

RISK ASSESSMENT OF MUSCULOSKELETAL DISORDERS IN NURSES USING THE WERA QUESTIONNAIRE

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Abstract

Introduction: Ergonomic factors are one of the most significant factors that occur in various specific work processes in the healthcare sector and different workplaces, resulting in side effects on health workers' health.

Aim: The aim of this study was to present a risk assessment of musculoskeletal disorders in nurses using the WERA questionnaire for ergonomic risk assessment at the workplace.

Materials and methods: A total of 160 nurses in three categories (primary, secondary, and dentistry fields) were surveyed. This study employed the Standard Nordic questionnaire for analyzing musculoskeletal symptoms and the WERA questionnaire for ergonomic risk assessment at the workplace.

Results: According to the results of the WERA questionnaire, 57.5% of nurses had a moderate degree of risk that required corrective measures, and 30% had a high level of risk that was unacceptable and required immediate improvements. Musculoskeletal issues occurring within the last 12 months were most common in the lower back (63.8%), neck (32.5%), and knees (24.9%). Musculoskeletal problems in the recent seven days were most common in the lower back, found in 40.6% of nurses.

Conclusion: Overall, based on the outcomes of this study, there is a need for the establishment of relevant ergonomic programs for professional prevention of the occurrence of musculoskeletal disorders in nurses.

Keywords: ergonomics, musculoskeletal disorders, nurses

Introduction

It is known that healthcare workers are exposed to a high risk of developing musculoskeletal disorders (MSDs). It is estimated that almost one-third of all cases of sickness among healthcare workers are related to MSDs^[1]. In their daily work activities, doctors, dentists, nurses, physiotherapists, and other health professionals and associates face cumulative traumas and continuous loads that lead to chronic diseases and musculoskeletal disorders^[2].

According to a study published in the International Journal of Occupational Safety and Ergonomics in South Korea (93.6%), Australia (92.6%) and Japan (78.4%) of nurses suffer from MSDs^[3]. In the USA, paramedics are in the second place, and nurses are in the fifth place on the list of ten professions with the highest risk of MSDs; and an average of 20 billion dollars are

spent annually on direct medical costs (illnesses), and 100 billion dollars on indirect costs (reduced or lost work ability)^[4].

MSDs affect body movements, causing damage or dysfunction of nerves, tendons, muscles, cartilage, spinal discs, and joints. Due to the cumulative effect and degenerative progressive changes of the connective tissue, there is discomfort, tingling, pain and stiffness, mainly in the back, herniation of the spinal discs, and alterations in the bone-joint structures of the arms, shoulders, and knees^[5].

The health sector plays a significant socioeconomic role in many countries. Providing better, higher quality and more organized health care can have a significant impact not only on patients but also on the socioeconomic development of countries^[6].

Within those frameworks, the role of ergonomics in healthcare is significant, which enables the design of an appropriate workplace layout^[7], a healthy work environment (managing workload, shortage of health personnel, and provision of quality health care)^[8]; equipping with interactive medical devices^[9]; reduction of work-related psychological stress^[10]; minimizing treatment errors^[11], and increasing patient safety^[12,13].

Risk factors for healthcare workers (such as significant straining during manipulation of patients and other heavy loads, incorrect body posture, standing and sitting for long periods, poorly designed workplace, emotional strain, workplace stress, overtime work, work in shifts, night work, etc.) lead to the development of cumulative injuries that increase the risk of musculoskeletal disorders^[14].

Considering the broad spectrum of adverse work-related health consequences, there is a pressing need to streamline the entire healthcare process to enable the implementation of ergonomically proven measures^[15]. The goal is to improve the health standards of health workers by implementing a holistic strategy built on the principles of ergonomics^[16].

In the modern era, the main interest of ergonomics is to reduce work-related stress in order to avoid unwanted health-related consequences^[17].

Aim of the study

The aim of this study was to present the risk assessment of musculoskeletal disorders in nurses from primary, secondary, and dental fields by applying the WERA questionnaire for ergonomic risk assessment in the workplace.

Materials and method

This is a descriptive-analytical cross-sectional study, which included 160 nurses divided into three groups. The first group consisted of 80 nurses from the primary field, the second group of 40 nurses from the secondary field, and the third group of 40 nurses from the dental field. The study was conducted in public and private healthcare facilities from September 2020 to June 2022.

Data in the current study were obtained by employing a questionnaire for the analysis of musculoskeletal symptoms and a questionnaire for work ergonomic risk assessment.

Analysis of musculoskeletal symptoms - a standardized Nordic questionnaire was used for the analysis of musculoskeletal symptoms (Standardized Nordic questionnaires for the study of musculoskeletal symptoms, Kourinka *et al.* 1987)^[18].

Work Ergonomic Risk Assessment - the Work Ergonomic Risk Assessment (WERA) was developed in order to provide a method of rapid screening the work tasks where there is exposure to a physical risk factor and association with the occurrence of work-related

musculoskeletal disorders [19],[20]. This instrument (WERA- Work Ergonomic Risk Assessment) includes six physical risk factors (body position when performing work tasks, repetitive movements, strain and heavy lifting, vibration exposure, stress contact when using hand tools, and duration of work tasks) and includes the five primary body parts (shoulder, wrist, back, neck, and leg)^[19,20].

The obtained data were statistically analyzed with the SPSS 26.0 program. Continuous variables are expressed as mean values with standard deviation, and nominal variables as absolute numbers and percentages.

Results

In this study, a total of 160 nurses from primary, secondary, and dental fields were included.

The results of the first part of the standard Nordic questionnaire refer to the analysis of the demographic characteristics of gender, age, education, BMI (Body Mass Index), and number of smokers.

Regarding gender, female respondents were prevalent with a total of 151 (94.4%). The mean age was 46.7 ± 11.08 years with a min/max age of 20/63. Most respondents have secondary education 124 (77.5%). BMI had an average value within the limits of normal nutrition (24.4). The number of non-smokers, 106 (66.3%), was higher than the number of smokers. Regarding the demographic characteristics, no significant difference was determined for $p > .05$ (Difference test) between the three groups of respondents.

Table 1 shows the results of the job characteristics (work experience at the current job, total work experience, shift work, number of working hours during a week), which are an initial part of the standardized Nordic questionnaire.

Table 1. Job characteristics (work experience at the current job, total work experience, shift work, night shift work, number of working hours during a week)

Job Characteristics	Nurses (N=160)	Nurses Primary field (N=80)	Nurses Secondary field (N=40)	Nurses Dental field (N=40)	
Years of experience in current position	12.8 +/-6.46	11.5+/-3.59	18.6+/-9.2	9.6+/-3.21	NS
Total years of experience	21.4+/-11.04	22.2+/-11.09	21.2+/-11.16	19.7+/-10.89	NS
Shift work					
One shift	61(38.1%)	37(46.2%)	24(60%)	0(0%)	NS
Two shifts	99(61.9%)	43(53.8%)	16(40%)	40(100%)	NS
Total number of working hours per week					
<40	4(2.5%)	2(2.5%)	1(2.5%)	1(2.5%)	NS
40	110(68.7%)	52(65%)	30(75%)	28(70%)	NS
>40	46(28.8%)	26(32.5%)	9(22.5%)	11(27.5%)	NS

Numerical data are expressed as mean values with standard deviations; frequencies as the number and percentage of respondents, $p > .05$ (Difference test)

The average years of experience of nurses in current position was 12.8 ± 6.46 years. The nurses from the secondary field had the longest working experience in the current position (18.6 ± 9.2), but no significant difference was registered in relation to other activities for $p > .05$.

The average total working experience was 21.4 ± 11.04 years, and there was no significant difference in all three groups for $p > .05$. A significantly larger number of respondents worked in two shifts, 99 (61.9%). All dental nurses worked in two shifts. None of the respondents was working night shift. Most respondents, 110 (68.7%), worked 40 hours a week, and 46 (28.8%) worked longer than 40 hours a week. According to the number of working hours per week, there was no significant difference between the groups for $p > .05$.

Table 2. Musculoskeletal symptoms (pain, discomfort, stiffness) in the last 12 months, i.e., seven days, and whether in the previous 12 months, there was a limitation in performing regular physical activities at work or home

Nordic questionnaire	Nurses (N=160)	Nurses Primary field (N=80)	Nurses Secondary field (N=40)	Nurses Dental field (N=40)	(p)
<i>Pain, discomfort, and stiffness in the last 12 months</i>					
Neck	52(32.5%)	26(32.5%)	12(30.0%)	14(35.0%)	NS
Shoulders	25(15.6%)	14(17.5%)	6(15.0%)	5(12.5%)	NS
Elbow	10(6.2%)	6(7.5%)	2(5.0%)	2(5.0%)	NS
Wrists / Hands	31(19.4%)	16(20.0%)	7(17.5%)	8(20.0%)	NS
Upper Back	42(26.2%)	21(26.3%)	10(25.0%)	11(27.5%)	NS
Low Back	102(63.8%)	52(65.0%)	25(62.5%)	25(62.5%)	0.0000
Hips	24(15.0%)	12(15.0%)	6(15.0%)	6(15.0%)	NS
Knees	35(24.9%)	17(21.3%)	8(20.0%)	10(25.0%)	NS
Ankles / Feet	7(4.4%)	3(3.8%)	0(0%)	4(10.0%)	NS
<i>Impairment in performing daily activities (work, home, hobbies) in the last 12 months</i>					
Neck	17(10.6%)	9(11.3%)	3(7.5%)	5(12.5%)	NS
Shoulders	9(5.6%)	6(7.5%)	2(5.0%)	1(2.5%)	NS
Elbow	9(5.6%)	5(6.3%)	2(5.0%)	2(5.0%)	NS
Wrists / Hands	16(10%)	9(11.3%)	3(7.5%)	4(10%)	NS
Upper Back	1(0.6%)	1(1.3%)	0(0.0%)	0(0.0%)	NS
Low Back	49(30.6%)	28(35.0%)	10(25%)	11(27.5%)	0.0000
Hips	18(11.2%)	9(11.3%)	4(10%)	5(12.5%)	NS
Knees	13(8.1%)	9(11.3%)	2(5.0%)	2(5.0%)	NS
Ankles / Feet	3(1.9%)	2(2.5%)	0(0.0%)	1(2.5%)	NS
<i>Pain, discomfort, and stiffness in the last seven days</i>					
Neck	25(15.6%)	14(17.5%)	5(12.5%)	6(15.0%)	NS
Shoulders	11(6.9%)	7(8.8%)	2(5.0%)	2(5.0%)	NS
Elbow	5(3.1%)	3(3.8%)	1(2.5%)	1(2.5%)	NS
Wrists / Hands	13(8.1%)	7(8.8%)	3(7.5%)	3(7.5%)	NS
Upper Back	13(8.1%)	7(8.8%)	3(7.5%)	3(7.5%)	NS
Low Back	65(40.6%)	34(42.5%)	16(40.0%)	15(37.5%)	0.0000
Hips	20(12.5)	10(12.5%)	5(12.5%)	5(12.5%)	NS
Knees	18(11.2%)	10(12.5%)	4(10.0%)	4(10.0%)	NS
Ankles / Feet	5(3.1%)	3(3.8%)	0(0.0%)	2(5.0%)	NS

Numerical data are expressed as the number and percentage of respondents, $p > 0.05$ (Difference test)

Table 2 shows the results of the second part of the standard Nordic questionnaire, i.e., the analysis of musculoskeletal symptoms (pain, discomfort, stiffness) in the last 12 months, i.e., seven days, and whether there was a restriction on performing regular physical activities at work or home in the previous 12 months.

Musculoskeletal symptoms (pain, discomfort, stiffness) in the last 12 months are most prevalent in the lower back in 102 (63.8%), neck in 52 (32.5%), and knees in 35 (24.9%) of the respondents, the percentage difference between lower back pain versus pain from other locations is significant for $p < .05$. Musculoskeletal symptoms (pain, discomfort, stiffness) in the last seven days are most prevalent in the lower back in 65 (40.6%), significantly more frequent at $p < .05$ in relation to pains from other locations.). Significantly, the most common reason for limiting the performance of regular physical activities at work or home in the last 12 months was musculoskeletal disorders in the lower back 49 (30.6%) among the respondents.

Table 3 shows the results of ergonomic risk assessment at the workplace and the level of risk obtained by applying the WERA (Work Ergonomic Risk Assessment) instrument, which includes five regions of the body (shoulder, wrist, back, neck and leg) and physical risk factors (strain, exposure to vibration, stress contact when using hand tools and duration of work tasks).

Table 3. Ergonomic risk assessment at the workplace and the level of risk obtained by applying the WERA (Work Ergonomic Risk Assessment) instrument, which includes five regions of the body (shoulder, wrist, back, neck and leg) and physical risk factors (strain, exposure to vibration, stress contact when using hand tools and duration of work tasks)

WERA Questionnaire	Nurses (N=160)	Nurses Primary field (N=80)	Nurses Secondary field (N=40)	Nurses Dental field (N=40)	(p)
<i>Shoulder / Risk level</i>					
low	18(11.2%)	10(12.5%)	5(12.5%)	3(7.5%)	NS
intermediate	75(46.9%)	36(45.0%)	18(45.0%)	21(52.5%)	NS
high	67(41.9%)	34(42.5%)	17(42.5%)	16(40.0%)	NS
<i>Wrist / Risk level</i>					
low	9(5.6%)	6(7.5%)	3(7.5%)	0(0.0%)	NS
intermediate	87(54.4%)	42(52.5%)	21(52.5%)	24(60.0%)	0.0099
high	64(40.0%)	32(40.0%)	16(40.0%)	16(40.0%)	NS
<i>Back / Risk level</i>					
low	12(7.5%)	6(7.5%)	3(7.5%)	3(7.5%)	NS
intermediate	85(53.1%)	43(53.8%)	22(55.0%)	20(50.0%)	0.0146
high	63(39.4%)	31(38.7%)	15(37.5%)	17(42.5%)	NS
<i>Neck / Risk level</i>					
low	12(7.5%)	6(7.5%)	3(7.5%)	0(0.0%)	NS
intermediate	86(53.8%)	42(52.5%)	21(52.5%)	26(65.0%)	0.001
high	62(38.7%)	32(40.0%)	16(40.0%)	14(35.0%)	NS
<i>Legs / Risk level</i>					
low	0(0%)	0(0.0%)	0(0.0%)	0(0.0%)	NS
intermediate	59(36.9%)	28(35.0%)	15(37.5%)	17(42.5%)	NS
high	101(63.1%)	52(65.0%)	25(62.5%)	23(57.5%)	0.0000
<i>Straining / Risk level</i>					
low	18(11.3%)	9(11.2%)	5(12.5%)	4(10.0%)	NS

intermediate	97(60.6%)	47(58.8%)	24(60.0%)	26(65.0%)	0.0000
high	45(28.1%)	24(30.0%)	11(27.5%)	10(25.0%)	NS
<i>Vibration / Risk level</i>					
low	8(5%)	0	0(0.0%)	8(20.0%)	NS
intermediate	11(6.9%)	0	2(5.0%)	9(22.5%)	NS
high	1(0.6%)	0	0(0.0%)	1(2.5%)	NS
<i>Contact stress / Risk level</i>					
low	19(11.9%)	11(13.8%)	6(15.0%)	2(5.0%)	NS
middle	58(36.3%)	30(37.5%)	14(35.0%)	14(35.0%)	NS
high	40(25.0%)	20(25.0%)	6(15.0%)	14(35.0%)	NS
<i>Tasks duration / Risk level</i>					
low	12(7.5%)	6(7.5%)	3(7.5%)	3(7.5%)	NS
intermediate	76(47.5%)	35(43.8%)	19(47.5%)	22(55.0%)	NS
high	72(45.0%)	39(48.7%)	18(45.0%)	15(37.5%)	NS

Numerical data are expressed as the number and percentage of respondents, $p < 0.05$ (Difference test)

According to the ergonomic assessment by body parts, for the shoulders of most of the respondents, 75 (46.9%) were determined to have a non-significant medium level of risk, followed by a high risk for 41.9%. The level of risk for the wrist, in a larger number of respondents, 87 (54.4%) have a significantly intermediate level of risk in relation to the other two modalities for $p < 0.05$ (Difference test, $p = 0.0099$). For the back in a larger number of 85 (53.1%) respondents (Difference test, $p = 0.0146$), as well as for the neck in 86 respondents (53.8%) (Difference test, $p = 0.001$), a medium level of risk is significantly registered. For the legs, the significant level of risk in most respondents - 101 (63.1%) is high (Difference test, $p = 0.0000$). The level of risk during stress in 97 (60.6%) respondents is significant in the middle for $p < 0.05$ (Difference test, $p = 0.0000$). For the use of vibrating tools, in terms of contact stress, as well as for task duration, no significant difference was determined for the level of risk.

Table 4 shows the results of the final ergonomic risk assessment at the workplace and the final level of risk with the application of the WERA (Work Ergonomic Risk Assessment) instrument and the corrective actions that should be taken.

Table 4. The final ergonomic risk assessment at the workplace/ risk level with the application of the WERA (Work Ergonomic Risk Assessment) instrument and corrective actions

The final result of the ergonomic assessment of the workplace/risk level corrective actions	Nurses (N=160)	Nurses Primary field (N=80)	Nurses Secondary field (N=40)	Nurses Dental field (N=40)
low (acceptable)	20(12.5%)	8(10.0%)	4(10.0%)	8(20.0%)
intermediate (corrective measures are needed)	92(57.5%)	47(58.8%)	26(65.0%)	19(47.5%)
high (not acceptable, urgent changes are needed)	48(30%)	25(31.2%)	10(25.0%)	13(32.5%)

According to the final result of the ergonomic assessment of the workplace, 20 respondents (12.5%) have a low level of risk that is acceptable. Most respondents, 92 (57.5%), have a medium level of risk for which corrective measures should be taken, and 48 (30%) respondents have a high level that is not acceptable and urgent changes are needed.

Table 5 shows the results of the analysis of the association of pain in the last 12 months by body parts (shoulder, wrist, back, neck, leg) and physical risk factors (body position when performing work tasks, straining and lifting a heavy load, vibration exposure, stress contact when using hand tools and duration of work tasks) with the final result of the ergonomic assessment of the workplace.

Table 5. Analysis of the association of pain in the last 12 months by body parts (shoulder, wrist, back, neck, leg) and physical risk factors (body position when performing work tasks, straining and lifting heavy loads, exposure to vibration, stress contact when using hand tools and duration of work tasks) with the final result of the ergonomic assessment of the workplace

Analysis of association of pain in the last 12 months and six physical risk factors/ final result of ergonomic workplace assessment	Nurses (N=160)	
	(p)	OR CI 95%
Shoulder pain/final result	NS	/
Pain in the wrist/final result	0.000815	OR= 4.0000 CI 95% (1.7227- 9.2877)
Pain in the lower back/final result	0.001019	OR=4.0196 CI 95% (1.6954- 9.5302)
Pain in the upper part of the back/final result	0.001680	OR=2.5172 CI 95% (1.1681- 5.4245)
Neck pain/final result	NS	/
Hip pain/final result	0.003433	OR=10.4324 CI 95% (1.4767- 78.5067)
Pain in the knees, ankles, feet/final result	NS	/
Straining and lifting a heavy load/final result	0.000194	OR=7.6588 CI 95% (2.4478- 23.9637)
Use of vibrating tools/final result	0.000194	OR=4.2857 CI 95% (1.5555- 11.8077)
Contact stress/final result	NS	/
Task duration/the final result	NS	/

p<.005(Pearson Chi-square)

No association was registered between shoulder pain and the final result of workplace ergonomic assessment/risk level and corrective actions for $p>.005$. An association was registered between wrist pain and the final result of workplace ergonomic assessment/risk level and corrective actions for $p<.005$. Pain in the wrist increases the chance of registering an increased level of risk by four times. An association between lower back pain and the final result of workplace ergonomic assessment/risk level and corrective actions was registered for $p<.005$. Pain in the lower back increases the chance of registering an increased level of risk by four times. An association was registered between upper back pain and the final result of an ergonomic assessment of the workplace/risk level and corrective actions for $p<.005$. Pain in the lower back increases the chance of registering an increased level of risk by two and a half times. No association was registered between neck pain and the final result of workplace ergonomic assessment/risk level and corrective actions for $p>.005$. An association was registered between hip pain and the final result of an ergonomic assessment of the workplace/level of risk and corrective actions for $p<.005$. Hip pain increases the chance of registering an increased level of medium risk by ten times. No association was registered between pain in knees, ankles/feet versus the final result of workplace ergonomic assessment/risk level and corrective actions for $p>.005$. An association between straining/heavy lifting and the final result of workplace ergonomic assessment/risk level and corrective actions was registered for $p<.005$. Exercising/lifting a heavy load increases the chance of registering an increased level of high risk by seven and a half times. An association was registered between the use of vibrating tools and the final result of an ergonomic assessment of the workplace/level of risk and corrective actions for $p<.005$. The use of vibrating tools increases the chance of registering an increased level of

high risk by four times. No association was registered between contact stress when using tools with rubber handles and the final result of an ergonomic assessment of the workplace/risk level and corrective actions at $p > .005$. No association was registered between the task duration and the final result from the ergonomic assessment of the workplace/risk level and corrective actions for $p > .005$.

Discussion

The aim of this study was to analyze the risk assessment of musculoskeletal disorders in nurses from primary, secondary, and dental fields by applying the WERA questionnaire. The results of the application of the WERA questionnaire indicated that 20 (12.5%) nurses had a low level of risk that was acceptable, 92 (57.5%) had a medium level of risk that required corrective measures, and 48 (30%) nurses were at a high level that was not acceptable and needed urgent changes. Regarding musculoskeletal disorders, the results of our study showed that musculoskeletal symptoms (pain, discomfort, stiffness) in the last 12 months were most prevalent in the lower back in 102 (63.8%), neck in 52 (32.5%) and knees in 35 (24.9%) nurses. Musculoskeletal symptoms (pain, discomfort, stiffness) in the last seven days were most prevalent in the lower back in 65 (40.6%) nurses, and the most common reason for limiting the performance of regular physical activities at work or home in the last 12 months was musculoskeletal disorders in lower back in 49 (30.6%) nurses. The incorrect posture of the body, especially on the back, neck, and legs, and the sedentary work that is characteristic for these activities indicated an increased occurrence of musculoskeletal disorders.

Numerous studies point to different methodological principles that examine the ergonomic characteristics of the workplace that affect the occurrence of musculoskeletal disorders among health workers. Muthukrishnan *et al.*, in a study carried out in 2019, used the standardized Nordic questionnaire and the WERA as a methodology tool for ergonomic assessment of nurses in the workplace. This study determined that 24% of nurses had a low level of risk, and 76% had a medium level of risk. No high level of risk was identified in this study^[21]. The results of our study correlate in the area of the occurrence of musculoskeletal disorders, but in the ergonomic risk assessment, 57.5% of nurses were at a medium risk, but 30% of nurses were at a high risk.

In a study by Darsana in India conducted on hospital nurses to assess the risk of occurrence of work-related musculoskeletal diseases, a standardized Nordic questionnaire and the MAPO index were used; the results showed that 68% of nurses had musculoskeletal symptoms, the most common of which were pain and discomfort in the lower back which were related to age, work experience, patient handling and type of department. Evaluation with the MAPO index showed that nurses were exposed to a moderate to high risk of work-related musculoskeletal disorders^[22]. In our study, the musculoskeletal symptoms in the lower back were also the most common, and the ergonomic risk assessment, although done with another instrument (WERA), showed a medium to high risk.

In the study by Kothari *et al.* from 2022 carried out on 96 nurses employed in a clinical department, the ergonomic assessment for the occurrence of musculoskeletal disorders was made with two ergonomic tools, RULA and REBA. The REBA ergonomic assessment was used to determine individuals' risk of developing an upper extremity MSD. The following results were obtained: 40% of subjects were with a moderate risk, 38% with a high risk, 9% with a low risk, 13% with a very high risk, and 0% with an insignificant risk. The results of the ergonomic assessment with RULA for assessing the risk of MSDs among the research participants were: 0%

of subjects had an insignificant risk, 10% of subjects had a low risk, while 44% and 46% of subjects had a high and medium risk of developing MSDs^[23].

In the study by Zayed *et al.* conducted in 2019 on 1000 nurses from different sectors, 92.3% of nurses had MSDs in the last 12 months. The most common symptom was lower back pain (56.6%), neck pain in 51.5% and knee pain in 50.4%. The most common risk factor for work was long-term work in the same job position (90.8%)^[24]. In our study, the most frequently determined musculoskeletal symptoms in the last 12 months were in the lower back, neck, and knees.

Literature findings and the results obtained in our study using the WERA questionnaire have led to the conclusion that nurses from both hospital and non-hospital activities are exposed to a medium to high ergonomic risk for the occurrence of MSDs. The most common musculoskeletal symptoms are pain, discomfort, and stiffness in the lower back, neck, and knees in the last 12 months. With the ergonomic assessment, it can be concluded that the greatest risk for the occurrence of MSDs among nurses is incorrect body posture, especially the back, neck, and legs, repetitive movements, long duration of work tasks, and sedentary work. Hence, there is a need to develop applicable ergonomic programs for the professional prevention of musculoskeletal disorders among nurses.

Conflict of interest statement. None declared.

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