

Original Article

The frequency and contributing factors of musculoskeletal disorders among Bangladeshi tertiary healthcare centre nurses

Rifat TA¹, Kairi TK², Dey S³, Khan NI⁴, Chowdhury RA⁵

Abstract

Introduction: Musculoskeletal disorders (MSDs) are a global concern among all occupational groups especially in healthcare providers. Nurses are vulnerable to MSDs and it can affect patient care.

Objective: This study aimed to determine the prevalence of MSDs and identify potential demographic or work-related factors associated with MSDs among the nurses in a tertiary health care center in Bangladesh.

Methods: This cross-sectional study was carried out among 167 nurses. Data were gathered using the Modified Extended Nordic Musculoskeletal Questionnaire to assess the MSDs. Outcome measures were the prevalence of MSDs, MSDs in different body regions, and socio demographic and work-related factors associated with MSDs.

Results: Within the last 12 months and 4 weeks before the study, period prevalence of MSDs was 73.7% and 61.1%. The point prevalence of the study was 44.3%. The body region-based prevalence rate of MSDs was highest in the lower back (61.1%), followed by the knee (44.9%) and then the neck (40.1%). Independent variables including BMI, designation, shift rotation, experience, work hours, and night shifts were significantly associated with MSDs.

Conclusion: The prevalence of MSDs among nurses was found to be very high and it is crucial to implement ergonomic and organizational changes to match the job to the nurses' demographic and occupational traits, which will help to prevent MSDs in return.

Received date:
23 March 2025

Accepted date:
24 May 2025

Keywords: nurses, musculoskeletal disorders, nordic musculoskeletal questionnaire.

How to cite this article: Rifat TA, Kairi TK, Dey S, Khan NI, Chowdhury RA. The frequency and contributing factors of musculoskeletal disorders among Bangladeshi tertiary healthcare centre nurses. Journal of Sylhet Women's Medical College. 2025 July; 15(02):62-74. <https://doi.org/10.47648/jswmc2025v15-02-127>

JSWMC 2025 [15(02)] P: 62-72

Introduction

Musculoskeletal disorders (MSDs) are a group of inflammatory and degenerative disorders that affect various parts of the body including the muscles, tendons, ligaments, joints, cartilage etc.^{1,2} Musculoskeletal problems can pose a major public health concern by causing impact on disability, physical and mental well-being, work absenteeism, and indirectly increasing healthcare system expenses.

5. Rahat Amin Chowdhury, Associate Professor and Head, Department of Neurology, Sylhet Women's Medical College, Sylhet.

Corresponding Author: Taffim Ahmed Rifat,
Assistant Professor, Department of Community Medicine,
Sylhet Women's Medical College, Sylhet.,
Email: drtaffimahmed11@gmail.com

Disabilities caused by MSDs are associated with reduced mobility and function across all age groups. These conditions also impact daily activities and make household tasks more challenging. A wide range of risk factors can influence the development of MSDs including individual, psychosocial and workplace factors.^{3,4}

Healthcare workers have a higher risk of developing MSDs than other occupational groups like construction workers, miner, manufacturing employees etc. and this prevalence can be as high as 89%.^{5,6} MSDs are

1. Taffim Ahmed Rifat, Assistant Professor, Department of Community Medicine, Sylhet Women's Medical College, Sylhet.
2. Tamal Kanti Kairi, Assistant Professor, Department of Community Medicine, Parkview Medical College, Sylhet,
3. Sanghamitra Dey, Medical Officer, Upazila Health Office, Sadar, Moulvibazar.
4. Nabila Islam Khan, Honorary Medical Officer, Department of Medicine, Sylhet MAG Osmani Medical College, Sylhet.,

prevalent in nurses, with 1 in every 6 nurses being at a high risk and increased work load often cause occupational injuries.⁷⁻⁹ Musculoskeletal complaints result from physically strenuous activities like assisting patients in changing positions, sustaining a hunched and twisted posture, forceful exertion and lifting heavy individuals.^{10,11} According to the Occupational Safety and Health Administration (OSHA), a study spanning 47 occupations in 18 countries reported that nurses undergo most amount of heavy lifting in comparison to any other occupation.¹² Musculoskeletal disorders frequently have a considerable impact on nurses' quality of life and can result in job limitations, absenteeism and a wish to exit the profession. Moreover, MSDs impact nurses' productivity and compassion, potentially resulting in a decline in care quality, patient satisfaction and safety.¹³ MSDs has been identified as an important cause of high turnover among nurses.¹⁴

Routine work of nurses can contribute to development of MSDs and their job demand has been found to be attributable to the severity of the problem, so much so that, this relationship has also been found in young nurses.¹⁵⁻¹⁷ The nursing field is one of the occupations with a high prevalence of work-related musculoskeletal disorders due to the nature of the job. Nurses need to provide constant care for their patients, which puts them at higher risk for musculoskeletal pains and disorders.^{18,19} The job requirements among nurses include physical tasks such as lifting, moving, prolonged standing, working long hours and maintaining certain postures. The effects of these factors vary based on how long they last, how often they occur and how sustainable they are. Every one of these external factors can also contribute to the occurrence or recurrence of musculoskeletal issues. Awkward static posture, repetitive movements and poor lifting technique can contribute to MSDs.²⁰ A study in United States identified six aspects contributable to MSDs in nurses such as: insufficient time and assistance, patient severity, ergonomic challenges, bodily movement problems, knowledge gaps and communication.²¹ Many studies looked into the prevalence of MSDs among nurses in various countries. For

example, 70.8% in South Korea, 66% in Switzerland, 88% in Iran and 80% in Turkey.²²⁻²⁵ These conditions are present in different areas of the body such as the neck, shoulder, arm, wrist and lower back, with lower back pain being the most prevalent.^{26,27} Nurses most commonly experience lower back injuries and related pain, with percentages ranging from 44.1% to 74.5% reported.^{11,28,29} Nurses who work with patients undergoing rehabilitation, those who are obese or overweight and those with limited mobility may be at a higher risk for developing MSDs.^{21,30} Numerous other workplace factors contribute to musculoskeletal issues among nurses, including prolonged standing, work experience and body mass index (BMI), as well as longer working hours, older age and more work experience.^{22,31,32}

MSDs have emerged as a major health problem among a wide variety of occupations in both developed and developing countries. MSDs among nurses are a significant problem for the health workforce, and the healthcare system must prevent the loss of nursing staff due to long-term absence, seeking other jobs or retiring early. The intention to quit the nursing field has been linked to the occurrence of musculoskeletal disorders related to work.³³ Because of the issues that MSDs cause in employees' personal and social lives, it is important to address them early on and make sure to make any needed changes in the workplace. This scenario is particularly significant in fields where musculoskeletal disorders are prevalent, particularly among nurses. Despite numerous studies conducted globally to determine the frequency of MSDs in nurses, there is limited data on the prevalence of MSDs among nurses in Bangladesh. Nurses in Bangladesh go through similar risks of developing MSDs just like works of literature have shown in other countries. This encourages the researchers to conduct this study with the objectives of determining the prevalence of MSDs in nine body regions and any possible demographic or work-related factors associated among the nurses in a Tertiary Health Care Center in Bangladesh.

Materials and Methods:

Study settings and Sampling

We conducted a cross-sectional study in November 2024 among the nurses of Sylhet Women's Medical College which is a tertiary level health care center in the north-eastern part of Bangladesh. All nurses working in the medical college were considered to be the sampling unit. The sample size was calculated using the $n=(z^2pq)/d^2$ formula with the expected prevalence of the event at 87.6%.³⁴

n = desired sample

z = confidence level at 95% = 1.96

p = expected proportion of event or prevalence of the event = 0.876

q = $1-p$ = 0.124

d = allowable error (5%) = 0.05

$n=(z^2pq)/d^2= (1.96^2 \times 0.87 \times 0.13) / 0.05^2 = 166.915 = 167$

The calculated sample size was 167 with a 95% confidence interval and relative precision of 5%. The inclusion criteria included: age ≥ 18 years, licensed nurses with work experience of >12 months in a permanent position, and no obvious physical and mental illness. Nurses who volunteered to take part were interviewed conveniently.

Data collection tool:

The interview had three parts: socio demographic details of the nurses, work-related questions, and the Modified Extended Nordic Musculoskeletal Questionnaire to assess MSDs in different parts of the body. The whole questionnaire was translated into the Bangla language. A pilot test on 5 nurses was done. Minor changes in the language of the Bangla questionnaire were made and an image showing nine body parts according to the Nordic Questionnaire was added to help participants show their specific body area where they have symptoms. Socio demographic details included age, sex, marital status, children, height, weight, and education level of the nurses. Work-related questions included designation of the nurse, department posted, years of experience in nursing service, on average how many hours per day and week a nurse has to serve, average number of night shifts per month (8pm to 8am), work mode of fixed morning/evening/night or rotation of shift and whether the nurse has a

secondary job. The Nordic Musculoskeletal Questionnaire (NMQ) was presented by Kuorinka et al. to measure MSDs and their consequences among the general population³⁵ and later Dawson et al. developed an Extended version of the NMQ (NMQ-E), aiming to produce larger and more useful datasets concerning the prevalence and consequences of MSDs.³⁶ The Modified NMQ-Extended MSDs in nine body regions, namely neck, shoulder, elbow, wrist/hand, upper back, lower back, hip/thigh, knee, and ankle/foot. The term MSDs was explained to address the presence of any symptoms such as aches, pain, or discomfort during the last 12 months, the past 4 weeks, and on the day of the interview. Follow-up questions regarding a body region included a change of duties, taking sick leave, medication for the trouble, and consultation with a doctor for that specific MSD.

Data collection method:

A self-reporting questionnaire with a consent form and an explanation of the study's objectives and participation instructions was distributed among nurses. Participation in the study was voluntary, and nurses had the freedom to decline or exit the study at any point. No personal identifying information, such as names or email addresses, was collected in the survey. Assurance was given regarding confidentiality and secrecy of the information they provide.

Data analysis:

For analysis purposes data were grouped as follows: age was grouped as <30 years and ≥ 30 years; height and weight were calculated into BMI and categorized according to WHO.³⁷ Nurses with 'Bachelor in Nursing' or 'Diploma/BSc in Nursing' are categorized as graduate nurses. Placement was grouped into general wards (e.g. Medicine, Surgery, Gynae, Pediatrics, Orthopedics) and specialty (e.g. ICU, NICU, PICU, CCU, Dialysis, OT); Work experience was grouped into ≤ 8 and >8 years; average hours of work per day into ≤ 7 and >7 hours; average hours of work per week into ≤ 42 and >42 hours and average night shifts per month into ≤ 7 and >7 shifts. All the numerical categories mentioned above are split using median. For the test of significance, the χ^2 (chi-

square) test was used to see the relation between MSDs and associated factors. Data were analyzed using SPSS version 25.

Ethical Clearance:

This study involved human participants and was approved by the Institutional Review Board and Ethical Clearance Committee of the Women's Medical College, Sylhet, Bangladesh (Ref/SWMCH/1414). Participants gave informed consent to participate in the study before taking part.

Results

Data was collected from 167 respondents. The socio demographic information of all respondents is presented in Table 1. The mean age, height, weight, and body mass index (BMI) of the respondents were 31.8 ± 6.9 years, 1.54 ± 0.09 m, 56.5 ± 9.9 Kg and 24.18 ± 4.95 kg/m² respectively. Males and females accounted for 8.4% and 91.6% of the sample population respectively. More than 2/3rd (68.9%) of the respondents were married and almost half (47.9%) of them had children. Most (45.5%) of the nurses belonged to normal BMI while 13.2%, 28.1%, and 13.25% of them were underweight, overweight, and obese respectively.

Table 1: Socio demographic profile of nurses (n=167)

Variable	Category	Frequency	Percentage
Age (years)	<30	86	51.5%
	≥30	81	48.5%
Sex	Male	14	8.4%
	Female	153	91.6%
Marital Status	Unmarried	52	31.1%
	Married	115	68.9%
Children	Has children	80	47.9%
	No children	87	52.1%
BMI	Underweight (<18.5)	22	13.2%
	Normal (18.5-24.9)	76	45.5%
	Overweight (25-29.9)	47	28.1%
	Obese (≥30)	22	13.2%
Education	Graduate Nurses	153	91.6%
	Post-graduate Nurses	14	8.4%

Work-related factors about the nurses are presented in Table 2. Most (62.3%) nurses were senior staff nurses (SSN) while 31.7% were assistant nurses (AN) and 6% were supervisors or in-charge. 60.5% were posted in general wards and the rest were in specialty. Among the scheduled duty, 81.4% worked in rotation of shifts and 18.6% had a fixed shift. The mean experience, hours of work per day & week, and average night shifts per month were 8.97 ± 6.21 years, 7.84 ± 2.31 hours, 44.34 ± 5.02 hours and 6.32 ± 3.12 shifts respectively. A small portion (7.2%) of the nurses had a secondary job elsewhere.

Table 2: Work-related Factors (n=167)

Variable	Category	Frequency	Percentage
Designation	SSN	104	62.3%
	AN	53	31.7%
	Supervisor/ In charge	10	6.0%
Place Posted	General Wards	101	60.5%
	Specialty	66	39.5%
Work mode	Nurses with Fixed Shift	31	18.6%
	Nurses with Rotation of Shifts	136	81.4%
Years of experience	≤8 years	85	50.9%
	>8 years	82	49.1%
Hours of work per day	≤7 hours	88	52.7%
	>7 hours	79	47.3%
Hours of work per week	≤42 hours	76	45.5%
	>42 hours	91	54.5%
Average night shifts per month	≤7	50	29.9%
	>7	117	70.1%
Secondary Job	Has a Secondary Job	12	7.2%
	No Secondary Job	155	92.8%

Table 3 shows MSDs-related information on the nurses. The respondents reported a 12-month prevalence rate of MSDs at any of the body regions to be 73.7%. The body region-

based prevalence rate of MSDs was highest in the lower back (61.1%), followed by the knee (44.9%) and then the neck (40.1%) but least in the elbow (18.6%). Period prevalence of the past 4 weeks was found to be 61.1% and the point prevalence rate of MSDs was 44.3% among the respondents. Having been burdened by the discomfort or pain in the past year 16.8% of nurses had to change duties or shifts and 13.2% of them have taken a sick leave for MSDs. More than one-fourth (27.6%) of the respondents reported taking medication to relieve the discomfort or pain and 13.2% have sought consultation from a doctor.

Table 3: MSDs-related information (n=167)

Variable	Frequency	Percentage
MSDs prevalence in the past 12 months		
MSDs present	123	73.7%
MSDs absent	44	26.3%
MSDs prevalence in various body regions		
Neck	67	40.1%
Shoulder	53	31.7%
Upper back	66	39.5%
Lower back	102	61.1%
Elbow	31	18.6%
Wrist/hand	33	19.8%
Hip/thigh	54	32.3%
Knee	75	44.9%
Ankle/foot	61	36.5%
MSDs prevalence in the past 4 weeks	102	61.1%
MSDs prevalence on the day of the interview	74	44.3%
Change of duties/shifts due to MSDs	28	16.8%
Sick leave taken due to MSDs	22	13.2%
Medication taken due to MSDs	46	27.6%
Consulted doctor due to MSDs	22	13.2%

Table 4 shows the association between the self-reported 12-month prevalence of MSDs and the socio demographic factors of all the respondents. The prevalence rate of MSDs increased with increasing age but it was not statistically significant ($p=0.079$). Females, married, and nurses with children had a higher prevalence of

MSDs but the association was not significant. However, nurses with higher BMI category had a higher proportion (overweight 87.2% and obese 90.9%) of MSDs ($p=0.001$). Educational qualification was not found influential in the prevalence of MSDs.

Table 4: Socio demographic factors associated with Musculoskeletal Disorders (MSDs) (n=167)

Variable		MSDs Present* n (%) [#]	MSDs Absent* n (%) [#]	p-value
Age (years)	<30	58 (67.4)	28 (32.6)	0.079
	≥30	65 (80.2)	16 (19.8)	
Sex	Male	9 (64.3)	5 (35.7)	0.526
	Female	114 (74.5)	39 (25.5)	
Marital Status	Unmarried	35 (67.3)	17 (32.7)	0.255
	Married	88 (76.5)	27 (23.5)	
Children	Has children	62 (77.5)	18 (22.5)	0.297
	No children	61 (70.1)	26 (29.9)	
BMI	Under weight (<18.5)	11 (50)	11 (50)	0.001
	Normal (18.5-24.9)	51 (67.1)	25 (32.9)	
	Overweight (25-29.9)	41 (87.2)	6 (12.8)	
	Obese (≥30)	20 (90.9)	2 (9.1)	
Education	Graduate Nurses	113 (73.9)	40 (26.1)	0.763
	Post-graduate Nurses	10 (71.4)	4 (28.6)	

*Percentage in parenthesis[#] Row percentages

Work-related factors associated with MSDs are presented in Table 5. SSN (76.9%) and AN (75.5%) had a higher proportion of MSDs ($p=0.005$). Nurses who worked in rotation

suffered more than those who had a fixed shift of duty ($p=0.003$). Respondents who had >8 years of experience (86.6%), worked more than 7 hours per day (84.4%) and more than 42 hours per week (86.8%) reported a higher prevalence of MSDs and the associations were statically significant. Nurses who had night shifts on more than 7 occasions every month had suffered more (82.1%) than those who had less ($p<0.001$). Nurses with secondary jobs did not reflect any differences in MSDs prevalence.

Table 5: Work-related factors associated with MSDs (n=167)

Variable		MSDs Present* n (%) [#]	MSDs Absent* n (%) [#]	p-value
Designation	SSN	80 (76.9)	24 (23.1)	0.005
	AN	40 (75.5)	13 (24.5)	
	Supervisor/In charge	3 (30)	7 (70)	
Place Posted	General Wards	70 (69.3)	31 (30.7)	0.151
	Specialty	53 (80.3)	13 (19.7)	
Work mode	Nurses with Fixed Shift	16 (51.6)	15 (48.4)	0.003
	Nurses with Rotation of Shifts	107 (78.7)	29 (21.3)	
Years of experience	≤8 years	52 (61.2)	33 (38.8)	<0.001
	>8 years	71 (86.6)	11 (13.4)	
Hours of work per day	≤7 hours	56 (63.6)	32 (36.4)	0.003
	>7 hours	67 (84.8)	12 (15.2)	
Hours of work per week	≤42 hours	44 (57.9)	32 (42.1)	<0.001
	>42 hours	79 (86.8)	12 (13.2)	
Average night shifts per month	≤7	27 (54)	23 (46)	<0.001
	>7	96 (82.1)	21 (17.9)	
Secondary Job	Has ^a Secondary Job	9 (75)	3 (25)	0.608
	No Secondary Job	114 (73.5)	41 (26.5)	
*Percentage in parenthesis [#] Row percentages				

Discussion:

MSDs are a very common health problem among medical professionals. Studies elsewhere have shown nurses are particularly vulnerable to MSDs.²²⁻²⁵ However; there is a lack of studies on MSDs among nurses in Bangladesh. In this cross-sectional study, most participants (91.6%) were female which corresponds to the demography of many studies; ranging from 82% to 98%.³⁸⁻⁴⁰ Mean age of the respondents was found to be 31.8±6.9 years. Similar respondents also took part in MSDs studies in Iran (32.10±7.30 years and 31.78±6.89 years) and China (31.83±7.18 years).⁴⁰⁻⁴² The mean BMI in our study was 24.18±4.95 kg/m² and 45.5% belonged to the normal class while 41.3% had ≥25 BMI. Nurses in other studies had a BMI mean of 31.78±6.89 kg/m², 31.83±7.18 kg/m² and 26.2±4.6kg/m² in Iran, China and Nigeria respectively.^{28,41,42}

Various work-related factors contribute to the development of MSDs. In this study, work experience was found to be 8.97±6.21 years. Other studies have shown similar patterns of experience among nurses in Iran and Nigeria, 8.4±7.03 years, 7.55±6.43 years, and 11.8±7.56 years respectively.^{28,40,41} In the current study average hours of work per day was 7.84±2.31 hours per day whereas other studies found it to be 8.77±1.37 and 8.91±1.51 hours per day.^{34,41} Hours of work per week among the respondents was 44.34±5.02 hours per week whereas other studies ranged from 40.4±6.51 to 52.65±8.27 hours.^{28,41} Nurses in this study mainly (81.4%) worked in rotation of shifts which is in line with other studies (81.6% and 91%).^{40,41}

The prevalence of MSDs for the past 12 months was 73.7%. Similar studies conducted in Switzerland, Turkey, Nigeria, Saudi Arabia, India, and China reported MSDs prevalence rates ranging from 61% to 85% which is consistent to our findings.^{18,23-25,28,43} This indicates MSDs have hardly anything to do with geographical area or socioeconomic standards, but rather are influenced by similar work-related factors present in every work setting among nurses worldwide. The last 4-week prevalence among nurses was 61.1% which is similar to a study in Estonia (64%).⁴⁴ The point prevalence on the day of the interview was 44.3%.

However, in 2010 a study in Nigeria found that to be as high as 66%.²⁸ These period and point prevalence show that MSDs are chronic issues among nurses.

In this study in the last 12 months participants were found mostly suffering from MSDs in the lower back (61.1%) followed by the knee (44.9%), and neck (40.1%). Many studies found Lower back was the prime area of MSDs among nurses.^{18,24,25,28,38,40-42,43} However some studies have also found most MSDs occur in the Neck and Shoulder.^{23,45} Ko et al. discovered a significant correlation between turning or moving patients and pain and discomfort in the lower back.⁴⁶ Factors that can contribute to lower back pain are repetitious movement, awkward postures, and high force levels during various tasks. In this study, 16.8% of nurses asked for a roaster/duty change and 13.2% have taken sick leave for MSD issues. A similar study in Nigeria reported that 8% of nurses asked for a duty change while 16% and 11% of nurses in Thailand and China respectively asked for a sick leave.^{42,47,48} In our study 13.2% of nurses consulted a doctor with a MSD complaint. A similar result (14.9%) was obtained from a study in Saudi Arabia.³⁸

This study found that overweight and obese nurses had the highest prevalence (87.2% and 90.9%) of MSDs in the past 12 months and the association was significant ($p=0.001$). The results of the present study reflect the results reported by studies in Nigeria and China.^{28,42} Furthermore, nurses who were working as SSNs and ANs were more prone to MSDs compared to nurses who were working as supervisors or nurses in charge ($p=0.005$). As SSNs and ANs deal more with patients and go through more physically demanding work, this can explain why they have reported more discomfort. A study in Busan, China found that general duty nurses suffered more (71.7%) MSDs compared to responsibility and head nurses.¹⁸ Nurses who worked in rotation of shifts had a higher prevalence of MSDs (78.7%) compared to nurses who had a fixed shift of duty (61.6%) and it was significantly associated with MSDs ($p=0.003$). Other studies in China and India found shift rotation to be associated with MSDs.^{18,23} Work experience of nurses was found a significant factor for MSDs in this study.

Nurses with over 8 years of experience suffered more and the association with MSDs was significant ($p<0.001$). As MSDs are chronic burdens it is explainable that the longer the risk factors work on different body regions the more the burden of MSDs increases. A similar study in Iran found a positive association between work experience and MSDs.⁴¹ Also another study in Saudi Arabia found nurses who worked 6-10 years and >10 years had odds of MSDs increase by 3.4 and 2 folds respectively.²⁸ Respondents who reported longer work hours per day and week were both significantly associated with MSDs in this study ($p=0.003$ and $p<0.001$). A multicenter study in Delhi found work hours to be significantly associated with MSDs.⁴⁹ Nurses who went through more than 7 night shifts per month reported more (82.1%) MSDs and it had a significant association with MSDs ($p<0.001$). Working at night can disrupt the circadian rhythm and add physical and psychological stress. Nurses who work night shifts and stay up late have been found similar association with MSDs in a study in China.⁴⁵

Limitations:

The measurement and symptoms of MSDs were self-reported, and no physiological testing was conducted to confirm the diagnosis, which might, therefore, exhibit self-report bias. The causative factors of MSDs were not investigated in this study using methods like the Rapid Entire Body Assessment and the Assessment of Repetitive Tasks Analysis. There is also a scope to investigate ergonomic issues include sustained postures, repetitive tasks, forceful hand exertions, use of equipment and precision requirement which can be investigated through direct observation or perhaps through a qualitative study. A random method of sample selection with an increased number of study centers would have improved the generalize ability of the findings. Future studies should consider increasing the participant pool from more study centers and employing a random sampling method to gather data. This can improve accuracy of the influential factors of musculoskeletal disorders among nursing personnel and give the findings more generalize ability.

Conclusion:

Occupational MSDs develop in a complicated manner due to multiple factors. Finding and averting risk factors at an early stage is highly crucial. This study focused on musculoskeletal disorders, an important aspect of occupational health that is less investigated in the workplace. MSDs prevalence in this study was found to be high among nurses, which can impact healthcare delivery such as increased absenteeism, reduced productivity, and implications for patient care quality. The intervention programs should be directed at policy changes and organizational support that includes ergonomic assessments of workspaces, promoting workplace wellness training, and ensuring adequate staffing levels to minimize workload stress.

Author's Contributions:

Conceptualization and literature review: Rifat TA and Kairi TK; Methodology: Rifat TA, Kairi TK, and Dey S; Data collection: Rifat TA, Chowdhury RA and Khan NI; Data Analysis: Kairi TK and Dey S; Writing original draft: Rifat TA; Writing review and editing: Chowdhury RA, Kairi TK, Dey S, and Khan NI. All authors read and approved the final manuscript.

Acknowledgements

The authors acknowledge the contribution of all the nurses who have taken part in this study.

Competing Interests

All the authors declared no competing interests.

Funding

This study did not receive grants from any funding agencies.

References:

1. Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. *Journal of Electromyography and Kinesiology* 2004;14:13–23.
<https://doi.org/10.1016/j.jelekin.2003.09.015>.
2. Anap D, Iyer C, Rao K. Work-related musculoskeletal disorders among hospital nurses in rural Maharashtra, India: a multi-center survey. *International Journal of Research in Medical Sciences* 2013;1:101.
<https://doi.org/10.5455/2320-6012.ijrms20130513>.
3. Da Costa BR, Vieira ER. Risk factors for work-related musculoskeletal disorders: a systematic review of recent longitudinal studies. *American Journal of Industrial Medicine* 2009;53:285–323.
<https://doi.org/10.1002/ajim.20750>.
4. David G, Woods V, Li G, Buckle P. The development of the Quick Exposure Check (QEC) for assessing exposure to risk factors for work-related musculoskeletal disorders. *Applied Ergonomics* 2008;39:57–69.
<https://doi.org/10.1016/j.apergo.2007.03.002>.
5. Daraiseh NM, Cronin SN, Davis LS, Shell RL, Karwowski W. Low back symptoms among hospital nurses, associations to individual factors and pain in multiple body regions. *International Journal of Industrial Ergonomics* 2010;40:19–24.
<https://doi.org/10.1016/j.ergon.2009.11.004>.
6. Eriksen W. The prevalence of musculoskeletal pain in Norwegian nurses aides. *International Archives of Occupational and Environmental Health* 2003;76:625–30.
<https://doi.org/10.1007/s00420-003-0453-6>.
7. Stubbs DA, Buckle PW, Hudson MP, Rivers PM, Worringham CJ. Back pain in the nursing profession I. Epidemiology and pilot methodology. *Ergonomics* 1983;26:755–65.
<https://doi.org/10.1080/00140138308963397>.
8. Videman T, Nurminen T, Tola S, Kuorinka I, Vanharanta H, Troup JDG. Low-Back Pain in Nurses and Some Loading Factors of Work. *Spine (Philadelphia, Pa 1976)* 1984;9:400–4.
<https://doi.org/10.1097/00007632-198405000-00013>.
9. Wilkinson WE, Salazar MK, Uhl JE, Koepsell TD, DeRoos RL, Long RJ. Occupational injuries: a study of health care workers at a Northwestern Health Science Center and teaching hospital. *AAOHN J* 1992 Jun;40(6):287-93. Erratum in: *AAOHN J* 1992 Aug;40(8):404.
<https://pubmed.ncbi.nlm.nih.gov/1388372/>.
10. Cilliers L, Maart S. Attitudes, knowledge and treatment of low back pain amongst nurses in the Eastern Cape, South Africa. *African Journal of Primary Health Care & Family*

- Medicine. 2013;5.
<https://doi.org/10.4102/phcfm.v5i1.535>
11. Jellad A, Lajili H, Boudokhane S, Migaou H, Maatallah S, Frih ZBS. Musculoskeletal disorders among Tunisian hospital staff: Prevalence and risk factors. *The Egyptian Rheumatologist*. 2013;35:59–63.
<https://doi.org/10.1016/j.ejr.2013.01.002>.
 12. EU-OSHA. Musculoskeletal Disorders in The Healthcare Sector. European Agency for Safety and Health at Work. 2020:1-23
https://osha.europa.eu/sites/default/files/Discussion_paper_MSDs_in_health_care_sector.pdf
 13. Naoum S, Mitseas P, Koutserimpas C, Spinthouri M, Kalomikerakis I, Raptis K, et al. Musculoskeletal Disorders and Caring Behaviors among Nursing Staff in Greek Hospitals: a Prospective Multicenter Study. *Maedica (Bucur)*. 2022;17(1):52-63.
<https://doi.org/10.26574/maedica.2022.17.1.52>
 14. Richardson A, Gurung G, Derrett S, Harcombe H. Perspectives on preventing musculoskeletal injuries in nurses: A qualitative study. *Nursing Open*. 2019;6(3):915–929.
<https://doi.org/10.1002/nop2.272>
 15. Stanchev V, Vangelova K. Musculoskeletal Disorders in Nurses in Hospitals. *Macedonian Journal of Medical Sciences*. 2022;10(E):439–443.
<https://doi.org/10.3889/oamjms.2022.8920>
 16. Chung Y-C, Hung C-T, Li S-F, Lee H-M, Wang S-G, Chang S-C, et al. Risk of musculoskeletal disorder among Taiwanese nurses cohort: a nationwide population-based study. *BMC Musculoskeletal Disorders* 2013;14. <https://doi.org/10.1186/1471-2474-14-144>.
 17. Sorour AS, El-Maksoud MMA. Relationship Between Musculoskeletal Disorders, Job Demands, and Burnout Among Emergency Nurses. *Advanced Emergency Nursing Journal* 2012;34:272–82.
<https://doi.org/10.1097/tme.0b013e31826211e1>.
 18. Attar SM. Frequency and risk factors of musculoskeletal pain in nurses at a tertiary center in Jeddah, Saudi Arabia: a cross-sectional study. *BMC Research Notes* 2014;7.
<https://doi.org/10.1186/1756-0500-7-61>.
 19. Hinmikaiye CD, Bamishaiye EI. The Incidence of Low Back Pain among Theatre Nurses: A Case Study of University of Ilorin and Obafemi Awolowo University Teaching Hospital. *International Journal of Nursing Science* 2012;2:23–8.
<https://doi.org/10.5923/j.nursing.20120203.02>.
 20. Kairi TK, Dey S. Prevalence of work-related musculoskeletal symptoms among tea garden workers in Bangladesh: a cross-sectional study. *BMJ Open* 2022;12:e061305.
<https://doi.org/10.1136/bmjopen-2022-061305>.
 21. Bhimani R. Understanding Work-related Musculoskeletal Injuries in Rehabilitation from a Nursing Perspective. *Rehabilitation Nursing* 2016;41:91–100.
<https://doi.org/10.1002/rnj.187>.
 22. Arsalani N, Fallahi-Khoshknab M, Josephson M, Lagerström M. Musculoskeletal Disorders and Working Conditions Among Iranian Nursing Personnel. *International Journal of Occupational Safety and Ergonomics* 2014;20:671–80.
<https://doi.org/10.1080/10803548.2014.11077073>.
 23. Ryu E, Ye B, Yi Y, Kim J. Risk factors of musculoskeletal symptoms in university hospital nurses. *Annals of Occupational and Environmental Medicine* 2014;26.
<https://doi.org/10.1186/s40557-014-0047-7>.
 24. Nützi M, Koch P, Baur H, Elfering A. Work-Family Conflict, Task Interruptions, and Influence at Work Predict Musculoskeletal Pain in Operating Room Nurses. *Safety and Health at Work* 2015;6:329–37.
<https://doi.org/10.1016/j.shaw.2015.07.011>
 25. Ertem AC, Ertem U. The Frequency of Musculoskeletal Pain in Nurses Working in Internal Medicine Intensive Care Unit and Related Factors. *Turkish Journal of Internal Medicine (Online)* 2023;5:240–7.
<https://doi.org/10.46310/tjim.1345172>.
 26. Reed LF, Battistutta D, Young J, Newman B. Prevalence and risk factors for foot and ankle musculoskeletal disorders experienced by nurses. *BMC Musculoskeletal Disorders* 2014;15. <https://doi.org/10.1186/1471-2474-15-196>.
 27. Yip YB. A study of work stress, patient handling activities and the risk of low back pain among nurses in Hong Kong. *Journal of Advanced Nursing* 2001;36:794–804.
<https://doi.org/10.1046/j.1365-2648.2001.02037.x>.

28. Tinubu BM, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-Related Musculoskeletal Disorders among Nurses in Ibadan, South-west Nigeria: a cross-sectional survey. *BMC Musculoskeletal Disorders* 2010;11. <https://doi.org/10.1186/1471-2474-11-12>.
29. Munabi IG, Buwembo W, Kitara DL, Ochieng J, Mwaka ES. Musculoskeletal disorder risk factors among nursing professionals in low resource settings: a cross-sectional study in Uganda. *BMC Nursing* 2014;13. <https://doi.org/10.1186/1472-6955-13-7>.
30. Choi SD, Brings K. Work-related musculoskeletal risks associated with nurses and nursing assistants handling overweight and obese patients: A literature review. *Work* 2016;53:439–48. <https://doi.org/10.3233/wor-152222>.
31. Mottaghi M, Moghadam MB, Rohani Z, Moghadam KB, Irani H. The Survey of Prevalence of Vertebral Column Pain and Some Related Factors in Nurses Employed in Gonabad Hospitals. *The Horizon of Medical Sciences* 2011;17:51–57. <https://imtg.gmu.ac.ir/article-1-1286-en.html>
32. Rokni M, Abadi MH, Saremi M, MirMohammadi MT. Prevalence of musculoskeletal disorders in nurses and its relationship with the knowledge of ergonomic and environmental factors. *J Gorgan Univ Med Sci*. 2016;18(1):128–132 <https://www.sid.ir/paper/78825/en>
33. Fochsen G, Hagberg M, Toomingas A, Lagerström M. Predictors of leaving nursing care: A longitudinal study among Swedish nursing personnel. *Occup. Environ. Med.* 2006;63:198–201. <http://dx.doi.org/10.1136/oem.2005.021956>.
34. Habibi E, Farrokhi E, Mansourian M. The Effectiveness of DINO Method in Estimating Musculoskeletal Disorders Risk Related to Patient Transfer. *Majallah-i Irgunumi* 2016;4:56–63. <https://doi.org/10.21859/joe-04017>. Available at: <https://web.archive.org/web/20180720041155/https://cdn.neoscriber.org/cdn/serve/313ea/de6de226df9951b19cd75df5906b5d395b6ded87/15063-pdf.pdf>
35. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardized Nordic questionnaires for the analysis of musculoskeletal symptoms. *Appl Ergon.* 1987;18:233–237. [https://doi.org/10.1016/0003-6870\(87\)90010-x](https://doi.org/10.1016/0003-6870(87)90010-x)
36. Dawson AP, Steele EJ, Hodges PW, Stewart S. Development and Test-Retest Reliability of an Extended Version of the Nordic Musculoskeletal Questionnaire (NMQ-E): A Screening Instrument for Musculoskeletal Pain. *Journal of Pain*. 2009;10:517–26. <https://doi.org/10.1016/j.jpain.2008.11.008>.
37. A healthy lifestyle - WHO recommendations [Internet]. World Health Organization; [cited 2024 Jun 14]. Available from: <https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations>
38. Tariah HA, Nafai S, Alajmi M, Almutairi F, Alanazi B. Work-related musculoskeletal disorders in nurses working in the Kingdom of Saudi Arabia. *Work* 2020;65:421–8. <https://doi.org/10.3233/wor-203094>.
39. Passali C, Maniopolou D, Apostolakis I, Varlamis I. Work-related musculoskeletal disorders among Greek hospital nursing professionals: A cross-sectional observational study. *Work* 2018;61:489–98. <https://doi.org/10.3233/wor-182812>.
40. Barzideh M, Choobineh AR, Tabatabaee HR. Job stress dimensions and their relationship to musculoskeletal disorders in Iranian nurses. *Work* 2014;47:423–9. <https://doi.org/10.3233/wor-121585>.
41. Hosseini E, Daneshmandi H, Bashiri A and Sharifian R. Work-related musculoskeletal symptoms among Iranian nurses and their relationship with fatigue: a cross-sectional study. *BMC Musculoskeletal Disord.* 2021;22:629 <https://doi.org/10.1186/s12891-021-04510-3>
42. Yan P, Li F, Zhang L, Yang Y, Huang A, Wang Y, Yao H. Prevalence of Work-Related Musculoskeletal Disorders in the Nurses Working in Hospitals of Xinjiang Uygur Autonomous Region. *Pain Research and Management*. 2017 (1); 5757108, 7 pages <https://doi.org/10.1155/2017/5757108>
43. Lin SC, Lin LL, Liu CJ, Fang CK, Lin MH. Exploring the factors affecting musculoskeletal disorders risk among hospital nurses. *PLoS ONE*. 2020;15(4): e0231319. <https://doi.org/10.1371/journal.pone.0231319>
44. Freimann T, Pääsuke M, Merisalu E. Work-Related Psychosocial Factors and Mental Health Problems Associated with

- Musculoskeletal Pain in Nurses: A Cross-Sectional Study. *Pain Research & Management*. 2016;1–7. <https://doi.org/10.1155/2016/9361016>
45. Yao Y, Zhao S, An Z, Wang S, Li H, Lu L, Yao S. The associations of work style and physical exercise with the risk of work-related musculoskeletal disorders in nurses. *International Journal of Occupational Medicine and Environmental Health*. 2019;32(1):15 – 24 <https://doi.org/10.13075/ijomeh.1896.01331>
46. Ko HW, Juan CW, Chang HJ. Low back pain related factors in nursing staff and caregivers. *Show- Chwan Med J*. 2011; 10(1,2): 69–80. <https://doi.org/10.6833/CJCU.2012.00234>
47. Thinkhamrop W, Sawaengdee K, Tangcharoensathien V, Theerawit T, Laohasiriwong W, Saengsuwanl J, Hurst CP. Burden of musculoskeletal disorders among registered nurses: evidence from the Thai nurse cohort study. *BMC Nursing*. 2017;16(68) <https://doi.org/10.1186/s12912-017-0263-x>
48. Bolarinde SO, Oyewole I, Abobarin AF. Work-related musculoskeletal disorders among nurses in various specialty areas in a Nigerian tertiary health institution. *Journal of Emergency Practice and Trauma*. 2019; 5(2): 41-46. <https://doi.org/10.15171/jept.2019.04>
49. Sharma F, Kalra S, Rai R, Chorsiya V, Dular SDS. Work-related Musculoskeletal Disorders, Workability and its Predictors among Nurses Working in Delhi Hospitals: A Multicentric Survey. *Journal of Clinical and Diagnostic Research*. 2022. <https://doi.org/10.7860/jcdr/2022/57953.16925>