Middle East J Rehabil Health Stud. 2025 January; 12(1): e148302 https://doi.org/10.5812/mejrh-148302

Published Online: 2024 October 5 **Research Article**

Musculoskeletal Disorders Among the United Arab Emirates Healthcare Professionals: Ergonomics Knowledge and Practice Study

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Received: 28 May, 2024; **Revised:** 6 September, 2024; **Accepted:** 9 September, 2024

Abstract

Background: Healthcare professionals (HCPs) are particularly vulnerable to musculoskeletal disorders (MSDs) due to job demands such as prolonged standing, patient handling, and awkward postures.

Objectives: This study aimed to assess the prevalence of MSDs among HCPs, examine the association between ergonomic knowledge and practices with MSDs, and identify predictors of ergonomic knowledge.

Methods: A cross-sectional study was conducted among HCPs, including doctors and nurses, working in the United Arab Emirates (UAE). The prevalence of MSDs was determined using the Nordic Questionnaire. Ergonomic knowledge and practice were assessed through a validated questionnaire covering sociodemographic and work-related factors, ten knowledge items, and fifteen practice items. A scoring system was used, where correct answers received a score of one, and incorrect answers received a score of zero. Ergonomic knowledge and practices were considered inadequate when participant scores fell below the median values of six for knowledge and eight for practice. The calculated sample size was 398, with a response rate of 96%, resulting in 380 participants. The chi-square test, binary, and multivariable logistic regression analyses were performed.

Results: The twelve-month prevalence of MSDs was 90.4%, with the highest percentage reported in the lower back (56%), followed by the upper back (43.4%), neck (39.2%), shoulder (38.9%), and elbow (21.3%). Inadequate ergonomic knowledge and incorrect ergonomic practices were found in 61.8% and 36.3% of HCPs, respectively. A significant association was observed between inadequate ergonomic knowledge ($P < 0.001$) and practice ($P = 0.035$) and the presence of MSDs. Significant predictors of inadequate ergonomic knowledge included the number of years worked (OR: 1.9; 95%CI: 1.00 - 3.5, $P = 0.049$), the provision of ergonomics training and awareness at the workplace (OR: 3.7; 95%CI: 1.9 - 7.2, $P < 0.001$), and inadequate ergonomic practices (OR: 1.9; 95%CI: 1.1 - 3.0, $P = 0.014$).

Conclusions: A very high prevalence of MSDs was found among HCPs, with the lower back being the most commonly affected site. Significant predictors of inadequate ergonomic knowledge included the number of years worked, the availability of ergonomics training at the workplace, and inadequate ergonomic practices. This study underscores the need for ergonomic training programs and ergonomically friendly workplaces to equip HCPs with the knowledge and practices necessary to prevent MSDs.

Keywords: Musculoskeletal Disorders, Healthcare Professionals, Ergonomics, Human Factors, Knowledge, Practice

1. Background

The global burden of musculoskeletal disorders (MSDs) is increasing (1). Musculoskeletal disorders often affect workers who engage in repetitive tasks, adopt awkward postures, or perform heavy lifting (2). Among healthcare professionals (HCPs), work-related MSDs are common, with documented rates over a one-year period ranging from 28% to 96% (3). A positive correlation has been identified between the severity of low back pain and factors such as work demands, job characteristics, ergonomics, posture, and worker activities (4).

Human factors engineering, or ergonomics, examines how humans interact with technology, systems, and their environment. Ergonomics applies theories and approaches to optimize both system

performance and human well-being (5). A study conducted in Oman among biomedical scientists revealed that 54.5% had good knowledge of ergonomics, despite 93.6% possessing high qualifications (6). This finding exceeds the 25.5% reported in a Nigerian study on the ergonomics knowledge of medical laboratory scientists (7). Additionally, 41.2% of nurses were found to have limited knowledge of ergonomic principles (8). In Pakistan, 40.1% of dental practitioners were reported to have poor ergonomic knowledge (9). Another Nigerian study showed that although 96.4% of surgeons and physicians had high ergonomics knowledge, only 13.9% implemented ergonomic practices (10). A study from Iran demonstrated an inverse relationship between ergonomics knowledge and MSDs among physiotherapists (11). Furthermore, personalized ergonomic interventions for nurses significantly reduced ergonomic risks, as measured by rapid entire body assessment (REBA) scores (12). Similarly, a study in Thailand showed that ergonomics interventions reduced MSDs in the arm, upper back, and lower back regions (13). However, there is limited data on the prevalence of MSDs and the level of ergonomic knowledge and practices among HCPs in the United Arab Emirates (UAE).

2. Objectives

This study aims to assess the prevalence of MSDs among HCPs, explore the association between ergonomic knowledge, practice, and MSDs, and identify predictors of ergonomic knowledge.

3. Methods

A cross-sectional study was conducted among doctors and nurses in the northern Emirates of the UAE from September 4, 2022, to December 30, 2022. Participants were 18 years or older, of any gender or nationality, and provided informed consent. Healthcare professionals who were unavailable, declined consent, or had pre-existing degenerative musculoskeletal diseases were excluded.

3.1. Sample Size Determination and Sampling

Convenience sampling was employed. The sample size was calculated using the formula $n = Z^2pq/L^2$, where n represents the sample size, p is the estimated proportion of HCPs with MSDs, taken as 0.38 based on a study in the UAE (14), q is 0.62, L is the desired margin of error (0.05), and Z corresponds to a 95% confidence level (1.96). Considering a potential 10% refusal rate, the calculated sample size was 398. When the eligible participants were approached, 18 declined, resulting in a response rate of 96%, with 380 participants included in the study.

3.2. Instrument for Data Collection, Validation, and Pilot Testing

Data was collected using a self-administered questionnaire consisting of two parts: The first part was developed by the research team and covered socio-demographics, nutrition, job characteristics, and ergonomic knowledge and practices. The second part comprised the standardized Nordic Musculoskeletal Questionnaire (NMQ) (15). Content validation of the first part was performed by experts, including an orthopedic surgeon, a community medicine specialist, and two musculoskeletal and sports physiotherapists. After validation, the final questionnaire was used for data collection.

3.3. Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB/COM/STD/81/April-2022). Permissions were secured from the data collection sites, and participants' privacy was maintained throughout the study. Participants were approached in person, provided with informed consent, and informed of their right to decline participation. The researchers ensured confidentiality and anonymity, and access to the data was limited to IRB members and the research team.

3.4. Statistical Analysis

Data was analyzed using the statistical package for social sciences (SPSS version 28). The chi-square test was used to assess associations, while binary and multivariable logistic regression models were employed to identify predictors of ergonomic knowledge. Significant factors from the binary regression analysis were further analyzed using multivariable logistic regression to control for potential confounding factors. By directly approaching potential participants and using a concise questionnaire, the nonresponse rate was minimized to about 4%.

Ergonomic knowledge and practice questions were scored, with correct answers receiving one point and incorrect answers receiving zero. Ergonomic knowledge and practices were considered inadequate when participant scores fell below the median values of six for knowledge and eight for practice.

4. Results

Table 1. Demographics and Job-related Variables (n = 380)

Variable and Subcategories	No. (%)
Age category (y)	
< 35	191 (50.3)
≥ 35	189 (49.7)
Gender	
Male	92 (24.2)
Female	288 (75.8)
Nationality (WHO regions)	
South-East Asia	278 (73.2)
Eastern Mediterranean	56 (14.7)
Others	46 (12.1)
Level of education	
Below master's degree	270 (71.1)
Master's degree and above	110 (28.9)
Body mass index categories	
Normal (18.5 - 24.9)	162 (42.6)
Underweight (< 18.5)	12 (3.2)
Overweight/obese (> 24.9)	206 (54.2)
Job	
Doctor	139 (36.6)
Nurse	241 (63.4)
Specialty (doctor)	
GP/emergency	31 (22)
Physician	38 (27)
Surgeon	40 (28.4)
Dentist	12 (8.5)
Others	20 (14.2)
Total years of experience	
≤ 5	86 (22.6)
6 - 15	197 (51.8)
> 15	97 (25.5)
Total working hours per week	
≤ 48	338 (88.9)
> 48	42 (11.1)
Workplace provided ergonomics training and promote awareness	
No	332 (87.4)
Yes	48 (12.6)

4.1. Sociodemographic Characteristics

Table 1 presents the demographic and job characteristics of the participants. The majority of participants were under 35 years old, predominantly female, and from South-East Asia World Health Organization (WHO) Region countries. Most participants held qualifications below a master's degree (such as a bachelor's or higher diploma) and were classified as either overweight or obese.

Most HCPs had between 6 - 15 years of experience and worked 48 hours or less per week. Additionally, 87.4% of the participants reported that their workplaces did not provide ergonomics training or awareness programs.

4.2. The Prevalence and Sites of Musculoskeletal Disorders

Figure 1 illustrates the prevalence of MSDs among the studied HCPs. Nearly 91% of participants experienced MSDs in at least one body part over the past twelve months.

Figure 2 presents the prevalence of MSDs at various body sites. The lower back was the most affected area, with 56% of participants reporting discomfort, followed

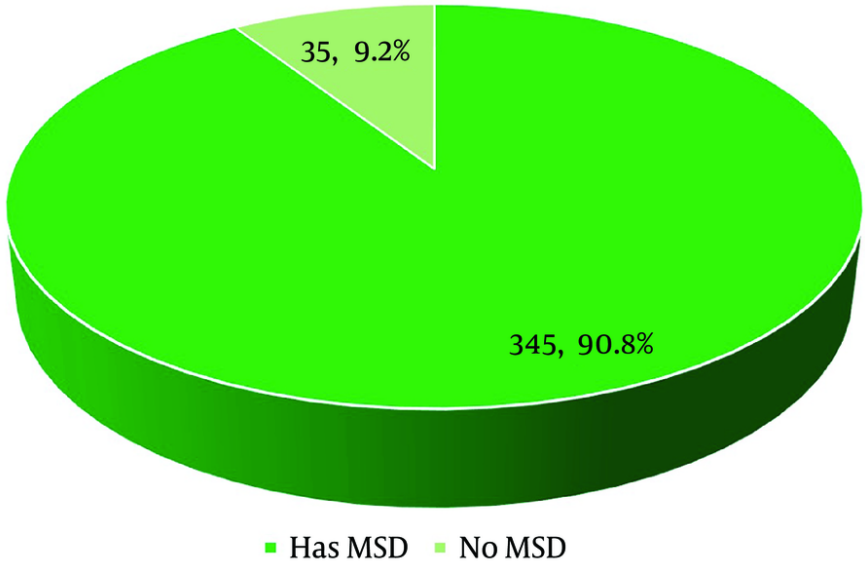

Figure 1. The prevalence of musculoskeletal disorders in at least one body site among healthcare professionals during the past twelve-months

by the upper back (43.4%), neck (39.2%), shoulder (38.9%), and elbow (21.3%).

4.3. The Ergonomic Knowledge, Practice and Musculoskeletal Disorders

The analysis revealed that 61.8% (n = 235) of HCPs had inadequate ergonomic knowledge, while 63.7% (n = 242) practiced correct ergonomic techniques. Table 2 shows a significant association between MSDs and both ergonomic knowledge and practices. The incidence of MSDs was notably higher among participants with inadequate ergonomic knowledge and incorrect practices.

4.4. The Predictors of Inadequate Ergonomics Knowledge

Table 3 shows the predictors of inadequate ergonomic knowledge. Initially, nurses were found to be 3.3 times more likely than doctors to have inadequate ergonomic knowledge, but this association became insignificant after adjusting for other variables. Healthcare professionals with less than 15 years of experience were at a higher risk of having inadequate ergonomic knowledge. Additionally, professionals working in environments where ergonomics training and awareness were not promoted were 3.7 times more likely to lack ergonomic knowledge. Moreover, HCPs with incorrect ergonomic practices were about 90% more likely to have inadequate ergonomic knowledge.

5. Discussion

5.1. The Prevalence and Sites of Musculoskeletal Disorders

We found a high prevalence of MSDs (91%) among HCPs, which is consistent with the studies by Zayed et al. (92.7%) and Elghazally et al. (88%) (16, 17). Previous studies attributed this high prevalence to a heavy workload and a lack of awareness about preventive approaches.

The lower back was the most affected site (56.1%), while the elbow was the least affected (21.3%). These findings align with Zayed et al., who reported 56.5% and 18.5%, respectively, for the same sites (16), and Alrimali et al., who found 68.9% and 16.9%, respectively (18). Additionally, our study found knee and ankle/feet MSD pain at 38.7% and 23.9%, which differs from Aleid et al., who reported 20.0% and 25.0%, respectively, among nurses in critical care units (19).

5.2. The Ergonomic Knowledge and Practice

Most of the HCPs in our study (68%) demonstrated inadequate ergonomics knowledge, which aligns with findings from Nigeria (74.5%) (7) and Iran (77.3%) (8). However, Saremi et al.'s study in Iran reported good ergonomic knowledge among HCPs (20). This difference

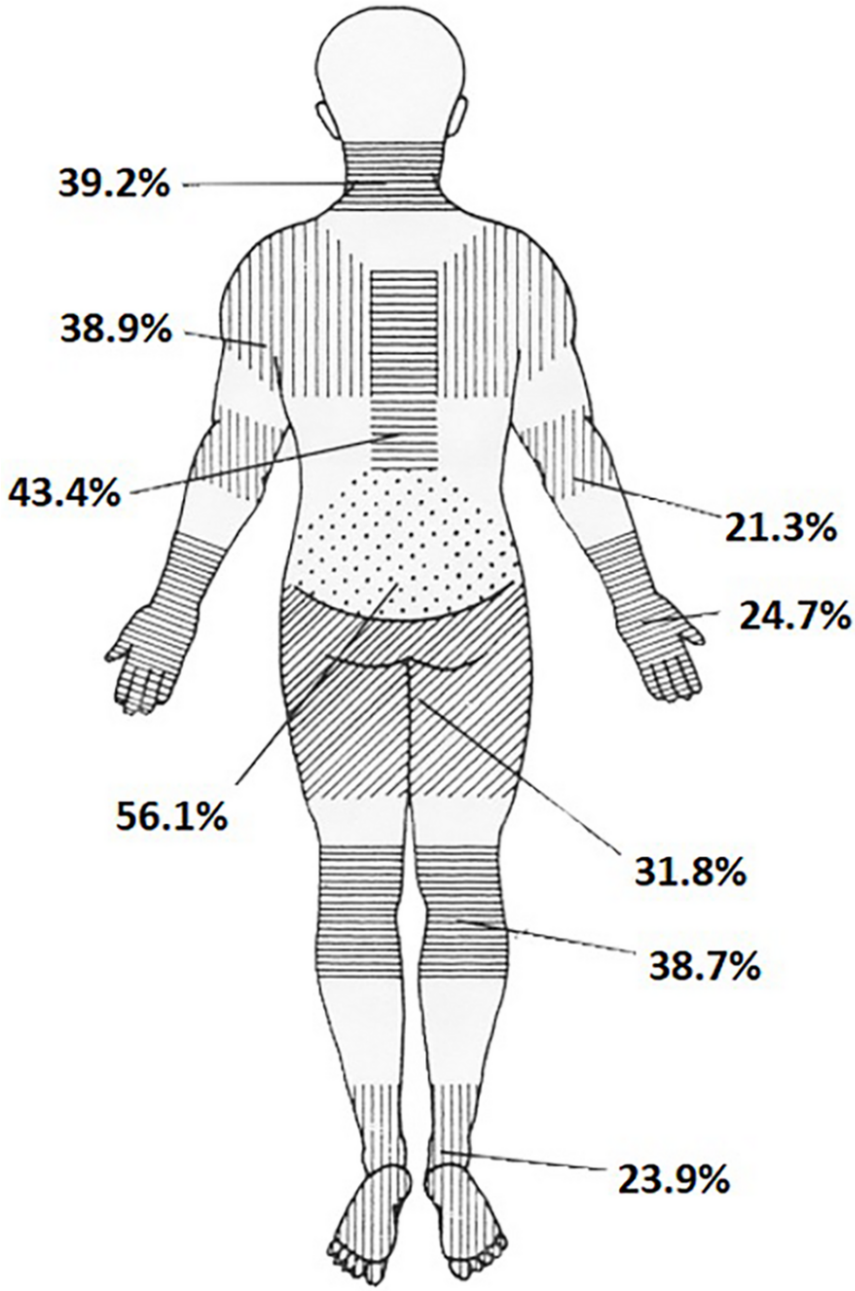

Figure 2. Prevalence of musculoskeletal disorders at different body sites among healthcare professionals during the past twelve-months

could be attributed to variations in the study population and the assessment tools used.

Our study also revealed lower MSD rates among participants with adequate ergonomic knowledge and practices, consistent with findings from other researchers who reported a negative correlation between ergonomic knowledge and MSDs (8).

5.3. The Predictors of Ergonomic Knowledge

Table 2. The Association Between Musculoskeletal Disorders and Knowledge and Practice of Ergonomics

Variables and Subcategories	Has MSDs [a]	No MSDs [a]	Total (n)	P-Value [b]
Knowledge of ergonomics				< 0.001
Inadequate	223 (94.9)	12 (5.1)	235	
Adequate	122 (84.1)	23 (15.9)	145	
Practice of ergonomics				0.035
Incorrect	131 (94.9)	7 (5.1)	138	
Correct	214 (88.4)	28 (11.6)	242	

Abbreviation: MSDs, musculoskeletal disorders.

[a] Values are expressed as No. (%).

[b] The chi-square test.

Table 3. Predictors of Inadequate Ergonomics Knowledge

Variables and Subcategory	No.	Crude Odds Ratio	Confidence Interval		P-Value [a]	Adjusted Odds Ratio	Confidence Interval		P-Value [b]
Age									
< 35	191	1.9	1.2	2.8	0.004	1.1	0.6	2.0	0.886
≥ 35	189	1				1			
Gender									
Male	92	1				1			
Female	288	2.7	1.7	4.4	< 0.001	1.7	0.9	2.9	0.069
Education									
Below masters	270	2.9	1.8	4.6	< 0.001	1.1	0.4	2.5	0.886
Masters and above	110	1				1			
Job									
Doctor	139	1				1			
Nurse	241	3.3	2.1	5.1	< 0.001	2.0	0.9	4.6	0.081
Number of years worked									
≤ 5	86	2.1	1.2	3.9	0.012	1.6	0.7	3.8	0.286
6 - 15	197	2.7	1.6	4.4	< 0.001	1.9	1.0	3.5	0.049
> 15	97	1				1			
Workplace provide ergonomic training and promote awareness									
No	332	3.5	1.9	6.6	< 0.001	3.7	1.9	7.2	< 0.001
Yes	48	1				1			
Practice ergonomic									
No	138	2.5	1.6	3.9	< 0.001	1.9	1.1	3.0	0.014
Yes	242	1				1			

[a] Binary logistic regression analysis.

[b] Multivariable logistic regression analysis.

The current findings are consistent with Alwahaibi et al.'s study in Oman, which found no association between age, gender, education level, and job type with ergonomic knowledge among biomedical scientists (6). We discovered that HCPs under the age of 35 were more likely to have inadequate ergonomic knowledge, similar to a study from India, where younger dental practitioners were at a higher risk of poor or fair ergonomic knowledge (21).

Initially, lower educational levels appeared to increase the risk of inadequate knowledge by 2.9 times. However, this effect became insignificant after adjusting for other variables, aligning with a Saudi study that showed higher education improves ergonomic knowledge. The Saudi study found that Board-certified

employees had 3.6 times better ergonomic knowledge than bachelor's degree holders (22).

Contrary to Oladeinde et al.'s study (7), which found that males were more likely to have lower ergonomic knowledge than females, our study suggests that gender differences are influenced by other variables, which may explain the inconsistent findings across studies.

Regarding job type, we found that nurses were 3.3 times more likely than doctors to have lower ergonomic knowledge, but this difference became insignificant after controlling for other variables in multivariable logistic regression. This may be due to inadequate ergonomic training for nurses, which tends to focus primarily on clinical skills, a trend observed in a similar study (22).

Our study also found that participants whose facilities did not provide ergonomics training had a higher risk of inadequate ergonomic knowledge. This aligns with Alruwaili et al.'s study in Saudi Arabia, which showed that ergonomic training reduced the risk of MSDs (23). Furthermore, our results demonstrated that ergonomic knowledge and practice are interconnected and significantly related to MSDs. This contrasts with Moosa and Bhayat's study from South Africa, which found no correlation between ergonomic knowledge and practice among dental students (24), while an Egyptian study among dentists did report a significant correlation (25).

Theories suggest that MSDs result from workplace exposures that lead to cumulative injuries and fatigue, emphasizing the importance of ergonomics in designing safer work environments (26). Individual and environmental factors may modify the cumulative workload, potentially explaining the varying results observed across different studies (5).

The present study underscores the need to provide ergonomic knowledge and ensure that ergonomic principles are practiced to reduce MSDs among HCPs. Hospital-wide ergonomics interventions, coupled with staff education, are essential strategies for mitigating MSDs. A systems-thinking approach can help understand the complex relationship between ergonomic knowledge, ergonomic practices, and the prevalence of MSDs (27). By considering these factors holistically, we can better address and mitigate MSDs in healthcare settings.

However, it is equally important to identify the root causes of MSDs, implement targeted interventions, and evaluate their effectiveness over time, while also considering the role of organizational culture. Longitudinal studies could provide valuable insights into these areas and inform more effective prevention strategies.

5.4. Limitation

We cannot generalize the findings since the sample was selected from a limited number of healthcare facilities and because a convenience sampling method was used to recruit participants. Additionally, there is the potential for recall bias due to the self-reported nature of the data. The cross-sectional study design also limits the ability to establish causal relationships between variables. A longitudinal study with a randomly selected sample would provide a deeper understanding of the dynamic relationships between the variables and offer more robust insights into the causal factors.

5.5. Conclusions

A very high prevalence of MSDs was observed among HCPs, with the lower back being the most commonly affected site. Significant predictors of inadequate ergonomic knowledge included the number of years worked, the presence of ergonomics training in the workplace, and inadequate ergonomic practice. This study highlights the need for targeted ergonomic-focused training programs to ensure HCPs are knowledgeable about and consistently practicing proper techniques to prevent MSDs.

Acknowledgements

We would like to thank all the participants for sharing their information.

Footnotes

Authors' Contribution: Study concept and design, critical revision of the manuscript for important intellectual content, statistical analysis, administrative, technical, and material support, and study supervision: S. A. S. and M. R. P.; acquisition of data, analysis and interpretation of data & drafting of the manuscript: U. B. F., H. Y., N. M., and H. H.

Conflict of Interests Statement: All authors, on behalf of the research team, declare no conflicts of interest regarding the following matters: No personal or financial benefits were derived from the items listed below: (a) Research support or employment; (b) personal financial interests; (c) stocks or shares in

companies; (d) any form of fees, or e) editorial board membership of MEJRS.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after its publication. The data are not publicly available due to some of information attached that could compromise the privacy of research participants.

Ethical Approval: The reference number for IRB approval from the Gulf Medical University Institutional Review Board is IRB/COM/STD/81/April-2022.

Funding/Support: No funding support was obtained from any financial bodies for the conduct of this study.

Informed Consent: Informed consent was obtained from all participants, and instructions, along with opportunities for clarification, were provided and explained at the beginning of the survey.

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