although the effectiveness varied depending on the training program's structure and frequency. Third, policies and procedures, including "zero lift" policies and protocols for equipment maintenance, played a crucial role in preventing WMSDs, contributing to decreased injury rates and compensation claims. Lastly, support and follow-up, including clinical nurse specialist programs and peer coaching, were associated with improved outcomes, promoting adherence to safety protocols and reducing pain intensity. Sepehrian, Hashjin, & Farahmandnia (2024) examined interventions for reducing sickness absence and improving work outcomes among nurses with work-related musculoskeletal disorders (WMSDs).

Fifteen studies, including Randomized Controlled Trials, pre-post, cohort, and crosssectional designs, were qualitatively synthesized. Six intervention categories emerged: back college, early workplace interventions, physical activity/training, psychosocial education, multifaceted interventions, and ergonomics programs. The study results showed that there is no single intervention type for reducing sickness absence or improving work outcomes. Richardson, McNoe, Derrett, & Harcombe (2018) revealed a notable lack of high-quality evidence supporting the effectiveness of any single intervention type. While some studies reported positive effects, particularly for patient lift systems and, to a lesser extent, unstable shoes, the overall quality of evidence was deemed insufficient to definitively support any intervention. Patient handling training, while showing some shortterm promise in some studies, did not demonstrate consistent efficacy. Multi-component interventions, integrating ergonomic aids, mechanical equipment, and training, also produced mixed results, with limited conclusive findings. According to Sousa, Baixinho, Presado, & Henriques (2023), in a review, encompassing 13 studies, interventions combining training on patient handling devices and ergonomics education were frequently associated with positive outcomes. However, a key limitation identified was the lack of comprehensive multifactorial approaches. While many studies investigated the impact of specific interventions, they did not systematically consider the interplay of individual, workrelated, organizational, and psychological risk factors.

3 Aim

Work related musculoskeletal disorders are a major concern for employees and employers because they result in high absenteeism costs, medical costs, workers' compensation costs, and permanent musculoskeletal limitations (Wang et al., 2017). The high incidence of WRMSDs requires an understanding of WRMSD prevention measures to improve the health of nurses and reduce absenteeism costs to the health care system, while continuing to provide quality care to those in need (Asuquo, Tighe, & Bradshaw, 2021).

The aim of this research is to explore the impact of work-related musculoskeletal disorders (WRMSDs) on nurses and identify effective strategies for their prevention and management.
Research Questions

1. What is the impact of the development of WRMSDs among nurses?

2. What effective strategies can be used in the prevention and management of WRMSDs among nurses?

4 Theoretical Framework

A theoretical framework is a research instrument that defines the relationships between diverse aspects of scientific knowledge, identifies gaps in existing knowledge, and directs the formulation of research questions, hypotheses, and procedures. Furthermore, it helps researchers to place their research into a broader theoretical framework, making it easier to interpret findings and make recommendations (Anfara and Mertz, 2014). The Neuman's system model provides the theoretical framework for this present study because it focuses on stressors identification and interventions to mitigate the effect of these stressors on individuals. This study highlights how workplace stressors affect the physical and psychological well-being of nurses as they perform their work duties as caregivers in their workplace, as well as intervening measures that could help them prevent and/or manage the impact of the stressors that cause MSDs in nurses.

4.1 Neuman's System Model

The Neuman Systems Model emphasises the interaction between the nurse, their surroundings, and their health reactions, providing a thorough framework for

comprehending the variables causing musculoskeletal disorders (MSDs) in nurses. Individuals are categorised by this concept as dynamic systems that interact with a range of internal and external influences. This model entails the following;

1. **Conceptualization of the Client System:** Five factors make up the client system, which in this instance is the nurse: psychological, developmental, spiritual, sociocultural, and physiological (Neuman, 2011). Every one of these factors affects how the nurse feels and manages the workplace pressures that could lead to musculoskeletal complaints.

2. **Stressors and Their Impact:** There are three types of stressors: extrapersonal, interpersonal, and intrapersonal. The physical demands of patient care, such as lifting and transferring patients, are prevalent stressors in the nursing context and can result in physiological stress that manifests as MSDs (Fawcett & Gigliotti, 2001). This underscores the need for primary prevention interventions that boost nurses' natural defences, such as ergonomic training and appropriate lifting techniques, to lower the likelihood of experiencing these physical stressors (Capers, 1996).

3. **Levels of Prevention:** Three degrees of prevention are proposed by the Neuman model: primary, secondary, and tertiary. Primary prevention for nurses with MSDs may include teaching body mechanics and putting ergonomic practices into place to avoid injuries (Louis, Neuman, Gigliotti, et al. (2011). Early detection and treatment of any MSD symptoms by suitable medical and physical therapy may be considered secondary prevention (Capers, 1996). By rehabilitating impacted nurses and assisting them in regaining optimal functionality, tertiary prevention would seek to lessen the lasting impacts of injuries (Fawcett & Gigliotti, 2001).

4. **Dynamic Interaction with the Environment:** By modifying interactions to maximise health and well-being, the nurse is portrayed in the model as an active participant in their surroundings (Neuman, 2011). Nurses deal with demanding work situations that can cause stress, underscoring the need for workplace policies and practices that promote well-being and reduce the incidence of MSDs (Bruick-Sorge, 2007). These practices and policies should focus on psychosocial aspects like workload and organisational culture. (Walton, 2009).

5. **Research Implications:** Nursing research is based on the Neuman system model. It promotes research on the connection between pressures at work and health outcomes, including MSDs in nurses (Freese, Russell, Neuman, & Fawcett, 2011). Prior studies have demonstrated the efficacy of ergonomic interventions, demonstrating how these prophylactic actions can stabilise and improve nurses' health in their work-related tasks (Günüşen, Üstün, 2010).

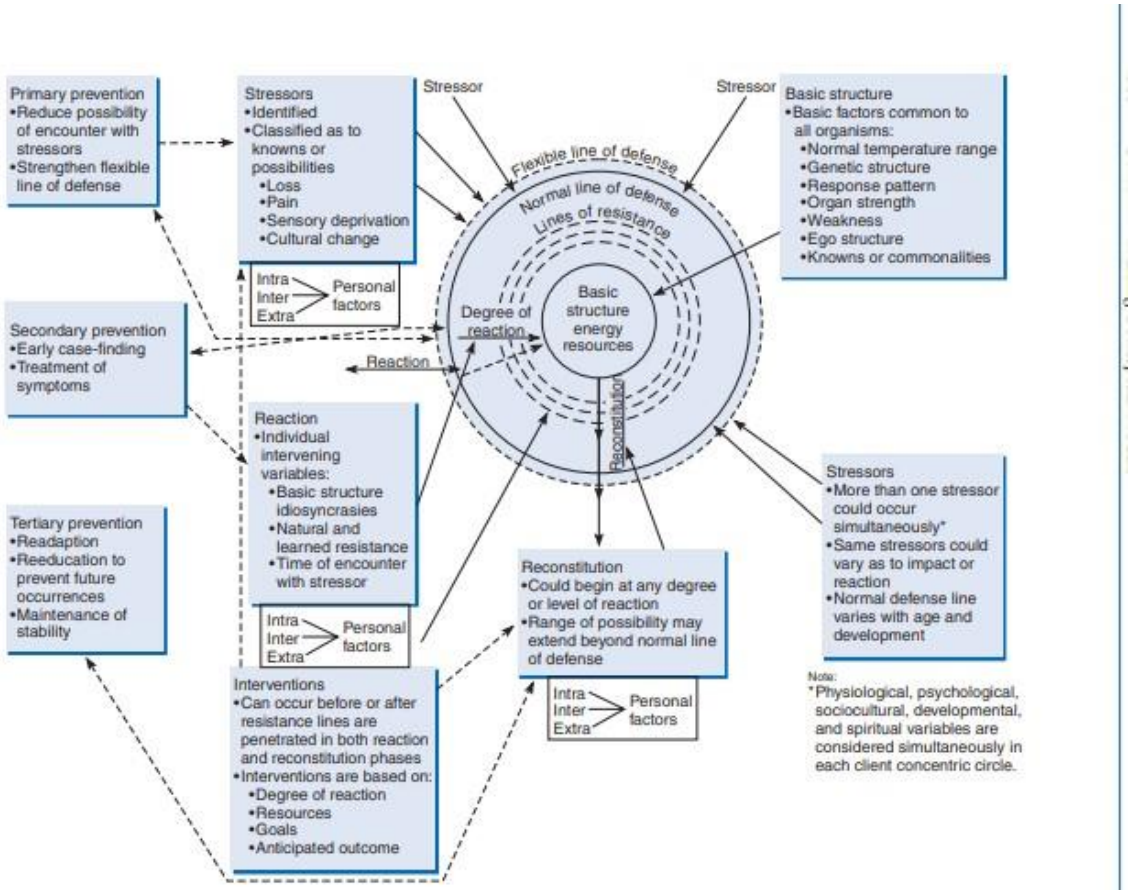

Figure 1: Neuman's system theory adapted from Nursing Theorist And Their Work p. 286

5 Methodology

Qualitative research design is characterized by its dynamic and adaptable nature throughout the project's lifespan, unlike quantitative research, where the design is typically predetermined. Qualitative researchers shape their approach as they engage with the study, with design elements often emerging post hoc, informed by field experiences. The primary aim is to cultivate a deep understanding of a phenomenon within unique contexts, emphasizing flexibility, holistic perspectives, active researcher involvement, ongoing data analysis, and diverse data collection methods. Researchers are often likened to bricoleurs, adept at navigating various tasks such as interviewing, reflection, and introspection, with a design process prioritizing planning that fosters adaptability based on insights gained during data collection. (Polit and Beck, 2010).

5.1 **Literature Review**

A literature review plays a crucial role in the research process by offering a critical analysis and summary of existing research and knowledge on a particular topic or research question. Its significance lies in inspiring new research ideas, establishing the groundwork for studies, shaping research questions, suggesting suitable methods, and pinpointing gaps in the existing evidence base. Particularly for quantitative researchers, literature reviews are indispensable as they facilitate comprehension of the current state of knowledge in a specific area and provide guidance for future research endeavors. Of the several types of reviews that exist, systematic literature reviews are by far the most informative and scientific, provided they are done carefully and well justified (Paul et al., 2021).

The goal of a systematic literature review (SLR) is to locate and synthesize relevant research comprehensively using orderly, transparent, and repeatable procedures at each step of the process (Shaffril et al., 2021). The process of conducting a literature review entail evaluating and analysing evidence from various studies, appraising the quality of research, and synthesizing information to derive meaningful conclusions. (Polit and Beck, 2010). According to Egger et al. (2008), there are 8 steps in the process of developing, conducting and reporting SLR in healthcare disciplines. These steps include formulating review question, defining inclusion and exclusion criteria, locating studies, selecting studies,

assessing study quality, extracting data, analysing and presenting results, and interpreting results. In this research, this process is used to achieve the research aims.

5.2 **Data Collection**

This study is based on a systematic review of publications related to the research issue on musculoskeletal disorder among nurses. A systematic review identifies and assesses relevant published and unpublished literature to answer well-defined research questions like those stated in the outset of this thesis research. The primary aim for performing a literature review is to synthesize a body of research on a specific issue to arrive at strong and wide conclusions and implications. Another reason to perform a literature review is that it is required. Most academic investigations, such as this, include a literature review to demonstrate knowledge of a research topic.

5.2.1 Study design

The SLR method allows for the inclusion of different studies, and this helps to draw conclusions from evidence with minimal risk of bias that can guide nurses and health professionals to make evidence-based decisions. (Aveyard, H. 2010)

The PICO format (Population, Intervention, Comparison, Outcome) was used to develop the inclusion and exclusion criteria for the SLR in this study. Table 1 summarizes the PICO for this research. Other criteria were applied to the SLR. The search for literature was limited to articles published between 2016 and 2024 (8years). In addition, the study only includes studies that are primary studies, peer reviewed, and published in English
Language. This study also follows the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) to identify and select relevant studies that are published on various journals.

PICO Terms	**Inclusion**	**Exclusion**
Population	Nurses	Other health professionals not involved in direct physical care for patients

Intervention	All interventions targeting the reduction of MSD	Other interventions not targeted at addressing MSD
Comparison	Usual healthcare work routines	Studies with intervention outside the healthcare setting
Outcome	Studies that reported outcomes for MSD	Studies that did not show any outcome related to MSD

Table 1: PICO and eligibility criteria for the research

5.2.2 Databases and Search Strategy

For the next step in this SLR which is to locate studies, a systematic search of two (2) databases EBSCO Host (CINAHL) and PubMed was completed. Boolean operators (AND, OR) were used on both databases to ensure an extensive search of existing research. The main keywords were “musculoskeletal disorder”, “nurses” and “intervention”. On both databases, the keywords were combined as (musculoskeletal diseases) AND (“nurses” OR “nurse” OR “nursing staff”) AND (“intervention” OR “treatment” OR “therapy”). On PubMed a different filter for randomized trials was applied to the search. Research publications retreived from these databases were recent evidence-based articles from 2016-2024.

5.2.3 Search Outcome

The initial search in the SLR generated a total of 211 studies from both databases. EBSCOHost (CINAHL) generated 109 studies and PubMed generated 102 studies. The search results were then checked for duplicates. A total of 96 duplicates were removed. After this, 115 titles were screened based on their titles and abstracts. 73 studies were excluded based on this because they did not meet the inclusion criteria. Full text review of 42 studies was conducted. 32 studies were further excluded because they were not relevant to the present review. A total of 10 studies were finally included in the review. The search and selection process are shown in Fig. 2.

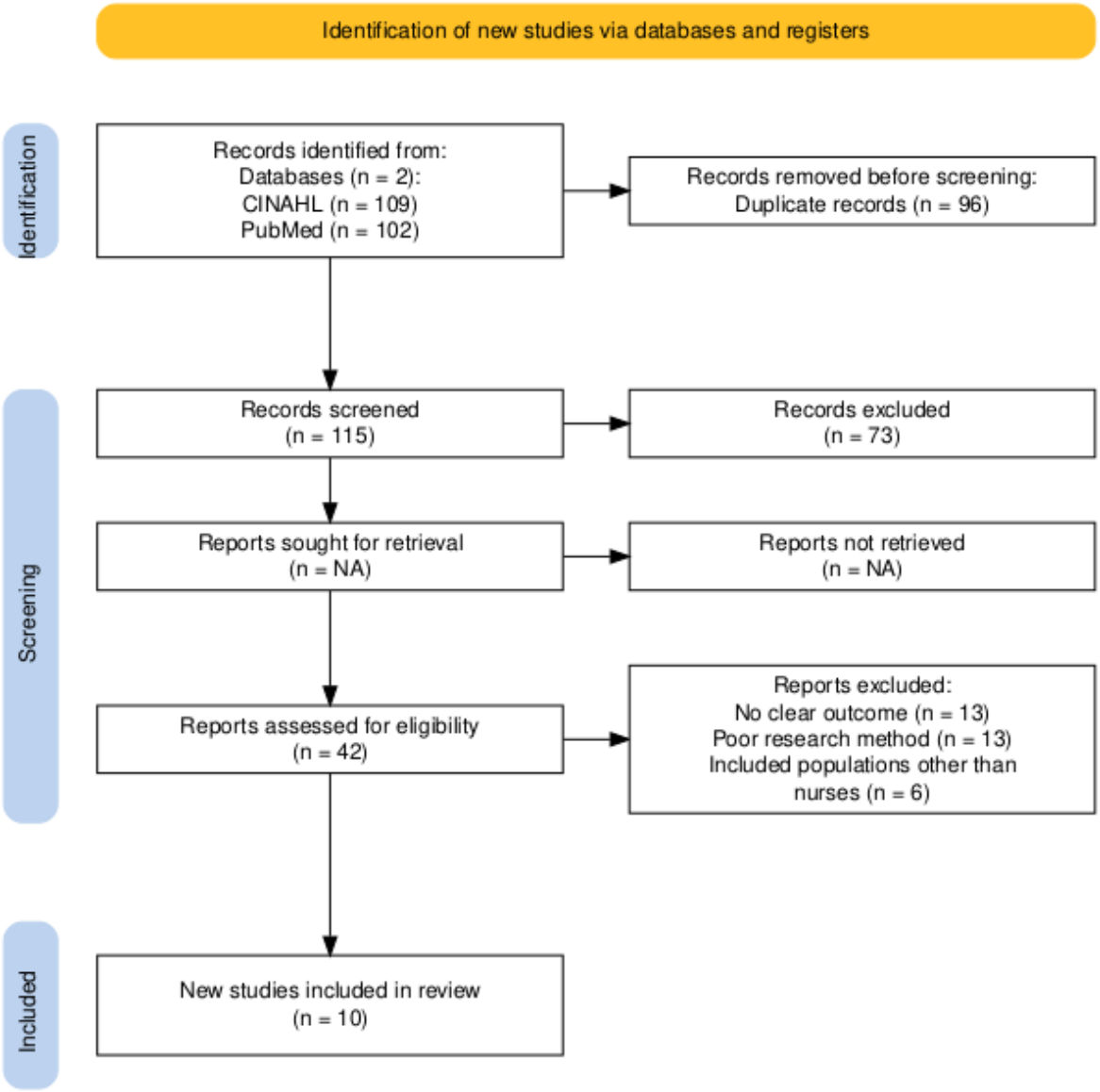

Figure 2: PRISMA Flow Diagram For SLR

5.3 **Data Analysis**

Data analysis encompasses the procedures of arranging, structuring, and deriving significance from the data gathered in a research endeavour. In qualitative studies, this involves grouping narrative information into cohesive patterns. Researchers discern themes and categories from the data to construct a comprehensive depiction or theory of the subject under examination. In qualitative research, data analysis is a continuous and simultaneous process that informs decisions regarding sampling, data collection, and interpretation. (Polit and Beck, 2010).

In this research, quality appraisal was first conducted for the studies selected to be included in the review. The purpose of this appraisal is to assess the methodological quality of the study and determine the extent to which the study has addressed potential bias in its design, conduct and analysis. This research applied the appraisal technique of Joanna Briggs Institute (JBI). The focus of the appraisal was on the study design, introduction, consistency of data collection, ethical matters, results, and discussion. (Joanna Briggs Institute, 2017).

Data extraction was extracted from the selected study after quality appraisal. Based on the defined selection criteria for the review, the data extraction was done. The extracted data include study identification including author, year of publication, and country, study objective, study design, intervention, and outcomes. A qualitative content analysis was further done to interpret and understand the interventions in the studies and the outcomes reported.

Author and year	**Study Aim**	**Study Design**	**Intervention**
Zakerian et al. (2021)	To evaluate the efficiency of ergonomic belt in reducing the risk of MSD in nurses.	Cross-sectional study	Ergonomic belt
Richardson et al. (2019)	To explore the perspective of nurses regarding techniques for preventing MSD.	Cross-sectional qualitative descriptive study	Education, Equipment, health and safety policy, and collaboration
Yilmaz & Isik Andsoy (2022)	To determine the prevalence of MSD among nurses and the associated factors	Cross-sectional design	Coping methods
Hernández et al. (2022)	To examine the	Randomized controlled trial	Multi-component intervention

	effectiveness of multicomponent intervention		
	in reducing the risk of MSD		
Rakhshani et al. (2024)	To investigate the effect of an educational intervention on MSD among nurses	Semiexperimental study	PRECEED-PROCEED Educational Intervention
Ratzon, BarNiv, & Froom (2016)	To examine the effect of a structured personalized ergonomic intervention program for MSD.	Randomized controlled trial	Personalized work routine
Bagheri Hosseinabadi et al. (2021)	To examine the effect of circadian rhythm stability on MSD prevalence	Cross-sectional study	Circadian rhythm stability
Yang et al. (2021)	To evaluate the effectiveness of a multidimensional intervention program to prevent and reduce WRMDs	Clustercontrolled trial	A multidimensional intervention program

Abdollahi et al. (2020)	To examine the effect of an ergonomics educational program on MSD on nurses	Quasirandomized controlled clinical trial	Education of nurses about ergonomics
Najafabadi et al. (2020)	To investigate the effect of acupressure on QOL among female nurses with chronic back pain.	Randomized-clinical trial	Acupressure intervention

Table 2: Data Extraction Table

5.4 **Ethical Consideration**

Academic integrity is the dedication to honesty, trust, fairness, respect, and accountability as the fundamental pillars of academic research. Plagiarism, defined as stealing and passing off another's or an existing source's ideas as one's own without attributing the source, is undoubtedly one of the most urgent issues confronting higher education scholars today. Plagiarism has a negative impact on the quality of academic work and research (Clarke, Chan, Bukuru, Logan, & Wong, 2023). Concerns about ethics are especially important in nursing research since the line between what constitutes proper nursing practice and data collection can sometimes become blurred (Denise & Cheryl, 2010, p. 118).

TENK is Finland's body of ethics that governs educational research. The Advisory Board's scope and mandate are focused on ensuring that research is conducted ethically and properly, as well as detecting and eliminating fraud and dishonesty in all studies (TENK). To avoid research misconduct known as plagiarism, researchers must realize the need of accurate citations when doing research in established scientific journals. According to (TENK), plagiarism, sometimes known as unacknowledged borrowing, is the practice of presenting another person's material as one's own without citing the necessary references. This includes research ideas, papers, essays, other publications or parts of them, visual materials, and translations. Direct and adapted copying are both types of plagiarism. It is important noting that the journals used in this thesis were appropriately credited, and the results were accurately stated, avoiding any type of plagiarism or journal misrepresentation wrongdoing.

6 Results

This section presents the background characteristics of the 10 studies included in this present systematic literature review (SLR) on musculoskeletal disorder prevention and management in nursing practice. The results were categorized into two (2) themes and six (6) subthemes with the goal of answering the research questions. The first theme investigated the negative impact of musculoskeletal disorders among nurses, including subthemes such as physical health risk and psychological health issues. The second main theme focused on the effective strategies for prevention and management of musculoskeletal disorders among nurses with subtheme such as education strategies, complimentary techniques where acupunture and ergonomic work tools were included and injury prevention as well as coping strategies in the event of MSDs occuring.

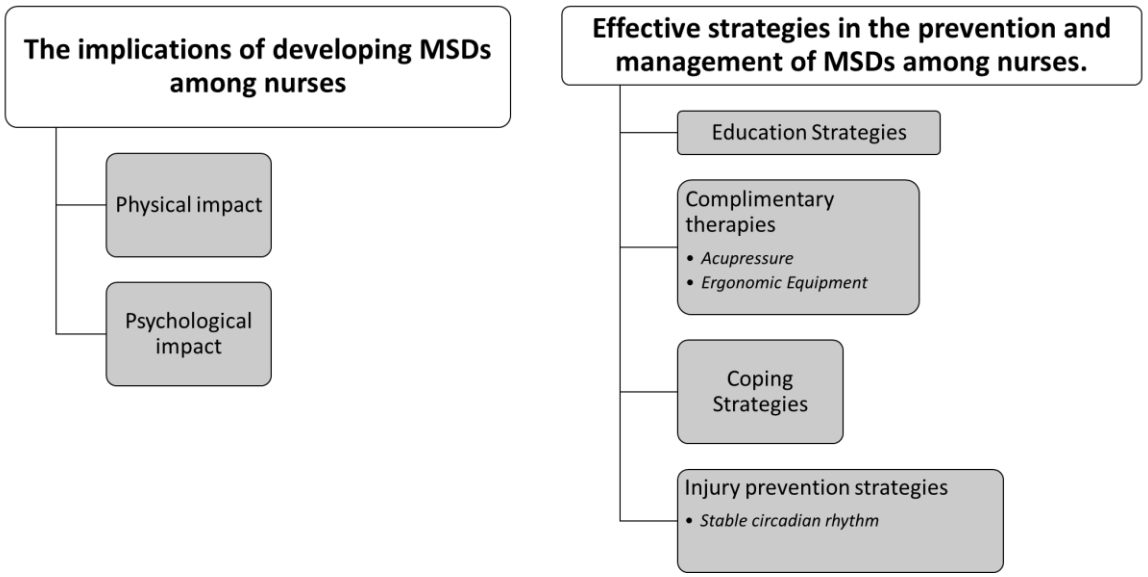

Figure 3: Result; Themes and sub-themes

6.1 **Study characteristics**

All the 10 studies were published in English language between 2016 and 2024. Six (6) of the studies were carried out in Iran. This high percentage of studies (60%) being conducted in Iran indicates the possibility of high prevalence of low back pain, MSDs, and work overload in the healthcare setting in Iran. Akbari et al. (2017) show that patient handling tasks and patient transferring duties carried out by nurses in Iran the high occurrence of MSDs among nurses in the country. The sample size of the studies included in this SLR ranges from 31 to

201. 9 of the included studies used quantitative randomized controlled trial design. 1 of the included studies is a qualitative research design. This study was selected to identify themes that emerged from study participants regarding the impact of MSDs and the effectiveness of interventions. None of the studies directly evaluated the physical and psychological impact of MSDs on study participants. All studies evaluated the implementation of interventions to reduce the rates of MSDs among nurses.

In terms of data collection, two main tools were identified among the selected studies. These are the Nordic musculoskeletal questionnaire and the Rapid Entire Boy Assessment (REBA). The Nordic musculoskeletal questionnaire was used to analyse the musculoskeletal symptoms before intervention and post-intervention. 5 out of the 10 included studies used this data collection tool to define the occurrence of pain in different parts of the body. REBA, on the other hand, was used for the assessment of musculoskeletal risks. This tool helped to target areas in the daily work routines which could benefit from the interventions. 3 studies used the REBA method. Of the 2 remaining studies, one used semistructured interviews for data collection, and the second used the PRECEDE-PROCEED model for data collection. Other data collection tools that emerged, often combined with the Nordic musculoskeletal questionnaire, were the Circadian Type Inventory questionnaire (Bagheri Hosseinabadi et al., 2021), SF36 questionnaire (Najafabadi et al., 2020), and the Borg Scale (Zakerian et al., 2021).

6.2 The implications of developing MSDs among nurses

Most of the studies included in this SLR suggested that MSDs is associated with physical and psychological health risks that would further influence the effectiveness of nurses in providing care.

6.2.1 Physical impact

The primary impact of musculoskeletal disorders is low back pain. According to the findings of the included studies there is high prevalence of lower backpain in both intervention and control groups who participated in the studies. Ratzon, Bar-Niv, & Froom (2016) reported that the frequency of pain in the lower back region among study participants was 44.32% followed by the neck region (34.4%). Yilmaz & Isik Andsoy (2022) reported that surgical

nurses frequently experienced pain in their lower back (68%). The study observed that that lower backpain experienced by surgical nurses affected their nursing care and had negative impacts on their daily lives. *The findings of Zakerian et al. (2021) show that among ICU nurses the incidence of back pain was high with the most relevant complaint being pain in the lumbar region followed by pain in the shoulder and arm.*

6.2.2 Psychological impact

Two studies suggested that MSD led to psychological health issues. Bagheri et al. (2021) found that the prevalence of MSDs among nurses caused work-family conflict. The study reports MSDs as strain-based work interference with family. According to the study, nurses who suffer depression or stress as a result of the role-induced strain from MSDs find it difficult to be an attentive spouse or responsible parent. Similarly, Yang et al. (2021) found that nurses with WRMDs reported experience of stress at work. Najafabadi et al. (2020) found that MSDs affect the quality of life of nurses as it leads to physical and mental degradation resulting in resignation, fragile professional communication, deterioration of the quality of care, professional dissatisfaction and leaving the profession. Participants in the study report that MSDs and experience of high rates of pain was responsible for absence from work, fatigue, and high turnover. Yilmaz & Isik Andsoy (2022) found that MSDs in the health industry especially among surgical nurses has implications for work, social life, and personal well-being and health.

In summary, the research indicates that MSDs among nurses are associated with both physical and psychological health risks, impacting their ability to provide care effectively. Lower back pain is the most common issue, with studies reporting high prevalence rates among nurses, particularly in surgical and ICU settings. For example, Ratzon et al. (2016) found a 44.32% incidence of lower back pain, while Yilmaz & Isik Andsoy (2022) reported 68% among surgical nurses, negatively affecting their work and daily lives. Additionally, MSDs contribute to psychological distress, including work-family conflicts, stress, and professional dissatisfaction. Studies by Bagheri et al. (2021) and Yang et al. (2021) highlighted how MSD-related stress impacts personal and professional roles. Najafabadi et al. (2020) further reported that MSDs lead to resignations, absenteeism, and diminished quality of care. Overall, MSDs significantly affect nurses' physical health, mental well-being, job performance, and quality of life.

6.3 Effective strategies in the prevention and management of MSDs among nurses.

Results from the reviewed studies documented the effect of interventions on MSDs in nurses. Most of frequent interventions for the prevention and management of MSDs in nurses identified in this present literature review include use of ergonomic belt, educational programs, acupressure and circadian rhythm stability. Some studies also investigated and documented effects of multi-component intervention plan. A total of 6 studies measured and documented educational strategies used in preventing and managing MSDs among nurses.

6.3.1 Education Strategies

Education and training of nurses appeared as the most frequent intervention used in the reviewed studies. The content of the educational intervention used in the studies varied significantly. Abdollahi et al. (2020) used educational programs focused on expunging the ergonomic risk factors nurses face in carrying out their daily tasks and the practical methods for removing such risk factors. Yang et al. (2021) designed and implemented an occupational health training program delivered in a two-months period. The program combined training focused on improving risk perceptions, health behaviour, and promoting a safe work environment. Richardson et al. (2019) applied reinforcement and repetition of information to help nurses understand MSDs and their prevention. In a 3 months intervention program Ratzon, Bar-Niv, & Froom (2016) carried out trainings on segmental stabilizing exercises, and principles of good work posture. The educational/coaching group meetings were conducted by a physiotherapist. Hernández et al. (2022) designed and implemented theoretical and practical training interventions over a two-day period. The intervention targeted multiple components including ergonomics, patient handling, physical exercises, and postures. Rakhshani et al. (2024) used lectures, Q&A and group discussions to deliver educational intervention that focuses on equipping nurses with integral information on appropriate forms to carry out their job duties, improve self-care behaviors, a eliminate deficiencies in the workplace.

Result from these quantitative studies showed significant impact on MSDs. All the studies observed that nurses' experience of MSDs was reduced with training. The use of education strategies helped to prevent injuries among nurses (Richardson et al., 2019). Educational

programs based on the PRECEDE-PROCEED model resulted in an increase in knowledge of the problem and leads to a reduction in the incidence of MSDs in nurses (Rakhshani et al., 2024). Similar result was documented in Hernández et al. (2022). Ratzon, Bar-Niv, & Froom (2016) reported a significant improvement in body posture of the nurses who participated in the study. Participants in the control group showed no significant difference before and after the intervention. The study however reports no significant difference between the two groups in terms of the number of body parts that participants experienced discomfort or musculoskeletal pain. In Yang et al. (2021), education strategies improved the risk perception of MSDs and health behaviour application. Statistical differences were observed in Abdollahi et al. (2020) between the intervention and control group. The study results showed that the prevalence of MSDs was significantly lower in the intervention group compared with the control group. In terms of the prevalence of MSDs in different parts of the body including ankle, hand wrist, lower back, neck, hip, and shoulder, the intervention group reported lower prevalence of MSD after the intervention than the control group. In addition to educational strategies, complimentary therapies such as the use of ergonomical work tools are means of combating the effects of MSDs.

6.3.2 Complimentary therapies

Acupressure and the use of ergonomic work equipment in the workplace have been linked to improved MSD prevention and management among nurses.

6.3.2.1 Acupressure

One study (Najafabadi et al.,2020) examined the effects of acupressure on MSDs. The findings indicate that within 2 to 4weeks after the intervention, there was significant improvement in the quality of life (QOL) of nurses experiencing chronic pain associated with MSDs. The independent t-test shows statistically significant differences between the two groups after the intervention. The study also finds that the physical and mental health of the intervention group was significantly higher in the three periods after the intervention.

6.3.2.2 Ergonomic Equipment

Zakerian et al. (2021) examined the effect of the use of ergonomic belt on MSDs among 60 nurses in a hospital. The study used Borg scale to examine the amount of perceived exertion experienced by nurses in handling their tasks. The study showed that the amount of

perceived exertion by nurses during patient transfer reduced significantly from 71.91% before the use of ergonomic belt to 48.58% after the use of ergonomic belt. The study further shows that lumbar disorders reduced greatly after using ergonomic belt. The study result however shows that there is no significant difference in the prevalence of MSDs in the elbow and forearm before and after the use of ergonomic belt.

6.3.4 Coping Strategies

One study Yilmaz & Isik Andsoy (2022) showed significant impact of coping strategies on MSDs. The study assessed coping strategies used by nurses to cope with pain within and outside the hospital. The study found that getting help in handling heavy patients, adjusting body posture, and using different part of the body in the care process were strategies used to reduce pain and ameliorate MSDs among nurses while in the hospital. Outside the hospital, the study found that walking, exercising, receiving support from a physiotherapist, pilates, and yoga were among the coping methods nurses used. According to the findings of the study, nurses used coping strategies more at the hospital than they did out of the hospital. Getting helps to handle heavy patients recorded the highest followed by walking, exercising, and receiving physiotherapist support.

6.3.5 Injury Prevention Strategies

Injury prevention strategies were identified in two studies included in this systematic literature review. circadian rhythm stability was used to identify nurses that are flexible and fit for shift work and can stay awake at unusual hours of the day or night. Staying awake and alert can help nurses avoid accidents; a steady circadian cycle keeps them aware of their surroundings and prevents them from bumping into barriers or falling down. *Bagheri Hosseinabadi et al. (2021) found that there was lesser experience of strain-based work influence on family among nurses who were flexible and able to stay awake during odd work hours in comparison to nurses who could not overcome drowsiness.*

However, the study reports no significant correlation between circadian rhythm stability and amplitude and MSDs.

7 Discussion

This thesis aim is to explore the impact of work-related musculoskeletal disorders (WRMSDs) on nurses and identify effective strategies for their prevention and management.. The present study summarizes the physical and psychological impacts of MSDs among nurses. Despite being a critical topic in the field of occupational health, there is still scarce evidence on the subject, and the available literature have provided results that do not combine the impact of MSDs among nurses and the effectiveness of prevention strategies. This study was performed to identify various interventions and ascertain their efficacy in existing studies in reducing the risk of MSDs among nurses. This review included 10 studies conducted in different geographical settings and which applied clear interventions for nurses who experience MSDs. The result of the systematic literature review conducted in this present thesis will be discussed in this section of the research.

7.1 **Result Discussion**

With regards to the first research question, the result of this present systematic literature review indicated that previous research has documented lower back pain as a major impact and factor associated with MSDs among nurses. This result is consistent with other findings in other studies. Sun et al. (2023) in a meta-analysis including 42 studies found that the lower back (59.5%) was the anatomical area with the highest prevalence of MSD. This is followed by the neck (53%) and the shoulder (46.8%). The study also suggests that there is a higher prevalence of MSD in developed countries than in developing countries. Cheng et al. (2014) found that there is a high prevalence rate of lower back pain (77.2%), neck pain (64.2%), and shoulder pain (58.7%) among nurses who report experiences of MSDs. According to the study, the high prevalence of lower back pain is associated with nurses engaging in daily tasks involving turning and transferring patients. In a study involving 498 nurses as the study participants, Kalkim et al. (2019) also found that there was a high prevalence of lower back pain among nurses with MSD. The study discovered that the participants with lower back pain did not have daily rest and worked 9 hours a day. This finding can be related to the findings in this present study. The psychological impacts of MSD as shown in Bagheri et al. (2021) and Yang et al. (2021) indicates that stress and role induced strain were found to be high among nurses with MSD. However, there are other

studies which found that the highest prevalence of pain among nurses with MSDs were felt in the shoulder (Lin et al., 2020) and neck (Lee et al., 2013) regions. These studies found that lower back pain and discomfort were least associated with MSDs. These findings, however, involved nurses or participants in departments that did not have a lot of patient handling and transferring responsibilities. Thus, MSDs among nurses resulting from a long duration of transferring and handling of patients causes lower back pain among nurses and this increases the experience of stress at work.

With regards to the second research question, the findings of this systematic literature review suggests that there are various effective interventions and strategies that can be used to prevent and reduce work-related musculoskeletal disorders among nurses. This result is in line with other systematic reviews (Richardson et al., 2018). The prevention strategies and intervention identified in this review included ergonomic instruments (belts), multi-component interventions, acupressure, circadian rhythm stability, coping strategies, and educational/training programs on patient handling training, posture, ergonomic risks, and health behaviour trainings.

Many studies included in this review suggested that the use of educational programs and trainings reduced the prevalence of musculoskeletal disorders among nurses. This is consistent with the findings of Bernardes et al. (2022). According to the study, increasing and promoting knowledge and awareness of proper ergonomics helps to rectify MSD related problems. Akbari et al. (2017) found that educating nursing staff in hospitals on the proper use of tools and devices for patient handling lowers the prevalence of MSDs among nurses. The studies included in this study examined both intervention and comparison groups. Most of the studies examined the groups pre and post intervention implementation. While the studies did not clearly state the efficacy of educational intervention on reducing the rate of MSD, they gathered information on improved nurses' knowledge and attitudes which contributed to assist nurses prevent MSDs. Thus, it was difficult to ascertain the exact direct impact of educational intervention in preventing MSDs and gauging the differences between the study groups.

In line with the findings from other studies, this review highlights that the use of specialised equipment as ergonomic belts is a baseline intervention in the prevention of work-related musculoskeletal disorders. In an integrative literature review, Asuqo et al. (2021) reported specialised equipment as one of the categories of interventions for reducing work-related

musculoskeletal disorders. The study found ceiling lift and the preferred intervention as it reduces the stress associated with pushing and pulling.

7.2 **Results and Theoretical Framework**

By applying the Neuman Systems Model to this research, a comprehensive understanding of the multifactorial nature of musculoskeletal disorders (MSDs) in nurses can be achieved. This model emphasizes a holistic and preventive approach, allowing nursing practice to address not only the physical demands of patient care but also the psychological and sociocultural factors that influence overall health outcomes. Guided by this framework, the study examines various interventions and strategies identified in existing research that could effectively prevent and manage MSDs among nurses.

A key finding of this systematic literature review (SLR) is that low back pain is a major consequence of MSDs, significantly impacting the physical well-being of nurses. This aligns with Neuman's Systems Model, which highlights how stressors—such as the physical demands of patient management—can disrupt system stability, resulting in pain. Furthermore, the model explains that these stressors extend beyond the physical domain, also affecting psychological and sociocultural dimensions, reinforcing the need for a holistic approach to MSD prevention and management in nursing practice

This present study result indicates that there is a correlation between psychological factors and MSDs and the findings are consistent with the Neuman's systems model. The psychological impacts of MSDs have been examined in previous studies. There is considerable similarity between the result of the present study and those of many other studies. Bazazan et al. (2019) conducted a study on 380 emergency nurses with MSD. Their results revealed that there is a high severity of MSD among emergency nurses that work at night, and this reflects the nature of the night work. The participants consequently reported poor sleep quality and circadian rhythm disruptions. The findings are consistent with that result of Bagheri Hosseinabadi et al. (2021). Hämmig (2020) associated MSDs with sleep disorders. The study found that high levels of accumulated MSDs significantly increased the risk of equally severe sleep disturbances compared with those who reported no MSDs at all.

Findings related to stress, work-family conflict, and decreased quality of life are also consistent with the model, illustrating how these psychosocial outcomes are responses to the physical stressors of nursing work. The model emphasizes the importance of primary interventions (health promotion) and secondary interventions (strain mitigation) in maintaining system stability, consistent with the identification of educational program review and ergonomic equipment as effective interventions. The framework suggests that these strategies strengthen client coping mechanisms, potentially reducing the severity of musculoskeletal disorders. The review rightly emphasises the need for multifaceted approaches, encompassing multiple interventions to address the holistic needs of nurses, which is a key element of Neuman's systems model.

7.3 **Method Discussion**

The scarcity of research on MSDs in nursing highlights the need for more robust investigation. Nurses can contribute to this by participating in research studies, sharing their experiences, and championing the use of evidence-based practices in their workplaces. This study further highlights that systematic reviews as a study design cannot be adequate in filling the knowledge gap in MSDs among nurses. The study emphasizes the need for further research on the long-term impact of interventions, the role of individual factors, and the implementation of best practices across different healthcare settings. There is a need to adopt a multidisciplinary approach to addressing MSDs, incorporating physical, psychological, and organizational factors (Ziam et al., 2020). This shifts the focus from solely individual responsibility to a systemic approach to workplace safety. From the results of this study, collaboration between nurses, healthcare administrators, ergonomists, occupational therapists, and other healthcare professionals is required to effectively address MSDs in the workplace.

The study's strengths lie in its comprehensive and systematic approach, adhering to PRISMA guidelines and utilizing a rigorous search strategy across two relevant databases.

The review also incorporates a theoretical framework, drawing upon Neuman's Systems Model to provide a holistic understanding of MSDs as stressors impacting nurses' wellbeing.

However, certain limitations are present. The study is primarily based on qualitative research, which may limit the understanding of the lived experiences of nurses with MSDs. The limited sample size of only 10 studies included in the review necessitates caution in drawing definitive conclusions, particularly regarding the effectiveness of specific interventions.

Moving forward, further research is critical to address several knowledge gaps. Firstly, more research is needed to evaluate the long-term effectiveness of interventions, including the impact of educational programs and the use of ergonomic equipment. Secondly, the role of individual factors, such as age, gender, work experience, and personal coping strategies, in influencing MSDs requires further investigation. Finally, the study highlights the need to translate research findings into practice by implementing evidence-based interventions across diverse healthcare settings.

8 Conclusion

This systematic literature review highlights the prevalence, impact, and effective prevention strategies and interventions for musculoskeletal disorders (MSDs) among nurses. The findings of this research indicate a critical need for proactive strategies to address this prevalent occupational health issue.

The review confirms lower back pain as a dominant symptom of MSDs experienced by nurses, a finding consistent with previous research. Importantly, this study expands on existing knowledge by demonstrating the significant psychological impacts of MSDs, including stress, work-family conflict, and diminished quality of life. These findings emphasize the importance of addressing MSDs as a holistic concern, encompassing both physical and mental well-being.

The review identifies several potential interventions, including educational programs, ergonomic equipment, acupressure, circadian rhythm stability, coping strategies, and multi-component interventions. While various studies show promise for reducing MSD prevalence through these interventions, the evidence base remains limited. Further, a clear consensus on the most effective intervention strategies is absent, underscoring the need for additional robust research.

This study ultimately calls for a collaborative approach to address MSDs among nurses. Healthcare organizations must prioritize ergonomic training, proper patient handling techniques, and access to appropriate equipment. Collaboration among nurses, healthcare administrators, ergonomists, occupational therapists, and other healthcare professionals is crucial for effectively addressing MSDs from a multidisciplinary perspective. By prioritizing nurses' health and well-being, a healthier and more sustainable healthcare system for all can be created.

Overall, this study contributes to the growing body of evidence on MSDs in nursing, highlighting the effectiveness of various interventions and providing valuable insights for future research. This research provides valuable insights for both practitioners and researchers, emphasizing the importance of addressing MSDs as a critical health and safety issue in the nursing profession.

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