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Original research

Prevalence and factors associated with work related musculoskeletal disorders of patient transfer by nurses in health care

Silvi Rushanti Widodo[a,*], Ratna Sari Dewi[b], Retno Widyaningrum[b]

[a]*Department of Industrial Engineering, Universitas Kadiri, Jl. Selomangleng No. 1 Pojok, Mojoroto, Kediri, Indonesia*
[b]*Department of Industrial Engineering, Institut Teknologi Sepuluh Nopember, Keputih, Sukolilo, Surabaya, Indonesia*

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ABSTRACT

Musculoskeletal disorders (MSDs), or muscle injuries, are some of the most common health problems worldwide. These disorders can have serious consequences, affecting physical health, mental well-being, time, productivity, and finances, often leading to significant losses. This study aims to identify the prevalence and factors linked to work-related musculoskeletal disorders (WRMSDs) among nurses who perform patient transfers in healthcare settings. A cross-sectional study was carried out from July to August 2023. The study included all nurses working in healthcare facilities during this period who met the inclusion criteria. Eligible participants were licensed nurses with at least one year of experience in the selected hospitals. Nurses who were unwilling to participate or unavailable during the data collection period were excluded. The study aimed to include the entire population of nurses working in the hospital, and the final sample was selected using purposive sampling. During the data collection phase, 40 nurses were available and met the eligibility criteria for participation. The findings revealed that gender is associated with musculoskeletal disorders among nurses [AOR: 2,110, 95% CI (0,165–27,017)]. Age [AOR: 0,000] and body mass index (BMI) [AOR: 0,345, 95% CI (0,077–1,538)] were also significant factors. Nurses over 35 years old and those who were obese had a higher risk of developing musculoskeletal disorders. Work experience more than 20 years was another factor linked to MSDs [AOR: 2,646, 95% CI (0,188-37,233)]. Additionally, education level and marital status were found to be associated with these disorders. In conclusion, a significant proportion of nurses involved in patient transfers experience work-related musculoskeletal disorders, with the lower back and neck being the most commonly affected areas. Key factors contributing to WRMSDs include gender, age, body mass index, work experience, education level, and marital status.

1. Introduction

Work-related musculoskeletal disorders (WMSDs) are syndromes characterized by soft tissue pain, numbness, stiffness, swelling, fatigue, irritation, and reduced mobility [1]. The National Institute for Occupational Safety and Health (NIOSH) in the United States defines musculoskeletal disorders (MSDs) as conditions that affect the body's musculoskeletal system, including bones, nerves, tendons, ligaments, joints, cartilage, blood vessels, and spinal discs [2].

MSDs, or muscle injuries, are among the most prevalent health issues globally, with significant consequences impacting physical health, mental well-being, time, productivity, and financial stability [3]. These disorders result from the continuous accumulation of minor and major stresses over time, leading to pain and discomfort in muscles, bones, and joints. Commonly affected areas include the hands, wrists, elbows, shoulders, neck, lower back, and feet [4]. Among nurses, the lower back is the most frequently reported site of discomfort [5].

In general, many symptoms of musculoskeletal disorders arise from workers experiencing discomfort [6]. This discomfort can gradually progress to aches and pains in specific body parts. If left unaddressed, these symptoms can lead to serious conditions such as tendonitis, tenosynovitis, or nerve injuries like carpal tunnel syndrome [7]. Discomfort serves as a warning sign that work methods need to be adjusted, as it can negatively affect performance, leading to increased errors and reduced work quality [8].

*Corresponding author:
Email: silvi@unik-kediri.ac.id

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Patient transfer is an activity classified under Manual Material Handling (MMH) [9]. MMH tasks, which involve direct physical labor, carry a risk of occupational hazards, including muscle injuries. Such tasks include climbing, pushing, lifting, pulling, and turning [10]. Research indicates that nurses who frequently lift patients often experience symptoms of muscle injuries due to the varying weights of patients and awkward working postures [11]. Healthcare is one of the riskiest sectors for nurses, where occupational hazards can lead to severe medical complications [12].

The focus on nurses in the context of patient transfer is particularly relevant for several reasons. First, nurses are integral to the healthcare system and routinely perform patient transfers, averaging 20 times per shift [13]. Second, patient transfer activities involve dynamic and unpredictable loads, unlike manual handling tasks in other industries where loads are typically static and measurable [14]. Additionally, patient transfers are complex due to the need to accommodate patients with varying health conditions and levels of dependency [15]. A study by Perumal et al. found that 78% of nurses experienced at least one WMSD episode related to patient transfer in the past year, with 45% requiring medical leave [16]. Understanding the risk factors and impacts of WMSDs in patient transfer is crucial not only for nurse health and safety but also for improving patient care quality and healthcare system efficiency [17].

Previous cross-sectional studies have extensively examined the prevalence and risk factors of MSDs among healthcare workers. For instance, a study at Mekelle University in Ethiopia reported that 65,2% of academic staff experienced musculoskeletal pain in the past 12 months [17]. A review of 13 studies across Asia, involving 5,753 respondents (18,8% male and 81,2% female), found an average prevalence of lower back pain (LBP) of 58,1% among healthcare workers [18]. In China, a meta-analysis of 23 studies involving 21,042 participants revealed a WMSD prevalence of 79% among clinical nursing staff [19]. These findings highlight the importance of understanding MSD risks specific to the nursing profession, particularly in tasks like patient transfers.

This study employs a cross-sectional design due to its efficiency and suitability for evaluating the prevalence and risk factors of MSDs within a short timeframe without requiring long-term observation. This design is particularly effective for studying common health issues like MSDs in working populations such as nurses. However, cross-sectional studies have both advantages and limitations. The advantages include efficiency, as data is collected once, and the ability to evaluate multiple independent variables (e.g., age, gender, BMI) simultaneously. The primary limitation is the inability to establish causality, as the design only identifies correlations, and both independent and dependent variables are measured concurrently [18].

The global prevalence of MSDs among nurses is estimated to range from 40% to 90% [19], with many Asian countries reporting rates between 60% and 80% [20]. This study addresses a gap in MSD research in Indonesia, particularly among nurses, where studies exploring unique risk factors such as marital status and education are limited. Additionally, there is a lack of strategies to reduce MSD risks in patient transfers.

This study contributes relevant local data from Indonesia, which can inform intervention planning in hospitals. It also highlights the need for patient transfer aids to reduce manual workload and serves as a foundation for ergonomic training and workplace modifications in future research. The aim of this study is to determine the prevalence and factors associated with work-related musculoskeletal disorders among nurses involved in patient transfer in healthcare settings.

2. Material and method

This study was conducted at a hospital in Kediri, Indonesia, after obtaining ethical clearance from the institution's ethical review committee. A cross-sectional study was carried out from July to August 2023. All nurses working in the healthcare facility during the study period who met the inclusion criteria were included in the study. Licensed nurses with at least one year of working experience in the selected hospital were eligible to participate. Nurses who were unwilling to participate or unavailable during the data collection period were excluded. The sample size targeted the entire population of nurses working in the hospital, and the actual sample was selected using purposive sampling. During the data collection period, 40 nurses were available and eligible for participation in the study.

2.1. *Data collection*

Data collection was conducted using a self-administered questionnaire based on the Standard Nordic Questionnaire (SNQ). The SNQ is the most widely used symptom questionnaire designed to assess musculoskeletal disorders. It was used to evaluate self-reported musculoskeletal complaints across nine body areas: the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips, knees, and ankles/feet. The questionnaire served as the primary instrument for gathering data on symptoms in these body parts. Participants were asked about work-related musculoskeletal disorders (WRMSDs) experienced in the past twelve months for each of the nine body areas. Responses to the questions were binary, with options of "Yes" or "No." If a respondent answered "No" to the first question for a specific body part, they were not required to answer subsequent questions related to that body part [21].

2.2. *Data management and analysis*

Once the questionnaire data entry was completed, the data were cleaned to address missing values,

outliers, and other inconsistencies. This was done by running commands such as frequency checks. The cleaned data were then exported to the Statistical Package for the Social Sciences (SPSS) version 25.0 for analysis.

A bivariate binary logistic regression analysis was conducted, and variables with a p-value of less than 0.2 were identified as potential candidates for inclusion in the final multivariable logistic regression analysis. Additionally, the assumptions for the chi-squared test were verified. Subsequently, a multivariable logistic regression analysis was performed to identify factors associated with work-related musculoskeletal disorders (WMSDs) among healthcare providers. In the final logistic model, variables with a p-value of less than 0.05 were considered statistically significant. The strength and direction of the associations were measured using the adjusted odds ratio (AOR) with a corresponding 95% confidence interval (CI).

In this article, several statistical terms are used during data processing. The Crude Odds Ratio (COR) represents the initial relationship between two variables without controlling for other variables [5]. The Adjusted Odds Ratio (AOR) is an odds ratio that has been adjusted by considering other variables in the multivariate analysis model, providing a more accurate relationship between the independent and dependent variables [5]. The Confidence Interval (CI) describes the range of values within which the population parameter is estimated to lie, with a specified level of confidence (typically 95%) [5].

3. Results and discussions

3.1. Sociodemographic characteristics

A total of 40 nurses participated in this study, achieving a 100% response rate. The majority of the participants were male (77,5%). The age of the respondents ranged from 26 to 59 years, with a mean age of 40,88 years (SD ± 6,6). Most participants were over 30 years old. The mean body mass index (BMI) of the participants was 26,32, with 27 participants (68%) classified as overweight, 7 (18%) as obese, and 6 (15%) as having a normal weight. All participants were married. In terms of education, 22 participants (55%) held a bachelor's degree, while 18 (45%) had a diploma. Regarding work experience, the mean duration of working experience was 16.8 years. Table 1 presents the characteristic of respondents.

3.2. The prevalence of work-related musculoskeletal disorders among nurses

Musculoskeletal disorders within the past month were reported by 82,5% of the nurses. This study also found that most nurses involved in patient transfer indicated that their working posture involved bending, which is considered an awkward posture, as shown in Fig. 1. Among all the reported symptoms, low back pain was the most prevalent (45%), followed by neck pain (40%), knee/right and left calf pain (35%), right shoulder pain (25%), and upper back pain (23%). All reported symptoms are illustrated in Fig. 2.

3.3. Factors associated with work-related musculoskeletal disorders

Bivariate analysis was used for data processing in this research. The results showed that male participants were 0,521 times more likely to experience musculoskeletal disorders during patient transfer compared to female participants [95% CI (0,054–5,00)]. There was no significant difference in muscle injury complaints between participants older than 35 years and those younger than 35 years. In other words, age (above or below 35 years) did not appear to influence the likelihood or frequency of muscle injury complaints in the study. Participants classified as obese had 0,457 times higher risk, respectively, of developing musculoskeletal disorders during patient transfer compared to those with a normal BMI [95% CI (0,138–1,512)].

Table 1.
Sociodemographic characteristics

Variables	Category	*N* (%)
Gender	Male	31 (77,5%)
	Female	9 (22,5%)
Age (years)	< 35	5 (12,5%)
	> 35	35 (87,5%)
Body Mass Index	Obesity	7 (18%)
	Overweight	27 (68%)
	Normal	6 (15%)
	Underweight	0
Working Experience (year)	< 10	5 (12,5%)
	10 – 20	24 (60%)
	>20	11 (27,5%)
Educational Level	Bachelor	22 (55%)
	Diploma	18 (45%)
Marital Status	Married	38 (98%)
	Single	(5%)

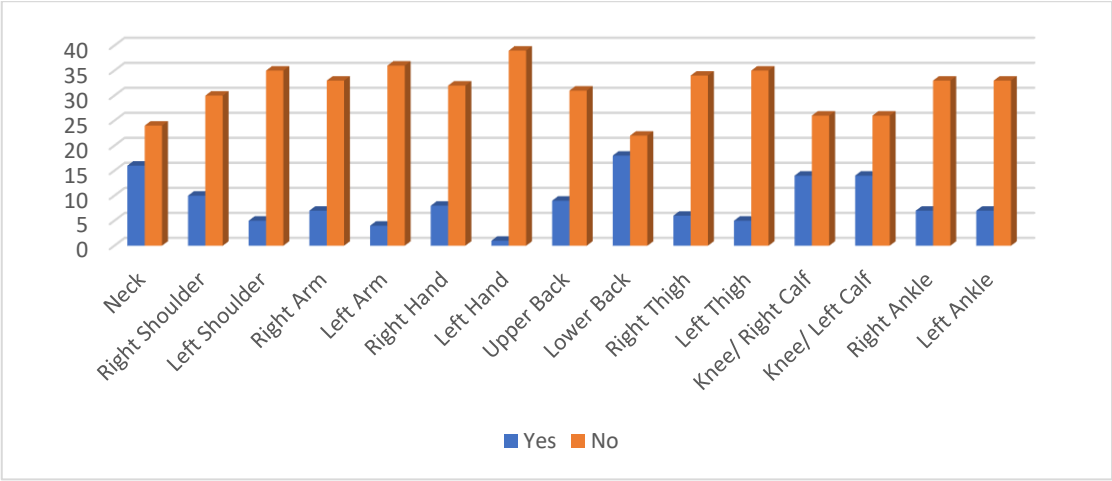

Figure 1. Overall prevalence of work-related musculoskeletal of nurses

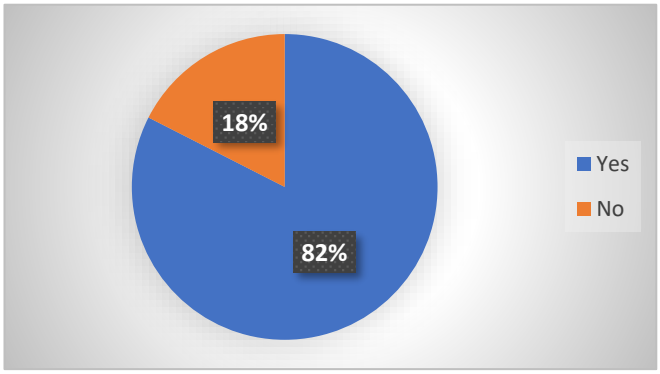

Figure 2. Prevalence of musculoskeletal disorders distribution in body parts among nurses

Participants who have working experience range 10 until 20 years have 0,385 times and who have working experience more than 20 years have 1,875 times than participants who have working experience less than 10 years. In terms of education, participants with a diploma had a 1,111 times higher risk than those with a bachelor's degree [95% CI (0,214–5,764)]. Additionally, there was no significant difference in muscle injury symptoms between married and single participants while transfer patients. However, when additional variables were accounted for in the analysis (such as sex, age, body mass index, working experience, and educational level), married participants were found to be 1,087 times more susceptible to muscle injury.

3.4. Discussion

The prevalence of musculoskeletal disorders (MSDs) varies across occupational groups and national boundaries. Studies have shown that musculoskeletal problems are common among healthcare workers, particularly nurses [22]. In our study, the majority of participants (82.5%) reported experiencing work-related musculoskeletal disorders (WRMSDs). This finding is consistent with a study from Ethiopia, which found that 64,2% of healthcare workers experienced WRMSDs [5].

The overall prevalence of musculoskeletal disorders among nurses ranges from 10% to 45%, with a mean of 22%. This indicates that a significant proportion of nurses involved in patient transfer experience the adverse effects of their job. Our study revealed a high prevalence of musculoskeletal disorders, particularly in the lower back and neck among nurses. Given the awkward postures often adopted during patient transfer, MSDs—especially back pain—appear to be almost unavoidable [19].

Globally, the prevalence of MSDs among nurses has been reported to range from 40% to 90%, which aligns with our study's finding of an 82,5% prevalence of WRMSDs among nurses [23]. In our study, 82,5% of respondents reported experiencing musculoskeletal disorders within the past month. This finding is consistent with a study conducted in Turkey (70,7%) but lower than a study in Iran (90,9%) [24].

Lower back symptoms were the most prevalent issue in our study, affecting 45% of participants. This aligns with findings from the literature [19]. Specifically, our study identified the following prevalence rates: low back pain (45%), neck pain (40%), knee/calf pain (35%), right shoulder pain (25%), upper back pain (23%), right hand pain (20%), right arm and ankle pain (18%), right thigh pain (15%), left thigh pain (13%), left arm pain (10%), and left hand pain (3%). Another study reported higher prevalence rates for low back pain, neck pain, and knee pain (74,5%, 45,2%, and 31,3%, respectively) [25]. Based on the main findings of this study, the highest prevalence of musculoskeletal disorders was observed in the lower back (45%) and neck (40%). Other studies have also reported similar results, indicating that the prevalence of low back pain among nurses in hospitals ranges from 50% to 85% [26].

The relationship between dependent variables, as analyzed using bivariate and multivariate analysis, revealed that gender is associated with musculoskeletal disorders among nurses [AOR: 2,110, 95% CI (0,165–27,017)], as shown in Table 2. This finding aligns with research from [5], which found that males are at higher risk of MSDs during patient transfer compared to females. Additionally, body mass index [AOR: 0,345, 95% CI (0,077–1,538)] showed that nurses who are obese are at a higher risk of musculoskeletal disorders.

Table 2.
Bivariate and multivariate logistic regression analysis of associated factors with WRMDs among nurses

Variables	Category	Bivariate			Multivariate		
		COR	95% CI		AOR	95% CI	
			Lower	Upper		Lower	Upper
Sex	Male Female	0.521	0.540	5.000	2.110	0.165	27.017
Age (years)	< 35 >35	.000	.000	.000	.000	.000	.000
Body Mass Index	Obesity Overweight Normal Underweight	0.457	0.138	1.512	0.345	0.077	1.538
Working Experience (year)	< 10 10 – 20 >20	0.385 1.875	0.091 .340	1.632 10.334	0.321 2.646	0.027 .188	3.886 37.233
Educational Level	Bachelor Diploma	1.111	.214	5.764	0.438	0.032	6.018
Marital Status	Married Single	.000	.000	.000	1.087	.000	.

This is likely due to the natural decline in body function with age and the cumulative effects of workload and poor posture [27]. Work experience was also associated with MSDs among nurses [AOR: 2,646], particularly for those with more than 20 years of experience. However, further research is needed to explore this relationship in more detail. Education level and marital status were also found to be associated with musculoskeletal disorders, but the underlying reasons for these associations remain unclear. There is limited research on these relationships, highlighting the need for further investigation.

Based on the observations and assessment of factors, it is evident that manual patient transfer activities are not recommended [28]. Therefore, the use of tools for lifting and moving patients is essential to reduce the risk of musculoskeletal disorders among nurses. Manual patient handling often forces nurses into awkward postures, which can lead to MSDs. One significant factor contributing to MSDs is the need for nurses to reach out and lift weights away from their bodies [29].

To mitigate these risks, the position of the bed and gurney should be perpendicular to each other, minimizing the distance and reducing the need for excessive movement [30]. Additionally, nurses should hold the gurney bedding and rotate their bodies slightly (avoiding full twisting) to shorten the time required for patient transfer and reduce the strain on their bodies. Avoiding awkward postures during patient handling is crucial to preventing musculoskeletal disorders. Furthermore, when multiple nurses are involved in patient handling, they should ideally be of similar height to ensure proper alignment of the patient's body. Nurses of the same height should avoid asking each other to raise or lower their arms, as this can lead to awkward postures and increase the risk of MSDs in the arms.

4. Conclusions

A high proportion of nurses working in the hospital who do the patient transfer of work-related musculoskeletal disorders at body parts with the low back and neck being injured most often. The significant associated factors responsible for the occurrence of work-related musculoskeletal disorders include the sex, age, body mass index, working experience, educational level, and marital status. nurses should emphasize comfortable body posture when performing their tasks, do physical exercise, take ergonomic training, and have breaks during working hours as a means of preventive strategies to avoid WRMSDs. It is also mandatory that nurses should be advised to visit physiotherapists when they have work-related musculoskeletal disorders.

Declaration statement

Silvi Rushanti Widodo: **Conceptualization, Methodology, Writing-Original Draft**. Retno Widyaningrum: **Collecting data.** Ratna Sari Dewi: **Writing-Review & Editing.**

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The author declares that this manuscript is free from conflict of interest and is processed by applicable journal provisions and policies to avoid deviations from publication ethics in various forms.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

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