International Journal of Occupational Safety and Health

ISSN: 2091-0878 (Online) ISSN: 2738-9707 (Print)

Original Article

Musculoskeletal discomforts among young nurses: A foreshadowing and the reasons behind

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Date of submission: 07.01.2026
Date of acceptance: 12.05.2026
Date of publication: 10.07.2026

Conflicts of interest: None
Supporting agencies: None
DOI:
https://doi.org/10.3126/ijosh.v16i2.88079

ABSTRACT

Introduction: Musculoskeletal discomfort in nurses is becoming more common. Studies have revealed that age and exposure to causative factors over the years might trigger symptoms. The goal of this study was to evaluate the prevalence and factors influencing the work-related musculoskeletal discomfort indications among young female nurses.

Methods: This cross-sectional study was performed between August, 2020 to November 2022. Maintaining the inclusion and exclusion criteria of this study, female registered nurses were chosen with an age limit of 29 years. Modified Nordic Questionnaire, Physical Activity Level (PAL) questionnaire, Copenhagen Psychosocial Questionnaire (COPSOQ), and Rapid Entire Body Assessment (REBA) tool were used. Percentage analysis, Correlation analysis, and Binary Logistic Regression tests were performed.

Results: 79.4% of participants reported the presence of musculoskeletal discomfort in at least one body region, and the most frequent among them was lower back pain (LBP) with a percentage of 51.4%. Quantitative Demand, General Health, and Vitality displayed a significant relation with LBP. Posture analysis exhibited high bending angles.

Conclusion: Musculoskeletal discomfort complaints among young nurses disclosed an alarming prevalence. High work demand and frequently unfavorable postures contributed to the outcomes. Addressing the discomfort among young workers is of the utmost priority to ensure good health and forestall deteriorating symptoms in the future. Amelioration of work-related discomforts can lead to improved performance, enhanced job quality, and improved physical and mental health. As health sectors play a vital role in society and embrace a large number of young workers, assessing the workers' discomfort leads to a better and flourishing tomorrow led by healthier individuals.

Keywords: Health care sector, Musculoskeletal diseases, nurses, occupational health, occupational stress

Introduction

Musculoskeletal disorders (MSDs) include pain, discomfort, numbness, stiffness, and inflammation of nerves, muscles, bones, and related issues. In severe cases, degeneration in bones, joints, nerves, and muscles may occur with compression of nerves, reduced blood flow, swelling, and restricted and reduced movements. Work-related musculoskeletal disorders (WMSDs) received considerable scholarly attention in almost all working sectors. Concerning other workplaces, hospitals and nursing homes are expected to be more secure, but, in most instances, the conditions contradict the perception. Practically, hospitals and nursing

homes, as workplaces, can source various WMSDs.[1] Aggravation of these discomforts leads to absence from work, sick leave, and burnout. These in turn affect the overall productivity, organisational expenses and workers' well-being.[2]

Several factors can contribute to the onset and magnification of musculoskeletal discomfort. There is evidence from prior research linking musculoskeletal discomfort to morphological variables,[3] degree of physical activity,[4] and psychosocial aspects in the workplace.[5] Though individuals' morphological and genetic factors are unalterable, the biomechanical and psychosocial dimensions of the discomforts are amenable to intervention. Notably, young nurses in India have remained an underexplored demographic in this context, despite being critical to the country's growing healthcare sector. Assessing these risk factors of the discomfort is very crucial as there are multiple factors involved simultaneously, and among them, the age of the nurses appears to be an important factor to consider, as it was found that the prevalence of MSDs and areas of discomfort varies with age.[6,7] With the rising population and increased patient load, more young nurses were assigned to jobs in the health sector in India. In this study, the subjects have been chosen with work experience of less than 10 years, with the maximum age being 29 years.[8]

Prior research conducted worldwide has demonstrated that young nurses encounter a range of emotional stressors in the workplace, including bullying, blaming, intergenerational hostility, lack of respect, need to prove competence, etc.[9,10] As they are in their early decades of life, constant discomfort and underlying causes can affect their quality of life and can lead to persistent ailments in the future. This study seeks to explore the prevalence of WMSDs among young nurses in West Bengal, India, and to critically examine the multiple factors, ranging from physical activity and body posture to psychosocial elements at work, that contribute to their discomfort. These findings aim to inform interventions and policies that could mitigate the risks of WMSDs while enhancing the overall well-being and professional longevity of young nursing personnel.

The objectives of the study are to observe the prevalence of work-related musculoskeletal discomfort among young nursing personnel of West Bengal, India, and to assess the daily physical activity levels (PAL) of the young nursing population and their relation to musculoskeletal discomfort. Along with these, evaluation of the possible psychosocial factors relating to the musculoskeletal discomforts and analysis of the postures of the young nursing personnel while performing the tasks allotted were also the goals of this study.

Methods

This observational study cross-sectional in nature and was performed between August, 2020 to November 2022. The study was conducted in eleven hospitals in West Bengal, India, where female nursing personnel under the age of thirty were recruited. Appointments or hospital email IDs on official websites were used to contact hospital and nursing home administrators. After permission and introduction to the nursing staff, the research details were explained, and interested volunteers were recruited. Taking the confidence level of 95% with a 10% margin of error and a 50% population proportion, using Cochran's formula, the calculated sample size was 96. The sample size of the study was attained by randomly selecting and contacting 123 registered nursing personnel who were within the specified age range of this study. Among them, 4 nursing personnel were engaged in major patient and ward-related activities, and 119 participated in the study. Finally, 107 were selected, maintaining the inclusion criteria of the study. The inclusion criteria of this study were female registered nurses employed in different wards of hospitals and nursing homes, and with an age limit of 29 years. The exclusion criteria were nurses with histories of major accidents and injuries in the past, chronic musculoskeletal diseases, pregnancy, histories of recent major surgery, clinically diagnosed psychological

disorders, and having taken sick leaves of 7 days or more within the previous month from the day of the study.

The ethical clearance of the study was obtained from the Institutional Human Ethical Committee (IHEC) from the Department of Physiology, University of Calcutta in December, 2019 (IHEC/SM/P93/2019). Participants were given the consent forms at first, mentioning the particulars of the study and only the nurses who consented and approved the measures were taken to the procedures.

At first, the body height and weight of the subject were measured using an anthropometer (Martin's Anthropometer) and a weighing machine ("Crown" weighing Machine, Mfg. by Raymon Surgical Co.) and noted down along with the age of the subject. Modified Nordic Questionnaire,[11,12] Physical Activity Level (PAL) Questionnaire,[13,14] and Copenhagen Psychosocial Questionnaire (COPSOQ),[15] were used in this study. In the Modified Nordic Questionnaire, various body parts like neck, shoulder, elbow, hand, upper and lower back, thigh, knee, and feet were mentioned, and there was also a whole-body schematic diagram with approximate positions of the areas present in the questionnaire, which aided in better understanding. There were questions about the presence of pain or discomfort in any of the mentioned body parts in the questionnaire within the last 12 months and also within the last 7 days. Participants were asked to point out appropriate body areas with discomfort by tick-marking the checkboxes. As it emerged from previous studies that health sectors are workplaces with extensive workloads and responsibility, to assess their effects on nursing personnel, seven scales from the COPSOQ, Quantitative Demands, Cognitive Demands, Emotional Demands, Demands for Hiding Emotions, General Health, Mental Health, and Vitality were chosen for this study.[16,17] The Demand scales and General health scale questions had 5 options ranging from 0 to 100, where a score of 100 meant the highest response value or the highest level of the criteria being measured, and 0 was the lowest. The Mental Health and Vitality scale questions had 6 options ranging from 0 to 100, with the previous scoring manner. In the PAL questionnaire, various daily activities like sleeping, dressing, eating, domestic work, etc., were mentioned, and the subjects were asked to select the appropriate activities as per their daily chores and state the approximate duration of those specific works in a whole day of 24 hours duration.

After that, the most frequent activities of the nurses were noted down in various wards, and the subjects were asked to mention the tasks they found to be exhausting to perform or caused discomfort in body parts after performing. To observe the daily duties of the nurses, video recordings were done at different wards in different hospitals, maintaining the privacy of the patients and their family members. The nurses had to perform comparable tasks daily, but their workstations and task frequency varied between wards and hospitals. The video recordings were analyzed for the working posture of the nurses. The specific tasks were chosen from the recording, considering the highest frequency found and subjects' reports on discomfort. The frames were split and extracted from the videos for posture analysis, and the Rapid Entire Body Assessment (REBA) tool was used for the investigation.[18,1]

SPSS 23 version was used to analyze the data. Descriptive statistics were used to estimate the percentages of discomfort reports in different body areas, along with the age, body height, weight, Body Mass Index (BMI),[19] and PAL. Spearman's correlation was used to evaluate the relationship between work-related musculoskeletal discomfort with BMI and PAL categories. Binary logistic regression was used to assess the psychosocial factors. Locating the neck, trunk, legs, upper arm, lower arm, and wrist positions from the selected postures of the subjects and considering the other factors like force, coupling score, activity score, etc., the final REBA scores were calculated.

Results

The mean age of the participants was 25 years, and the mean height and weight were 156 cm and 57 kg, respectively (Table 1). According to the BMI classification,[20] 64.5% of participants belonged to the normal BMI category, 18.7% were overweight, and 8.4% of participants belonged to the underweight and obese categories each. Analysis of the PAL questionnaire depicted that 49.5% of subjects were in sedentary lifestyles, 46.7% in moderately active ones, and 3.7% in vigorously active lifestyles.

Table 1: Demographics of the subjects

Variables	Minimum	Maximum	Mean (SD)
Age (years)	20	29	25.21 (±2.69)
Height (cm)	130	172	156.18 (±6.29)
Weight (kg)	31	94	57.33 (±11.21)
BMI (kg/m^2)	15.52	35.38	23.44 (± 4.11)
PAL	1.45	2.38	1.71 (± 0.15)

In this present study, it was found that among the total participants (N=107), 79.4% of respondents reported the presence of musculoskeletal discomfort in at least one body region. The most frequently reported discomfort was in the lower back region, and 51.4% of subjects reported the discomfort since last year. Subjects with a percentage of 40.2% described that the lower back pain (LBP) prevented them from performing daily tasks, and 32.7% reported the presence of discomfort in the last week (Table 2).

Table 2: Percentage of subjects with discomfort in different body areas

Discomfort In Body Areas	Percentage of Participants (%)
Neck	
Since Last 12 Months	25.2
Prevented From Work	18.7
Last 7 Days	15.9
Shoulder	
Since Last 12 Months	22.4
Prevented From Work	14.0
Last 7 Days	14.0
Elbow	
Since Last 12 Months	2.8
Prevented From Work	1.9
Last 7 Days	0.9
Wrist/ Hand	
Since Last 12 Months	11.2
Prevented From Work	8.4
Last 7 Days	8.4

Upper Back	
Since Last 12 Months	14.0
Prevented From Work	13.1
Last 7 Days	12.1
Lower Back	
Since Last 12 Months	51.4
Prevented From Work	40.2
Last 7 Days	32.7
Hip/Thigh	
Since Last 12 Months	15.9
Prevented From Work	10.3
Last 7 Days	12.1
Knee	
Since Last 12 Months	20.6
Prevented From Work	15.9
Last 7 Days	16.8
Ankle	
Since Last 12 Months	20.6
Prevented From Work	15.9
Last 7 Days	15.0

With BMI and PAL, musculoskeletal discomforts revealed nonsignificant correlations here with r_s values of 0.054 and -0.092 with p values of 0.584 and 0.343, respectively.

As LBP was found to be the most recurrent one, the subjects were categorized into two groups, with the presence and absence of symptoms. The distribution of subjects' responses on the COPSOQ scales taken in the study was presented individually in Figure 1. For each scale response, subjects with and without LBP were depicted discretely.

In binary logistic regression, seven psychosocial factors from COPSOQ analysis were incorporated as independent variables and the LBP as the dependent variable. The full model containing all the predictors was statistically significant with $\chi 2(7, N=107) = 48.713$, $p < .001$. In this model, the Cox & Snell R Square value was 0.366, and the Nagelkerke R Square value was 0.488. Quantitative Demand, General Health, and Vitality showed statistically significant influence on the model. In the case of Quantitative Demand, the OR value was 1.074. (Table 3).

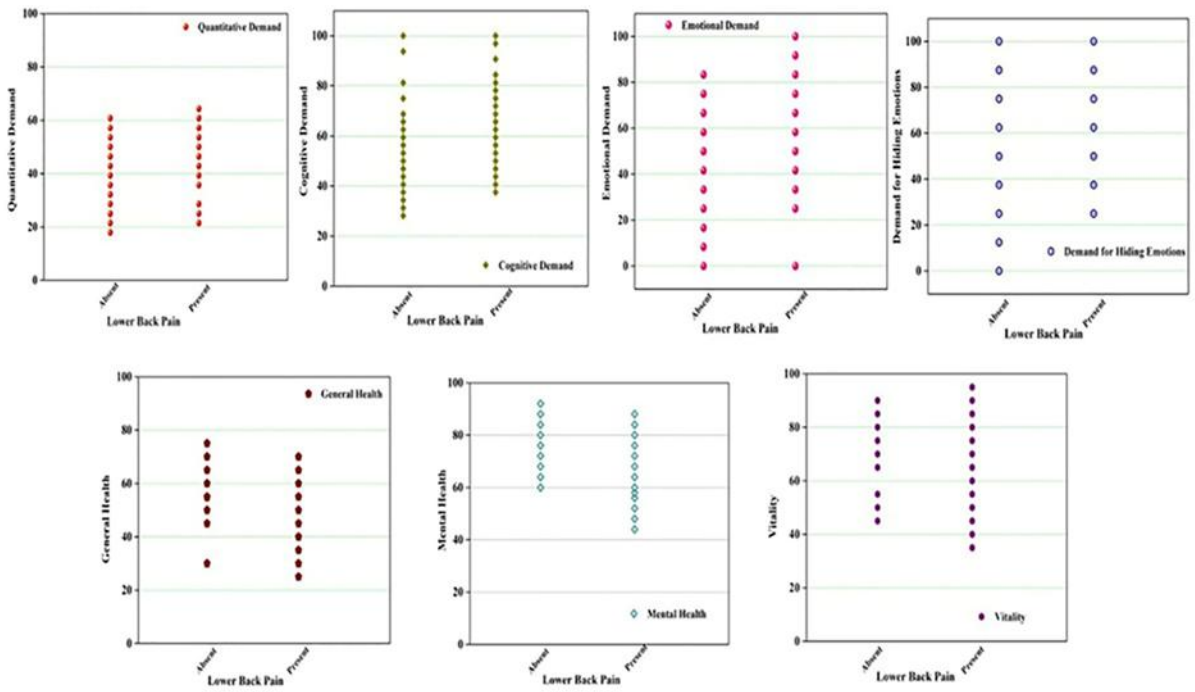


Figure 1: Distribution of individual scales of COPSOQ with the LBP reports

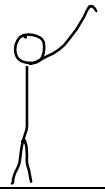
Table 3: Logistic regression model of LBP with scales of COPSOQ

	B	S.E.	Wald	df	p	OR	95% CI for OR	
							Lower	Upper
Quantitative Demand	.071	.027	7.064	1	.008	1.074	1.019	1.132
Cognitive Demand	.038	.020	3.492	1	.062	1.038	.998	1.080
Emotional Demand	-.007	.016	.181	1	.670	.993	.963	1.025
Demand for Hiding Emotions	.003	.014	.053	1	.817	1.003	.976	1.031
General Health	-.070	.034	4.271	1	.039	.933	.873	.996
Mental Health	.046	.035	1.708	1	.191	1.047	.977	1.122
Vitality	-.047	.023	4.154	1	.042	.954	.912	.998
Constant	-1.526	2.808	.295	1	.587	.217		

S.E.= Standard Error, OR= Odds Ratio

Most frequent and fatiguing daily activities were inspected, reviewed, and assessed with the REBA tool. Tasks with low REBA scores were eliminated, and only tasks with medium and high-risk levels were taken into further analysis. In Table 4, the eight tasks with long duration or high frequency and high REBA scores were mentioned with the scoring and stick diagrams of the postures.

Table 4: Working posture analysis using the REBA tool

Serial No.	Figure	Assessment	Task Description	Neck Score	Trunk Score	Legs Score	Upper Arm Score	Lower Arm Score	Wrist Score	REBA Score
Task 1		Long Duration	Holding and supporting the patient in maintaining an upright seated posture during a meal	1	**4**	1	**5**	1	3	**9**
Task 2		Long Duration	Pulling the patient's bed by rotating the lever handle	1	**5**	2	2	1	2	**7**
Task 3		Long Duration	The procedure of Ryles tube feeding	2	1	1	**4**	1	2	4
Task 4		Long Duration	Writing on a table during the duty handover	2	2	2	1	1	2	5
Task 5		High Frequency	Arranging instruments and medicines on a table	1	**4**	1	2	1	1	4
Task 6		High Frequency	Arranging instruments on a shelf	2	2	2	**4**	1	1	**7**
Task 7		High frequency	Administering an injection	2	2	1	2	1	**3**	4
Task 8		High Frequency	Changing the saline bottle	2	1	1	**4**	1	1	4

Discussion

In this study, all the subjects (N=107) were in their first few years of working life. They were a young platoon of workers with ages below 30 years and with a mean age of 25 years. In this study, 64.5% of subjects had normal BMI, and 18.7% were overweight. In both the underweight and obese categories, there were 8.4% of subjects. Almost half of the subject population were in sedentary lifestyles, with only 3.7% in vigorously active ones and 46.7% in moderate levels. Among them, 79.4% of participants reported musculoskeletal discomfort in at least one body region. The most prevalent one among them was LBP with a percentage of 51.4%. Discomfort in the neck, shoulder, knee, and ankle constituted percentages of 25.2%, 22.4%, 20.6%, and 20.6%, respectively. This present study is supported by the findings of Yasobant and Rajkumar (2014), who depicted young health workers with a greater chance of developing musculoskeletal discomfort [21]. In the study by Heiden et al. (2013), age groups exhibited disparities in MSDs complaints among nurses. From young to old, MSD incidence increased, as did physical discomfort [22]. As this present study showed a considerable percentage of young workers facing musculoskeletal discomfort, and prior studies demonstrated age-related symptom prevalence [22], there is an invariable likelihood of worsening discomfort with advancing age. Nurses reported the extent of discomfort and their outlook, and when discussing the presence of discomfort with them, the following responses were found.

"After the night duty, I feel pain in the waist area and legs."

"It happens sometimes that the patient is so critical we don't have the chance to sit"

"Sometimes the pain hurts, but what I am doing is of greater importance. This helps me go."

In this study, work-related musculoskeletal discomforts showed a non-significant correlation with BMI and PAL. While some researchers [6], contrary to this present study, have linked BMI to an increased risk of MSDs, other studies [23] have found that other work-related factors, such as posture and hours worked, have a more substantial impact than BMI. In this study, PAL showed a non-significant relationship with the presence of work-related musculoskeletal discomfort. However, it is important to highlight that 49.5% of the participants of this study led sedentary lifestyles, and 46.7% of the subjects were moderately active. Some research showed the beneficial effect of recommended physical activity on reducing discomfort symptoms [24] while others showed aggravation of symptoms with work-related physical activity [25]. Since earlier studies showed contradictory results and this study found a non-significant correlation between PAL and symptoms, yet 79.4% of musculoskeletal discomfort was found in the present study, more research is needed to recognize the causal factors here.

As LBP was found to be the most prevalent discomfort among the others, the contribution of different psychosocial factors was assessed here, taking LBP as the dependent variable. In binary logistic regression, seven factors from COPSOQ were incorporated as independent variables. The full model containing all the predictors was statistically significant with $\chi 2(7, N=107) = 48.713$, $p < .001$. The model as a whole explained between 36.6% (Cox & Snell R Square) to 48.8% (Nagelkerke R Square) of the variance in LBP and classified correctly in 81.3% of cases. Three predictors, Quantitative Demand, General

Health, and Vitality, showed a statistically significant influence on the model. Quantitative Demand showed the strongest contribution with OR 1.074. This 'Quantitative Demand' scale reflects the problem-oriented dimension of a workplace and imparts information about the tasks workers must perform. This study reinforced the study performed by Choobineh et al. (2010), where operating room (OR) nurses depicted a very high physical and mental demand. Activities of direct material handling were found to be associated with reported symptoms.[26,27] During the interview process, several questions were asked. Some examples of the responses have been highlighted. To the questions of COPSOQ, "Do you have to work very fast?" and "Do you have to keep your eyes on lots of things while you work?" the following types of responses were found in most cases, respectively.

"Most of the time, I have to work fast, depending upon the work pressure in the ward."

"We must check various aspects during duty hours. There are different types of patients with different needs. We must cater to everything and act according to the individual needs of each patient."

In this study, General Health and Vitality showed a negative association with LBP, which was analogous to previous studies where LBP was found to be positively associated with poor general health and could also alter the quality of life.[28,29]

As the nursing personnel had to perform wearing tasks during their entire working hours and the effects of some distinct activities could impact their health, the tasks performed by them were evaluated thoroughly using the REBA tool. The tasks scored 2 to 3 were designated as the low-risk tasks and removed from the analysis. Tasks scored 4 and above were selected for evaluation. Eight tasks were taken here and represented in Table 4. Among the activities taken into consideration, multiple tasks showed difficult posture scores with side bending or twisting and high bending angles (Table 4). The neck score of 2 depicted >20° flexion to the front. Trunk score ≥ 4 depicted forward flexion of >60°, and in the case of score 5, there was the twisting or side-bending posture. The upper arm score with a score of 4 showed a 90° upward position, and the score of 5 added the condition of raised shoulders in the posture. Wrist score 2 showed 15° up and downward movement, and with a score of 3, there was a side-bent wrist position. Twisted and bent postures for an extended period were able to cause pain and discomfort in musculoskeletal areas, which may lead to work-related musculoskeletal discomfort. These findings were supported by a study performed by Asghari et al. (2019) on nurses showing frequent and prolonged bending postures of the neck and trunk, and the type of task they performed demanded that the participants maintain those positions for a long time.[30] Sagittal inclinations ranging from 0° to 20° are in an acceptable range and are categorised as erect postures. In this position, the pressure on the spinal disc is minimal. It rises in tandem with increasing sagittal inclination. Sagittal inclinations ranging from 20° to 60° are deemed conditionally permissible, while those exceeding 60° are considered unacceptable. Nurses were subjected to complex and often risk-prone tasks, with varying percentages of time spent in extreme positions according to their wards. Studies unveiled that varied degrees of trunk forward bending are associated with LBP reports.[31] Patient transfer is merely one of the numerous responsibilities that comprise nurses'

daily work; they spend a significant portion of their workday on duties that do not involve direct patient contact.[32] Sagittal inclinations exceeding a 60° angle were most frequently induced by bed making (22%), tidying up/cleaning (16%), and basic care chores (16%).[32] However, among the 8 tasks evaluated here, only 3 tasks showed trunk scores ≥4, which depicted forward flexion of >60° with side bending and twisting. Although the largest proportion of study participants reported LBP, REBA analysis revealed concerning scores in other body regions as well, including the upper arm, wrist, neck, and so forth, alongside the trunk.

In another study, it was found that a large number of nurses reported that they had their first symptoms of work-related musculoskeletal discomfort in the first five years of their work life.[33] This was surely an important issue to discuss, as a vast number of workers reported the onset of symptoms at a young age. Though it was discussed previously that the frequency and aggravation of discomfort symptoms increase with age in nursing staff, contradictory findings also surfaced. After the age of 50 years and with 20 or more years of service, the prevalence of work-related musculoskeletal discomfort reports weakened.[33] According to previous research, it is possible that in very senior nursing personnel, there were fewer patient handling duties and amplified administrative work, also, they might avoid damaging work tasks or exhausting physical loads, and had better knowledge and experiences of injury prevention and coping strategies and were more used to with getting more staffs and supports to conduct an injurious workload, handling patients, executing alteration of procedures and positions of patients to dodge an injury or re-injury.[33] As the young group of nursing workers was assumed to be called for most of the vigorous tasks that emerged, their responses here could be enlightening in this aspect. To the question of the Modified Nordic Questionnaire, "Have you at any time during the last 12 months been prevented from doing your normal work because of the trouble?" the following responses were found.

"When there is a need for long-duration tasks to be performed, we are asked for."

"Some critical patients need repeated inspection, and some ask for the nurses repeatedly. We go and check them mostly. It happens."

According to studies, awkward working postures, stressful task demands, inadaptable work methods, and faulty workstation designs can lead to discomfort and incapability, which in turn leads to psychosocial stress, a shortfall in competition, and difficulty in matching the demand, which can again play some vital roles in the aggravation of physical symptoms.[34-37] This flawed loop must be broken to improve the overall physical and mental health of workers. This study sheds some light on the incidence of work-related musculoskeletal discomfort and the work-related factors responsible for young nursing workers in the health sectors of India.

Given the focus of this research on young nurses' musculoskeletal discomfort and the possible determinants of symptoms' onset and severity, addressing the underlying causes is advisable. Many studies illustrate the implementation of diverse preventive measures for nursing personnel to decrease the prevalence of symptoms.[38,39]

Multiple considerations might be taken into account when proposing safety measures like reducing the workload on each nurse, allocating the workload more equitably, increasing the

workforce, ergonomics and safety training, educating the nurses on the detrimental effects of MSDs, advocating for their willingness to disclose their discomfort without apprehension of criticism or harassment and finally consistent follow-up by the management.[40-42]

This study contributes to the growing body of research on the social and occupational health of young working nurses, a demographic often overlooked in existing literature. The findings provide a platform for interdisciplinary debate, opening avenues for future studies at the intersection of sociology, health policy, and workplace ergonomics. Given the increasing reliance on young nurses in India's growing healthcare sector, these insights hold significant implications for policymakers, healthcare administrators, and scholars in the fields of social health and labor studies. This study contributed to designating some probable causal factors for MSDs among this population (Figure 2).

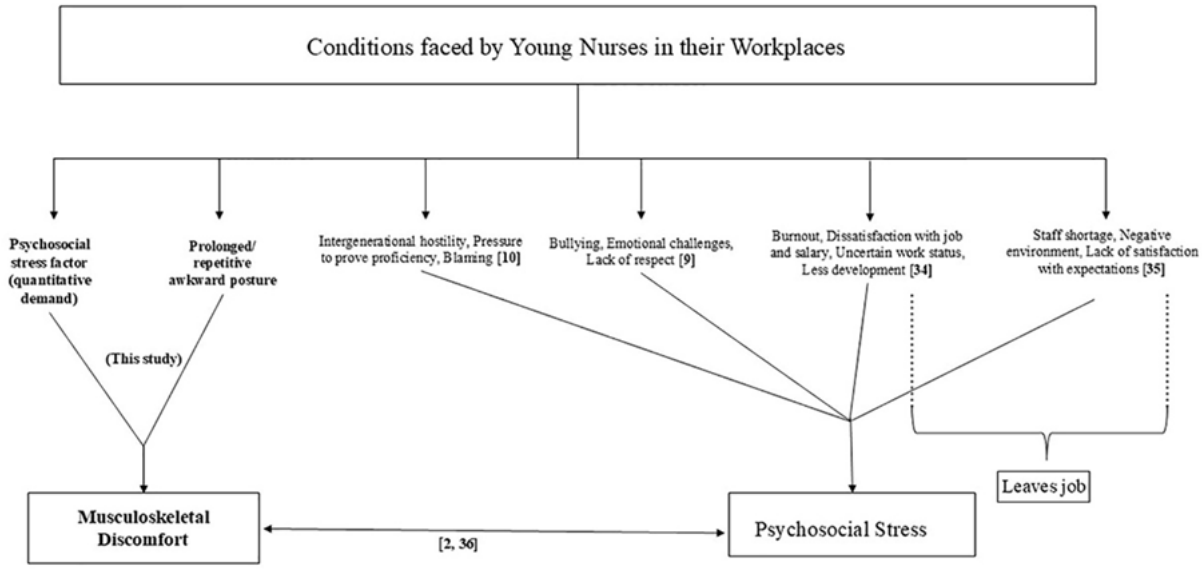


Figure 2: The contribution of this study to the evaluation of the circumstances faced by young nurses in workplaces

Conclusion

Musculoskeletal discomforts, with LBP being the most prevalent, were reported by a significant proportion of young nurses under the age of thirty. The musculoskeletal symptoms of nursing personnel may be adversely affected by increased quantitative demand and frequent injurious working postures associated with general nursing duties. The hindrance of a nurse's ability to perform due to discomfort symptoms can lead to a significant decline in the efficiency of health resources. Beyond the individual experience of pain and discomfort, these conditions have systemic implications for the healthcare sector, where the diminished functional capacity of nurses can lead to inefficiencies and increased strain on already overburdened health systems. It is necessary to conduct more detailed investigations to alleviate the symptoms, as the number of young nurses entering the health industry continues to rise. This research underscores the need for a more integrated approach to workplace health—one that critically considers not only ergonomic interventions but also the underlying social and institutional structures that shape the working conditions of young nurses. Future studies

should adopt a broader sociocultural lens to investigate how structural and policy-level factors influence the well-being of young healthcare professionals.

Acknowledgement

The authors would also like to thank all participants and hospital authorities for their kind cooperation.

References

1. Chowdhury U, Das T, Mazumder S, Gangopadhyay S. Low back pain among hospital nurses: the interplay of underlying factors. Indian J Physiol Allied Sci. 2024;76(3):66-74. Available from: https://doi.org/10.55184/ijpas.v76i03.297
2. Boden LI, Biddle EA, Spieler E A. Social and economic impacts of workplace illness and injury: current and future directions for research. Am. J. Ind. Med. 2001;40(4):398-402. Available from: https://doi.org/10.1002/ajim.10013
3. Heuberer PR, Plachel F, Willinger L, Moroder P, Laky B, Pauzenberger L, et al. Critical shoulder angle combined with age predict five shoulder pathologies: a retrospective analysis of 1000 cases. BMC Musculoskelet Disord. 2017;18:1-9. Available from: https://doi.org/10.1186/s12891-017-1559-4
4. Serra MVGB, Camargo PR, Zaia JE, Tonello MGM, Quemelo PRV. Effects of physical exercise on musculoskeletal disorders, stress and quality of life in workers. Int J Occup Saf Ergon. 2018;24(1):62-7. Available from: https://doi.org/10.1080/10803548.2016.1234132
5. Du J, Zhang L, Xu C, Qiao J. Relationship between the exposure to occupation-related psychosocial and physical exertion and upper body musculoskeletal diseases in hospital nurses: a systematic review and meta-analysis. Asian Nurs Res. 2021;15(3):163-73. Available from: https://doi.org/10.1016/j.anr.2021.03.003
6. Alias AN, Karuppiah K, How V, Perumal V. Prevalence of musculoskeletal disorders (MSDS) among primary school female teachers in Terengganu, Malaysia. Int J Ind Ergon. 2020;77:102957. Available from: https://doi.org/10.1016/j.ergon.2020.102957
7. Mahajan D, Gupta M K, Mantri N, Joshi NK, Gnanasekar S, Goel AD, et al. Musculoskeletal disorders among doctors and nursing officers: an occupational hazard of overstrained healthcare delivery system in western Rajasthan, India. BMC Musculoskelet Disord. 2023;24(1):1-10. Available from: https://doi.org/10.1186/s12891-023-06457-z
8. Karan A, Negandhi H, Hussain S, Zapata T, Mairembam D, De Graeve H, et al. Size, composition and distribution of health workforce in India: why, and where to invest? Hum Resour Health. 2021;19:1-14. Available from: https://doi.org/10.1186/s12960-021-00575-2
9. Clendon J, Walker L. 'Being young': a qualitative study of younger nurses' experiences in the workplace. Int Nurs Rev. 2012;59(4):555-61. Available from: https://doi.org/10.1111/j.1466-7657.2012.01005.x
10. Anderson LB, Morgan M. An examination of nurses' intergenerational communicative experiences in the workplace: Do nurses eat their young? Commun Q. 2017;65(4):377-401. Available from: https://doi.org/10.1080/01463373.2016.1259175
11. Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon. 1987;18(3):233-7. Available from: https://doi.org/10.1016/0003-6870(87)90010-X
12. Dickinson CE, Campion K, Foster AF, Newman SJ, O'rourke AMT, Thomas PG. Questionnaire development: an examination of the Nordic Musculoskeletal questionnaire. Appl Ergon. 1992;23(3):197-201. Available from: https://doi.org/10.1016/0003-6870(92)90225-K
13. Raustorp A, Pangrazi RP, Ståhle A. Physical activity level and body mass index among schoolchildren in south-eastern Sweden. Acta Paediatr. 2004;93(3):400-4. Available from: https://doi.org/10.1111/j.1651-2227.2004.tb02969.x
14. United Nations University, World Health Organization. Human Energy Requirements: Report of a Joint FAO/WHO/UNU Expert Consultation: Rome, 17-24 October 2001 (Vol. 1).

Food & Agriculture Org. 2004. Available from: https://www.semanticscholar.org/paper/Human-energy-requirements-%3A-report-of-a-Joint-FAO-%3A-Fao/5ad71334e77b374be3c28692fd86ee2ed1cf91bb

15. Kristensen TS, Hannerz H, Høgh A, Borg V. The Copenhagen Psychosocial Questionnaire-a tool for the assessment and improvement of the psychosocial work environment. Scand J Work Environ Health. 2005;31(6):438-49. Available from: https://www.jstor.org/stable/40967527
16. Kaliniene G, Ustinaviciene R, Skemiene L, Vaiciulis V, Vasilavicius P. Associations between musculoskeletal pain and work-related factors among public service sector computer workers in Kaunas County, Lithuania. BMC Musculoskelet Disord. 2016;17(1):1-12. Available from: https://doi.org/10.1186/s12891-016-1281-7
17. Yue P, Xu G, Li L, Wang S. Prevalence of musculoskeletal symptoms in relation to psychosocial factors. Occup Med. 2014;64(3):211-6. Available from: https://doi.org/10.1093/occmed/kqu008
18. Hignett S, McAtamney L. Rapid entire body assessment (REBA). Appl Ergon. 2000;31(2):201-5. Available from: https://doi.org/10.1016/S0003-6870(99)00039-3
19. Poskitt EME. Body mass index and child obesity: are we nearing a definition? Acta Paediatr. 2000;89(5):507-9. Available from: https://doi.org/10.1111/j.1651-2227.2000.tb00327.x
20. World Health Organization. The Asia-Pacific perspective: redefining obesity and its treatment. 2000. Available from: https://iris.who.int/items/a74d8440-5c1d-4237-9559-3f729058587b
21. Yasobant S, Rajkumar P. Work-related musculoskeletal disorders among health care professionals: A cross-sectional assessment of risk factors in a tertiary hospital, India. Indian J Occup Environ Med. 2014;18(2):75. Available from: https://pubmed.ncbi.nlm.nih.gov/25568602/
22. Heiden B, Weigl M, Angerer P, Müller A. Association of age and physical job demands with musculoskeletal disorders in nurses. Appl Ergon. 2013;44(4):652-8. Available from: https://doi.org/10.1016/j.apergo.2013.01.001
23. Thamrin Y, Pasinringi S, Darwis AM, Putra IS. Relation of body mass index and work posture to musculoskeletal disorders among fishermen. Gac Sanit. 2021:35:S79-82. Available from: https://doi.org/10.1016/j.gaceta.2020.12.022
24. Nawrocka A, Niestrój-Jaworska M, Mynarski A, Polechoński J. Association between objectively measured physical activity and musculoskeletal disorders, and perceived work ability among adult, middle-aged and older women. Clin Interv Aging. 2019;14:1975-83. Available from: https://doi.org/10.2147%2FCIA.S204196
25. Abazari M, Karimi A, Babaei-Pouya A. Evaluation of Musculoskeletal Disorders and Level of Work Activity in Staff of the Public Educational Hospital of Iran, 2019. Malays J Med Health Sci. 2020;16(1):137-43. Available from: https://www.researchgate.net/publication/338671043_Evaluation_of_Musculoskeletal_Disorders_and_Level_of_Work_Activity_in_Staff_of_the_Public_Educational_Hospital_of_Iran_2019
26. Sarkar K, Dev S, Das T, Chakrabarty S, Gangopadhyay S. Examination of postures and frequency of musculoskeletal disorders among manual workers in Calcutta, India. Int J Occup Environ Health. 2016;22(2):151-8. Available from: https://doi.org/10.1080/10773525.2016.1189682
27. Choobineh A, Movahed M, Tabatabaie SH, Kumashiro M. Perceived demands and musculoskeletal disorders in operating room nurses of Shiraz city hospitals. Ind Health. 2010;48(1):74-84. Available from: https://doi.org/10.2486/indhealth.48.74
28. Hestbaek L, Leboeuf-Yde C, Manniche C. Is low back pain part of a general health pattern or is it a separate and distinctive entity? A critical literature review of comorbidity with low back pain. J Manip Physiol. Ther. 2003;26(4):243-52. Available from: https://doi.org/10.1016/S0161-4754(03)00003-4
29. Nasution IK, Lubis NDA, Amelia, Hocin K. The correlation of pain intensity and quality of life in chronic LBP patients in Adam Malik general hospital. IOP Conf. Ser: Earth Environ Sci. 2018;125(1):012183. Available from: https://doi.org/10.1088/1755-1315/125/1/012183
30. Asghari E, Dianat I, Abdollahzadeh F, Mohammadi F, Asghari P, Jafarabadi MA, et al.

Musculoskeletal pain in operating room nurses: associations with quality of work life, working posture, socio-demographic and job characteristics. Int J Ind Ergon. 2019;72:330-7. Available from: https://doi.org/10.1016/j.ergon.2019.06.009

31. Nourollahi M, Afshari D, Dianat I. Awkward trunk postures and their relationship with low back pain in hospital nurses. Work. 2018;59(3):317-23. Available from: https://doi.org/10.3233/wor-182683
32. Freitag S, Ellegast R, Dulon M, Nienhaus A. Quantitative measurement of stressful trunk postures in nursing professions. Ann Occup Hyg. 2007;51(4):385-95. Available from: https://doi.org/10.1093/annhyg/mem018
33. Tinubu B, Mbada CE, Oyeyemi AL, Fabunmi AA. Work-related musculoskeletal disorders among nurses in Ibadan, South-west Nigeria: a cross-sectional survey. BMC Musculoskelet Disord. 2010;11(1):1-8. Available from: https://doi.org/10.1186/1471-2474-11-12
34. Flinkman M, Laine M, Leino-Kilpi H, Hasselhorn HM, Salanterä S. Explaining young registered Finnish nurses' intention to leave the profession: a questionnaire survey. Int J Nurs Stud. 2008;45(5):727-39. Available from: https://doi.org/10.1016/j.ijnurstu.2006.12.006
35. Çamveren H, Arslan Yürümezoğlu H, Kocaman G. Why do young nurses leave their organization? A qualitative descriptive study. Int Nurs Rev. 2020;67(4):519-58. Available from: https://doi.org/10.1111/inr.12633
36. Lang J, Ochsmann E, Kraus T, Lang JW. Psychosocial work stressors as antecedents of musculoskeletal problems: a systematic review and meta-analysis of stability-adjusted longitudinal studies. Soc Sci Med. 2012;75(7):1163-74. Available from: https://doi.org/10.1016/j.socscimed.2012.04.015
37. Chowdhury U, Das T, Mazumder S, Gangopadhyay S. A Study On The Interrelationship Of Musculoskeletal Symptoms With Job Demands And Job Content: A Cross-Sectional Study On Nurses. J Hum Ergol. 2023;52(1-2):14-22. Available from: https://cir.nii.ac.jp/crid/1390581954004998400
38. Abdollahi T, Pedram RS, Pahlevan D, Yekaninejad MS, Amaniyan S, Leibold SC. Effect of an ergonomics educational program on musculoskeletal disorders in nursing staff working in the operating room: A quasi-randomized controlled clinical trial. Int J Environ Res Public Health. 2020;17(19):7333. Available from: https://doi.org/10.3390/ijerph17197333
39. Szeto GPY, Law KY, Lee E, Lau, T, Chan SY, Law SW. Multifaceted ergonomic intervention programme for community nurses: pilot study. J Adv Nurs. 2010;66(5):1022-34. Available from: https://doi.org/10.1111/j.1365-2648.2009.05255.x
40. Chowdhury U, Das T, Mazumder S, Gangopadhyay S. Work-Related Musculoskeletal Disorders and Mental Health among Nursing Personnel in the Context of COVID-19 Pandemic in West Bengal, India. Int j occup saf Health. 2023;13(2):234–44. Available from: https://doi.org/10.3126/ijosh.v13i2.47775
41. Karki P, Joshi YP, Khanal SP, Gautam S, Paudel S, Karki R et al. Prevalence and Factors Associated with Occupational Musculoskeletal Disorders among the Nurses of a Tertiary Care Center of Nepal. Int j occup saf health. 2023;13(3):375–85. Available from: https://doi.org/10.3126/ijosh.v13i3.51792
42. Mohamed Z, Al-Natour M. The Impact of Physical and Psychological Job Demands on Nurses' Work-Related Low Back Pain: A Systematic Review and Meta-analysis. Int j occup saf health. 2024;14(4):576–91. Available from: https://doi.org/10.3126/ijosh.v14i4.61329