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ORIGINAL RESEARCH

Patterns of Musculoskeletal Disorders among Staff Nurses in the Emergency Department in Saudi Arabia: A Cross-sectional Study

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Abstract

Background: The physically demanding and high-stress environment of Emergency Departments (EDs) significantly contributes to the heightened risk of musculoskeletal disorders (MSDs) among ED nurses. Despite this known association, there is a lack of comprehensive understanding of the prevalence rates and contributing factors within ED settings in Saudi Arabia, necessitating further investigation.
Purpose: This study delves into the prevalence and potential predictors of MSDs among nurses in this critical healthcare setting.
Methods: A cross-sectional survey was conducted in March 2023 using convenience sampling of 177 ED nurses across 16 public hospitals in Hail, Saudi Arabia. The Nordic Musculoskeletal Questionnaire was employed, with SPSS analyses covering frequency and percentage of pain prevalence via cross-tabulation, and logistic regression to identify risk factors.
Results: Over the past year, 68.9% of participants reported lower back pain affecting normal activities in 55.4% of cases. Neck pain was more likely in individuals aged 20-29 and former smokers accounting for 47.6% of the variance (p=0.001). Shorter shifts under 8 hours reduced neck pain risk, whereas a schedule with 50% of night shifts heightened the risk, contributing to 28.4% of the variance (p=0.001). Nurses aged 40-49 and those with significant childcare duties faced higher shoulder pain risk (p=0.024), and adult caregiving duties was linked to upper back pain explaining 40.6% of the variance (p=0.017). No significant links were found for other musculoskeletal pains.
Conclusion: The study reveals a significant prevalence of MSDs among the evaluated ED nurses, significantly influenced by specific demographic and work-related factors. Addressing these through ergonomic interventions, optimal scheduling, and wellness programs is crucial for nurse well-being and patient care. Future research should focus on creating holistic wellness programs that support nurses musculoskeletal health.

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1. Introduction

Work-related musculoskeletal disorders (MSDs) represent a critical and pervasive hazard in the modern workplace. Persistent exposure to occupational tasks can initiate a complex of symptoms affecting the musculoskeletal system, including pain, which can extend to muscles, bones, tendons, blood vessels, and nerves, leading to the development of MSDs (Centers for Disease Control and Prevention, 2020). These conditions are not just the leading cause of occupational morbidity, but are also a substantial contributor to missed workdays, suboptimal job performance, long-term disability, and a pronounced degradation in the quality of life (Wang

et al., 2019). The fiscal impact of MSDs is substantial, encompassing extensive medical expenditures, workers' compensation, and a ripple effect through the economy due to lost productivity and increased healthcare utilization. These disorders are not merely individual health issues, emerging as a formidable public health challenge, straining the healthcare system, influencing the economy, and escalating societal costs (Crawford et al., 2020; Rosado et al., 2023).

Healthcare workers in particular often operate in constrained spaces or heavy loads maneuver, leading to an uptick in work-related MSDs (Jacquier-Bret & Gorce, 2023). This is particularly evident in high-intensity settings such as emergency departments (EDs), where nurses and other healthcare professionals engage in constant physically demanding activities, which can adversely affect their capacity to render high-quality care (Senmar et al., 2019). The reported prevalence of MSDs among nursing personnel is strikingly broad, with figures reaching over 80% (Chandralekha et al., 2022; Dhas et al., 2023; Krishnan et al., 2021; Nasaif et al., 2023; Ribeiro et al., 2017; Sun et al., 2023; Tang et al., 2022). This wide range emphasizes not only the pervasiveness of the issue but also the variability of the conditions within different healthcare settings and practices. The lower back, neck, and shoulder areas are most frequently impacted by these disorders (Aleid et al., 2021; Gilchrist & Pokorná, 2021; Nasaif et al., 2023; Rypicz et al., 2020; Senmar et al., 2019; Sun et al., 2023; Tang et al., 2022; Yunxia et al., 2022)

Previous literature has consistently linked a combination of intrinsic personal traits and extrinsic occupational demands to the heightened risk of MSDs in nurses (Alharbi et al., 2021; Chang & Peng, 2021; Lin et al., 2020; Muthukrishnan & Ahmad, 2021; Nurhayati et al., 2022; Zare et al., 2021). Personal traits such as age, body mass index, may predispose individuals to MSDs, affecting the body's resilience to physical stress (Krishnan et al., 2021; Lin et al., 2020). Occupational demands pose an additional risk through mechanisms such as biomechanical strain from prolonged awkward postures, musculoskeletal wear from the frequent handling of heavy objects, and tissue microtrauma resulting from repetitive task execution (Meyers et al., 2023). Vigorous exertion required in patient handling can overwhelm the musculoskeletal system's adaptive capacity (Muthukrishnan & Ahmad, 2021), while psychological job stressors, including the high-pressure environment, can lead to heightened muscle tension and impaired recovery (Afsharian et al., 2023; Zare et al., 2021). Irregular shift patterns and extended working hours limit the time available for restorative processes, compounding the impact on musculoskeletal health (Chang & Peng, 2021). This multifactorial framework, underlined by robust associations found in studies, situates MSDs as a consequential occupational hazard among nurses.

Within the nursing sector, evidence points to ED nurses as being particularly susceptible to MSDs, more so than their counterparts in other nursing areas (Ou et al., 2021). This vulnerability has profound implications for healthcare delivery: MSDs are a leading factor in both absenteeism and decreased productivity among nursing staff (Asuquo et al., 2021; Ribeiro et al., 2017), and have been implicated in a cascade of adverse effects, ranging from a degradation in the quality of patient care to diminished patient satisfaction and overall safety (Ribeiro et al., 2017). These interconnected outcomes encourages the urgent need for targeted interventions within the nursing profession, especially in high-risk ED settings.

Recent research points out the significance of targeted training and ergonomic strategies in diminishing MSDs among nurses (Abdollahi et al., 2020; Albanesi et al., 2022). Initiatives such as comprehensive training in patient handling and ergonomic tool usage directly address MSD risk factors. Equally, programs aimed at stress reduction (Zare et al., 2021) and promoting mindfulness are crucial for enhancing nurses' mental resilience, indirectly lowering MSD risks by encouraging healthier workplace habits and reducing stress-related musculoskeletal issues. These measures do not only equip nurses to effectively confront MSD challenges but also promote a culture of safety and well-being essential for high-quality patient care.

Although the impact of MSDs is recognized globally, there is a lack of comprehensive understanding of the prevalence rates and contributing factors within ED settings in Saudi Arabia, necessitating further investigation. Therefore, this study aims to address this gap by assessing the prevalence of MSD's patterns among ED staff nurses. Additionally, it explores and identifies the predictive factors that contribute to the incidence of MSDs within this cohort. The ultimate goal is to enhance awareness and support the introduction of preventive measures for MSDs in emergency departments across Saudi Arabia.

2. Methods

2.1 Research design

This research employed a cross-sectional epidemiological approach. It supports analyzing MSD prevalence and risk factors, ideal for our exploratory goals to identify predictors and form hypotheses for future research.

2.2 Setting and samples

The study was conducted in March 2023. Participants included ED nurses employed across all 16 peripheral and central public hospitals in the Hail region, Saudi Arabia. Eligible participants were those who had been working in the ED for at least one year and who expressed a willingness to participate in the study. To ensure a representative sample, we employed convenience sampling with a quota set for each hospital to reflect its proportion of the overall nurse population. The sample size for this study, targeting a population of 328 ED nurses within the region, was determined by presuming a 50% prevalence rate of MSDs. This rate was adopted based on a median value inferred from a range reported in existing literature on MSDs incidence among nurses, acknowledging the variability in such estimates (Chandralekha et al., 2022; Dhas et al., 2023; Krishnan et al., 2021; Nasaif et al., 2023; Ribeiro et al., 2017; Sun et al., 2023; Tang et al., 2022). A 95% confidence level and a 5% margin of error were chosen to ensure a representative and statistically significant sample, aligning with common practices for health-related research (Naing et al., 2022). These parameters culminated in a calculated sample size of 177. The study's response rate met this requirement precisely, with 177 received responses, thereby providing a robust data set for analysis.

2.3 Measurement and data collection

Survey data were collected in March 2023 using a Google Forms link containing the questionnaire. An informed consent form outlining the study's objectives, methods, potential risks, and the voluntary nature of participation, was included as part of the instrument. The researchers collaborated with the nursing offices in Hail region hospitals for the questionnaire distribution. They acted as intermediaries and were responsible for forwarding the questionnaire to the individual emails of ED nurses or posting it in professional groups on social media, depending on the most common and effective communication methods used within their respective hospitals.

This study's data collection instrument was divided into two sections. The initial segment encompassed 12 demographic inquiries designed to gather essential background information on each participant. Personal and occupational variables were incorporated, drawing on both the insights of pertinent epidemiological research on risk factors and the authors' expertise. These variables included gender, age, marital status, weekly hours dedicated to childcare, care for adults, smoking habits, years of experience in ED, typical shift length, the ratio of night shifts per month, weight, height, and Body Mass Index (BMI).

The second section of our survey used the English version of the Nordic Musculoskeletal Questionnaire (NMQ) (Kuorinka et al., 1987). The English version was utilized due to the participants' proficiency in English, and the presence of non-Arabic speaking staffs. The instrument delves into the prevalence and patterns of MSDs in the participant's key body regions including the neck, shoulders, upper back, elbows, wrists/hands, lower back, hips/thighs, knees, and ankles/feet. NMQ captures data on musculoskeletal pain through three inquiries. These include assessing the prevalence of musculoskeletal symptoms experienced over the past year, their occurrence within the last seven days, and their impact on the respondent's ability to undertake normal work activities over the last year. In our study, the section concerning the last seven days' prevalence was not utilized. This decision stemmed from a desire to emphasize the identification of long-standing musculoskeletal conditions and their underlying risk factors among ED nurses, rather than short-term or acute discomforts. This approach allows for a clearer understanding of the chronic musculoskeletal challenges faced by ED nurses, informing targeted interventions and preventative strategies tailored to mitigate occupational hazards and enhance the overall work environment and health outcomes for this critical workforce. The NMQ employs a simple binary scoring system where respondents indicate the presence or absence of pain or discomfort within the last year in each body region, along with their effect on daily tasks, which are noted in a binary yes/no format. Interpretation of the NMQ is primarily descriptive, focusing

on the prevalence of reported symptoms. Scores are tallied based on the number of affected body areas, enabling targeted investigations into high-risk areas for MSDs among ED nurses.

The NMQ has been used to assess the severity and impact of musculoskeletal symptoms in occupational groups, including nursing populations. Reliability tests of the NMQ among clerical and nursing staff showed most items had disagreement rates between 0% and 15%, with some reaching 30%. Validity tests also revealed up to 13% disagreement. Following these findings, specific items were refined to improve the questionnaire's precision and utility (Kuorinka et al., 1987). The widespread use of the questionnaire in musculoskeletal disorder research across diverse populations underscores its effectiveness in capturing detailed and accurate data on MSDs. (López-Aragón et al., 2017). To ensure the NMQ's clarity and comprehensibility, it was pilot tested on a subset of the target population before the main study. The feedback confirmed participants' understanding, supporting its use in its English form.

2.4 Data analysis

All statistical analyses were performed using Statistical Package for the Social Sciences software, version 25 (IBM Inc., Chicago, IL, USA). The descriptive statistics for all the participants were expressed as frequency and percentage, which were calculated for the categorical variables. The prevalence of pain in each body region was determined by cross-tabulation. Logistic regression models were used to explore the risk factors among the participants, categorical variables were prepared for logistic regression analysis using dummy coding. There was no missing data in our analysis.

2.5 Ethical considerations

This research was approved by the Ethics Committee of Hail Region (Approval no 2023-8). Every participant was provided with a comprehensive explanation of the study's objectives, consent forms, details about their rights, including confidentiality and anonymity, and information on the anticipated time required to fill out the questionnaire. To ensure confidentiality and anonymity, no personal identifiers were collected, and participants were informed that any published results would be reported in aggregate form only, without any individual data being recognizable.

3. Results

3.1 Personal and work-related characteristics of the participants

Table 1 presents the personal and work-related characteristics of the participants. Of the 177 respondents included in this analysis, 133 (75.1%) were female, 106 (59.9%) were in the 20-to-29-year age group, and 90 (50.9%) were married. Most respondents reported that they spent zero hours per week caring for children (60.5%) and zero hours (41.8%) taking care of adults. Most of the respondents (92.7%) had never smoked and had been practicing in the ED for 1-5 years (46.9%). Almost half the respondents worked 8-to-12-hour shifts (49.7%). As per the proportion of night working shifts per month, the largest group (41.8%) worked 25% night shifts. The respondents had a mean weight of 66.7 kg (SD=16.8), a mean height of 162.3 cm (SD=8.7), and a mean body mass index (BMI) of 25.3 (SD=6.2) which ranged from 15.6 to 62.9.

Table 1. Personal and work-related characteristics (n=177)

Characteristics	f	%	Mean	SD
Age (year)				
20-29	106	59.9		
30-39	60	33.9		
40-49	9	5.1		
50 and above	2	1.1		
Gender				
Male	44	24.9		
Female	133	75.1		
Marital status				
Single	82	46.3		
Married	90	50.9		
Widowed/ separated	5	2.8		

Table 1. Continued

Characteristics	f	%	Mean	SD
Working experience in ED				
Less than a year	56	31.6		
1-5 years	83	46.9		
6-10 years	28	15.8		
10 years and above	10	5.7		
Working shift				
Less than 8-hour shift	82	46.3		
8-12 hour shift	88	49.7		
Over 12-hour shift	7	4.0		
Proportion of night shifts per month				
None	20	11.3		
25%	74	41.8		
50%	55	31.1		
75%	24	13.5		
Only night shifts	4	2.3		
Smoking status				
Never a smoker	164	92.7		
Were a former smoker	8	4.5		
Current smoker	5	2.8		
Hours spent per week caring for children				
Zero	107	60.5		
1-19	29	16.4		
20-49	28	15.8		
50	13	7.3		
Hours spent per week caring for adults				
Zero	74	41.8		
1-19	36	20.3		
20-49	44	24.9		
50	23	13		
Weight (kgs)			66.7	16.8
Height (cm)			162.3	8.7
BMI (kg/m2)			25.3	6.2

3.2 Patterns of musculoskeletal disorders

Table 2 illustrates any pain or discomfort experienced by the respondents over the last 12 months. Lower back pain was reported as the most frequent pain, affecting 68.9% of participants, followed by neck and shoulder pain (45.2% and 48.6% respondents respectively). Elbow pain was the least reported, with 83.1% of participants indicating no pain in this area.

Table 2. Pain experienced in the last 12 months (n=177)

Musculoskeletal pain	No f (%)	Yes f (%)
Neck	97 (54.8)	80(45.2)
Shoulders	91 (51.4)	86(48.6)
Elbows	147(83.1)	30 (16.9)
Upper back	110 (62.1)	67 (37.9)
Lower back	55 (31.1)	122 (68.9)
Wrists/hands	129 (72.9)	48(27.1)
One or both hips/thighs/buttocks	123(69.5)	54 (30.5)
One or both knees	109 (61.6)	68 (38.4)
One or both ankles/feet	117(66.1)	60 (33.9)

Table 3 shows any musculoskeletal pain that prevented the respondents from conducting normal activities. Lower back pain significantly hindered normal activities for 55.4% of the participants, the highest among the body parts listed. In contrast, elbow pain was the least disruptive, with 80.2% reporting no interference with activities.

Table 3. Musculoskeletal pain preventing normal activity (n=177)

Musculoskeletal pain	No f(%)	Yes f (%)
Neck	124 (70.1)	53 (29.9)
Shoulders both/either	120 (67.7)	57 (32.2)
Elbows both/either	142 (80.2)	35 (19.8)
Wrists/hands both/either	132 (74.6)	45 (25.4)
Upper back	121 (68.4)	56 (31.6)
Lower back	79 (44.6)	98 (55.4)
Hips/thighs/buttocks	124 (70.1)	53 (29.9)
Knees	121 (68.4)	56 (31.6)
Ankles/feet	126 (71.2)	51 (28.8)

3.3 Predictive factors contributing to the incidents of musculoskeletal disorders

Table 4 presents the binomial logistic regression used to ascertain the effects of personal and work-related characteristics of the participants on musculoskeletal pain interfering with normal activities. The logistic regression models for neck pain, shoulder pain, and upper back pain were statistically significant. On the other hand, the binomial logistic regressions concerning elbows, wrists/hands, the lower back, hips/thighs/buttocks, knees, and ankles/feet were not statistically significant (p>0.05).

A logistic regression model was statistically significant for neck pain, χ^2=69.879, p=0.001. The model explained 47.6% (Nagelkerke R^2) of the variance in debilitating neck pain. Of all the predictor variables, only four were statistically significant: the 20- to 29-year-old age group, former smokers, working shifts lasting less than 8 hours, and working 50% night shifts. Those in the 20- to 29-year-old age group had 4.18 times higher odds of experiencing neck pain interfering with daily activities compared to other age groups, while former smokers had 19.932 increased odds. Individuals normally working shifts lasting less than 8 hours had 0.31 decreased odds of having neck pain. Those working 50% night shifts had 12.448 increased odds of experiencing neck pain interfering with normal activities.

Another logistic regression model was statistically significant, explaining 28.4% (Nagelkerke R^2) of the variance in debilitating shoulder pain, χ^2=57.154, p=0.024. Of all the predictor variables, only three were statistically significant: the 40- to 49-year-old age group, spending more than 50 hours per week taking care of children, and normally working shifts lasting less than 8 hours. Those who were 40 to 49 years old had 128.841 increased odds of having debilitating shoulder pain compared to other age groups, while those spending more than 50 hours a week caring for children had 12.066 increased odds. Individuals typically working shifts lasting less than 8 hours had 0.325 decreased odds of shoulder pain interfering with normal activities. Another logistic regression model was statistically significant, explaining 40.6% (Nagelkerke R^2) of the variance in debilitating upper back pain, χ^2=58.649, p=0.017. Of all the predictor variables, only two were statistically significant: those caring for adults for 20 to 49 hours per week, and over 50 hours per week. Those caring for adults for 20 to 49 hours and over 50 hours per week had 9.229 and 15.239 increased odds, respectively.

4. Discussion

This study examined the patterns and predictors of MSDs among staff nurses in the ED. Reports from ED nurses revealed that MSDs commonly affected various body regions, hindering their daily functions and effectiveness at work. Lower back, neck, and shoulder pain emerged as the most common areas of discomfort among ED nurses; a finding that is consistent with previous research (Aleid et al., 2021; Gilchrist & Pokorná, 2021; Nasaif et al., 2023; Rypicz et al., 2020; Senmar et al., 2019; Sun et al., 2023; Tang et al., 2022; Yunxia et al., 2022). Our findings align

with global observations, suggesting that such discomfort transcends geographical and cultural boundaries and is closely linked to the intrinsic nature of nursing tasks. The rigorous demands of patient care, which often involve lifting, transferring, and supporting patients, can lead to cumulative strain on the musculoskeletal system, particularly in the spine and shoulders (Richardson et al., 2019). The pronounced prevalence of lower back pain among our study's ED nurses, with a notable 68.9% affected, demands a significant occupational health concern, which echoes the broader literature's identification of lumbar issues as a primary challenge within the nursing profession (López-Aragón et al., 2017). The disruption of regular activities reported by 55.4% of participants draws attention not only to individual well-being but also to potential implications for workforce sustainability and patient care quality. These persisting findings suggest a systemic issue within nursing work environments and highlight the imperative need for effective ergonomic solutions.

Table 4. Logistic regression predicting pain interfering with normal activities

Predictors	B	SE.	Wald	X^2	R^2	*p*	OR	95%CI
Neck pain predictors				69.879	47.6%	0.001		
20-29 years old	1.429	0.634	5.082			0.024	4.175	1.205-14.462
Less than 8-hour shift	-1.186	0.563	4.443			0.035	0.305	0.101-0.920
Former smoker	1.034	0.294	11.490			0.022	0.294	
50% night shift/month	2.522	1.028	6.018			0.014	12.448	1.660-93.337
Constant	22.855	31.415	0.529			0.467	8426517656.459	
Shoulder pain predictors				57.154	28.4%	0.024		
40-49 years old	4.859	1.913	6.448			0.011	128.841	3.029-5479.745
50 hours per week caring for children	2.490	0.994	6.282			0.012	12.066	1.721-84.598
Less than 8-hour shift	-1.123	0.523	4.610			0.032	0.325	0.117-0.907
Constant	22.710	28.046	0.656			0.418	7288873815.027	
Upper back pain predictors				58.649	40.6%	0.017		
20-49 hours taking care of adults	2.222	0.680	10.674			0.001	9.229	2.433-35.007
Over 50 hours taking care of adults	2.724	0.796	11.720			0.001	15.239	3.204-72.476
Constant	26.357	23.754	1.231			0.267	279665446281.096	

Note. B=Regression Coefficient, SE=Standard Error, Wald=Wald Statistic, X2=Chi-square Statistic, R2=Pseudo R-squared (Nagelkerke)

In our study, younger nurses (aged 20-29) were found to be at a markedly higher risk for functional neck pain, with a risk of 4.18 times greater than other age groups. This finding might reflect the unique combination of lifestyle factors—such as intensive use of technology—and job-related pressures characteristic of this age group. This is supported by Chan et al. (2020) who linked smartphone overuse to neck pain in nursing students. Additionally, our data suggested that lifestyle choices, such as smoking, have a lingering impact on musculoskeletal health, even after cessation. Former smokers in our cohort faced an alarming 19.932-fold increased risk of neck pain, resonating with Chen et al. (2018)'s findings on the long-term effects of smoking on neck pain incidence. Notably, working less than 8 hours emerged as a protective factor, which might reflect the benefits of shorter work periods in reducing cumulative physical strain, as suggested by the inverse relationship between work hours and the prevalence of MSDs (López-Aragón et al., 2017). This could potentially inform shift scheduling policies aimed at minimizing musculoskeletal strain among ED nurses. Moreover, our findings highlighted the negative impact of night shifts on musculoskeletal health, with a staggering 12.448-fold increase in the risk of neck pain. Night shifts often involve a higher workload and increased frustration levels, which Bazazan et al. (2019) have associated with worsened musculoskeletal outcomes. Collectively, these findings pointed to a multifactorial etiology for neck pain among ED nurses, necessitating a multifaceted approach to prevention and management. Such modifications could encloud scheduling practices, lifestyle modification programs, and ergonomic interventions.

The study findings highlighted a pronounced increase in the risk of musculoskeletal pain with age, particularly within the 40-49 age group, which showed a 128.841-fold rise in debilitating

shoulder pain. Supporting evidence revealed a 2.4% annual incidence rate of shoulder pain in adults over 40 (Djade et al., 2020). This significant uptick may be rationalized by age-related degenerative processes, reduced muscle strength, and the cumulative effect of prolonged exposure to occupational risk factors (Nygaard et al., 2022). This insight suggests a dual burden of natural aging processes and occupational exposures contributing to the heightened risk of musculoskeletal conditions. Furthermore, the significant association between extensive caregiving hours and the increased likelihood of shoulder and upper back pain among nurses sheds light on the compounded effects of work and non-work-related physical activities. The parallel between caregiving duties and clinical tasks—both involving strenuous physical efforts such as lifting and bending—suggests an overlapping risk factor that may limit opportunities for muscle recovery and exacerbate the risk of injury (Tariah et al., 2020). This scenario indicates the critical need for comprehensive occupational health strategies that consider the full scope of physical exertion experienced by nurses, both in their professional and personal lives. To address these challenges, targeted intervention strategies should not only focus on ergonomic improvements within the clinical setting but also advocate for supportive measures that extend into the home environment.

5. Implication and limitation

The study calls for healthcare systems to recognize the surge in MSDs among ED nurses, as these conditions significantly affect their work performance and raise the risk of work-related disability. A comprehensive strategy is crucial, beginning with early ergonomic interventions. This includes ergonomic assessments of workstations and providing ergonomic equipment such as adjustable chairs, ergonomic keyboards, and specialized footwear. Workspace modifications, like arranging equipment for easy reach and optimizing lighting, are also essential. Training programs on proper lifting techniques, promoting regular physical activity, and stress management initiatives are integral components. Wellness programs must be customized to tackle specific risk factors such as age, smoking status, shift patterns, and night duties. This includes regular musculoskeletal evaluations for nurses across all career stages, ensuring access to physical therapy, and revising work schedules to alleviate the strain from extensive night shifts. The study also indicates that personal caregiving responsibilities might exacerbate shoulder and upper back pain, pointing to the necessity for healthcare institutions to provide flexible schedules and additional support to nurses who have dual caregiving roles. Moreover, fostering a culture that encourages reporting and addressing early signs of musculoskeletal discomfort can aid in timely intervention, potentially mitigating the progression of symptoms.

The study's limitations arise from its cross-sectional design, which precludes establishing causal relationships between identified factors and MSDs. Additionally, its regional focus on the Hail region may impact the generalizability of the findings. Furthermore, the reliance on self-reported data can introduce bias, while the snapshot nature of the study may not have fully captured the fluctuating prevalence of MSDs over time or the influence of unmeasured confounding variables.

6. Conclusion

The results of this study serve as foundational data for the Hail region, setting the stage for heightened awareness and the adoption of preventative measures against MSDs among ED nurses. The research finds a significant incidence of MSDs, with demographic and work-related factors substantially influencing this trend. A majority of participants experienced lower back pain, which often impacted their daily activities. Neck pain was more prevalent among younger adults and former smokers, with night shifts also increasing the risk. Shoulder pain was notably higher in middle-aged nurses and those with childcare responsibilities, while upper back pain was associated with adult caregiving duties. Addressing these issues is crucial and calls for the implementation of ergonomic improvements, the establishment of appropriate work schedules, and the initiation of wellness programs—all of which are vital to the well-being of nurses and the standard of patient care. Our findings highlight the need for continuous study and follow-up on MSD interventions among ED nurses. Future research should focus on creating holistic wellness programs that support musculoskeletal health, aiming to foster a work environment that enhance nurses' well-being.

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Author contribution

All authors (AMA, NMA, AAA, ARA, RT, MAD, FAA, EPA) contributed substantially to the study design, data collection, analysis, and interpretation of results. All authors drafted and revised the article and approved the published version.

Conflict of interest

The authors declare that there is no conflict of interest regarding the research, authorship, or publication of this manuscript.

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