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*Original article*

# Prevalence and Risk Factors of Work-related Musculoskeletal Disorders Among Nurses: A Cross-Sectional Study in Benghazi, Libya

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**Abstract**
This study looks into the prevalence of work-related musculoskeletal disorders among nurses in Benghazi, Libya, and analyzes associated risk factors. A cross-sectional survey was done using the Nordic Musculoskeletal Questionnaire (NMQ), involving 215 registered nurses from several polyclinics in Benghazi. The questionnaire investigated the prevalence and functional impact of work-related musculoskeletal disorders, as well as demographic and occupational characteristics. Inclusion criteria: registered nurses who had worked for at least one year. Exclusion criteria: those with under one year of experience or pre-existing musculoskeletal diseases. Data were analyzed using SPSS version 24 with chi-square tests and logistic regression. Significance was set at $p < 0.05$. The mean age of participants was 43.66 (±7.24) years, with females comprising 94.9% (n=204). Participants worked an average of 19.28 (±8.84) hours per week and had a mean work experience of 19.36 (±9) years. Mean BMI was 29.39 (±5.29) kg/m². The results indicate high prevalence (92.1%), with common pain sites being lower back (68.8%), neck (52.6%), and knee (48.4%). Functional limitations due to low back pain affected 41.9%. Differences across age groups were not statistically significant ($p = 0.152$). No associations were found between BMI and knee pain ($p=0.597$) or years of experience and neck pain ($p=0.720$). However, a strong association was found between weekly working hours and low back pain ($p = 0.007$). Logistic regression revealed no significant associations, though a trend was noted for BMI ($p = 0.062$).
**Keywords**: Work-related Musculoskeletal Disorders, Nurses, Prevalence, Libya, NMQ.

## Introduction

Work-related musculoskeletal disorders (WRMSDs) are a major occupational health issue for workers worldwide [1]. The World Health Organization (WHO) states that musculoskeletal disorders are among the leading causes of disability and limitations in daily activities and at work [2]. These disorders, characterized by injuries and problems involving muscles, nerves, and tendons, are most common in people who engage in repetitive motions or physically demanding occupations. Bernardino Ramazzini, a pioneer in occupational medicine, emphasized the importance of diagnosing occupational illnesses and developed a system for identifying issues such as WRMSDs [3]. These conditions, also known as repetitive strain injuries (RSIs) can affect multiple parts of the body [4]. This comprises the back, legs, upper limbs, and neck. WRMSDs, if not handled appropriately, can lead to considerable medical costs and decreased productivity. Because of the nature of their employment, nurses are among those most impacted by WRMSDs. The risk of developing these illnesses is increased by physically demanding occupations, including lifting patients and standing for extended periods [5]. Although there is extensive literature on WRMSDs in many countries, there is relatively little information on specific places, such as Libya.

In Benghazi, Libya, the healthcare system is undergoing important transitions and facing significant challenges, particularly within polyclinics, such as resource restrictions and increased patient loads. Recent developments in Libya's healthcare system, combined with persisting socioeconomic constraints and restricted safety regulations, underline the need for a comprehensive examination of WRMSDs in this setting.

Previous research has demonstrated the prevalence of work-related musculoskeletal disorders (WRMSDs) among nurses. According to a study by Sun et al. (2023) the prevalence of WRMSDs among nurses was 77.2% with the highest rates noted for lower back pain (59.5%), neck pain (53%), and shoulder pain (46.8%). Interestingly, developed countries exhibited these higher prevalence rates. [6] The prevalence of WRMSDs was much higher at 92.3%, in a different study by Zayed et al. (2019) at Tanta University in Egypt. In this study, the most common complaints were knee pain (50.4%), neck pain (51.5%), and low back pain (56.6%) [7]. Additionally, 79% of nurses reported low back pain, according to Mukhtad's (2019) study conducted at Benghazi Medical Center in Libya [8]. Our research is required to fill a major gap in the literature because no study has yet fully analyzed WRMSDs affecting many anatomical regions among nurses in polyclinics in Benghazi, Libya. This study aims to investigate the prevalence and contributing variables of work-related musculoskeletal disorders (WRMSDs). Among nurses in Benghazi, Libya, in order to identify domestic and international treatments that can enhance nurses' well-being and workplace ergonomics.

## Methods

A cross-sectional study design included a self-administered survey utilizing the Arabic version of the Nordic Musculoskeletal Questionnaire (NMQ), a validated tool for assessing musculoskeletal problems. The questionnaire collects demographic information such as gender, age, height, weight, length of employment,


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and weekly working hours. Participants were asked about pain or discomfort in nine body regions over the past 12 months, along with specific questions for each region. Participants indicate functional Impact, including difficulty performing tasks and presence of pain or discomfort in the last 7 days. The target population was registered nurses in Benghazi polyclinics.

A total of 242 questionnaires were distributed from February to April 2025, of which 215 were deemed effective. In collaboration with the nursing department heads, we arranged times to meet with the nursing staff during their shifts. This allowed us to distribute the surveys in person; at these meetings, we explained how to fill out the questionnaire, ensuring that participants could ask any questions about the study and receive rapid support if necessary. The distribution process sought to improve response rates and participant engagement.

All registered nurses who have been working in their current role are eligible to participate in the study; nurses with less than one year of work experience were excluded from the study to ensure that participants had adequate exposure to the physical demands of nursing or if they had a diagnosis of any other musculoskeletal disorder, which is essential for accurately assessing the prevalence of work-related musculoskeletal disorders (WRMSDs).

The study was conducted in accordance with the principles set forth in the Declaration of Helsinki and all participants provided informed consent prior to participation.

All the data were tabulated and analyzed by using Statistical Package for the Social Sciences software version 24 (IBM Corp., Armonk, NY, USA). Numerical data (e.g., age, BMI) were presented as mean ± standard deviation (SD), while categorical data (e.g., gender) were presented as frequencies and percentages. A 95% confidence interval (CI) was calculated for the prevalence of WRMSDs across different body parts to assess the reliability of the prevalence estimates. A chi-square test was used to assess the link between WRMSDs and other demographic characteristics, with Fisher's exact test serving as a backup if one cell had an expected count of less than 5. Logistic regression was used to find significant risk factors related to WRMSDs after accounting for relevant covariates. A p-value of <0.05 was deemed statistically significant.

## Results

The study included a total of 215 registered nurses from Benghazi polyclinics, Table 1. Demonstrates that the mean age of participants was 43 (±7.24) years and females accounted for 94.9% (*n*=204) while males made up only 5.1% (*n*=11). Participants worked an average of 19 (±8.8) hours per week. The mean years of work experience were 19.3 (±9) years. The mean Body mass index was 29.39 (±5.2) kg/m$^{2,}$ with 83% classified as overweight and obese.

***Table 1. Demographic characteristics of participants***

| **Gender** | ***N*(%)** |
|---|---|
| Male | 11 (5.1%) |
| Female | 204 (94.9%) |
| | **Mean(SD)** |
| Age | 43.66 (7.24) |
| Years of employment | 19.36 (9) |
| BMI | 29.39 (5.29) |
| Weekly working hours | 19.28 (8.84) |

### *Prevalence of Work-related Musculoskeletal Disorders*

The overall prevalence of work-related musculoskeletal disorders in the last 12 months was 92.1%, pain events in different anatomical regions were reported in the following order of occurrence: lower back (68.8%), neck (52.6%), knee (48.4%), shoulder (47.4%), upper back (42.3%), hand (37.7%), feet/ankles (33.5%), hip/thigh (21.4%), elbow (14.4%). as illustrated in Figure 1 and 2 respectively.

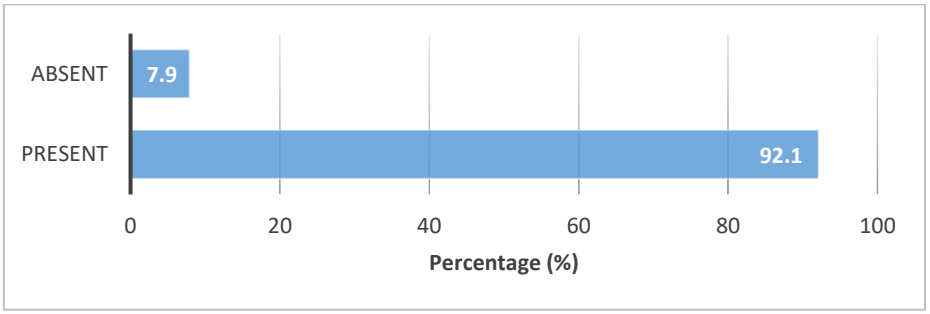


***Figure 1. Overall prevalence of WRMSDs***


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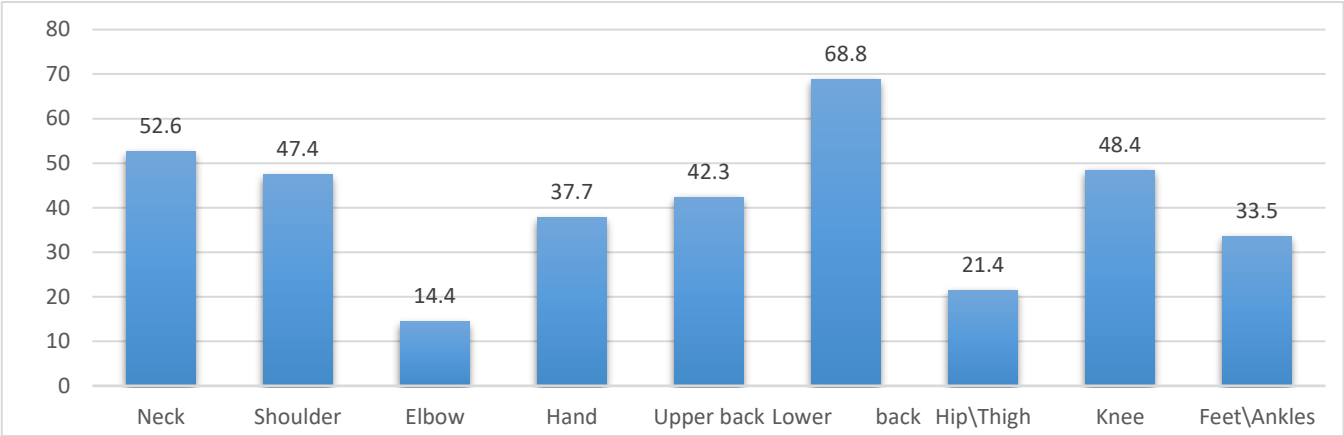


***Figure 2. Distribution across different anatomical regions***

The three most common sites of pain associated with work-related musculoskeletal disorders (WRMSDs) were lower back, neck, and knee pain, respectively. Among the participants, low back pain was the most frequently reported complaint, with 68.8% of individuals experiencing it within the past 12 months, and 43.7% reporting low back pain within the past 7 days. Notably, 41.9% experienced functional limitations, affecting their ability to perform routine activities.

Similarly, neck pain affected 52.6% of participants within the past 12 months and 30.2% in the last week. Functional impairment due to neck pain was reported by 28.8% hindering their ability to engage in daily tasks. A significant number of participants experienced knee pain, with 48.4% reporting it within the past year and 32.6% within the last week. Functional limitations due to knee pain were indicated by 30.7% of those affected. Subsequently, we analyzed the prevalence of work-related Musculoskeletal disorders across different age groups. The results showed that 85% of participants aged 27-36 reported WRMSDs, while 95.3% of those in the 37-46 age group and 92.1% in the 47-60 age group reported similar complaints. As shown in figure 3. A Fisher's exact test was conducted to assess the association between age groups and the presence of WRMSDs. the results revealed a non-significant difference in prevalence across age groups (p=0.152). Table 2 shows the contingency table summarizing the observed frequencies.

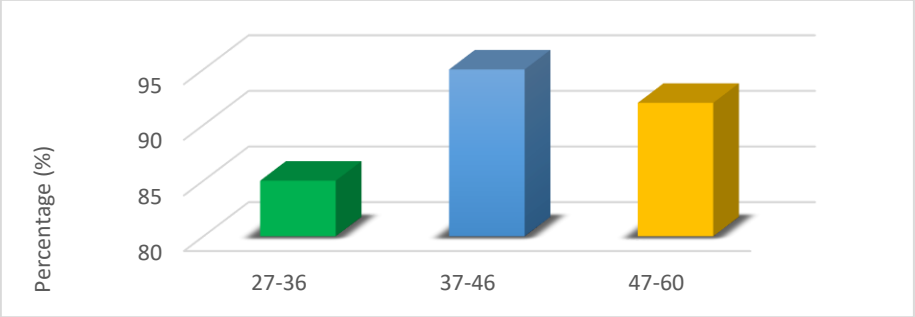


**Figure 3. Prevalence of WRMSDs in different age groups**

***Table 2. Prevalence of WRMSDs in relation to different age groups***

| Age Group | WRMSDs Present (%) | WRMSDs Absent (%) | P-value |
|---|---|---|---|
| 36-27 | %85 | %15 | |
| 46-37 | %95.3 | %4.7 | 0.152 |
| 60-47 | %92.1 | %7.9 | |

A chi-squared test was conducted to examine the association between working hours per week and the prevalence of low back pain. The results indicated a significant association between the two variables ($x^2$ = 9.698, df = 2, p = 0.007), as detailed in Table 3. To quantify the strength of this association, Cramér's V was calculated, yielding a value of 0.212, indicating a moderate relationship between working hours and the prevalence of low back pain. As presented in Table 4. The Chi-square test revealed no statistically significant association between neck pain and years of employment groups ($x^2$= 0.658, df = 2, p = 0.720). Similarly, the relationship between knee pain and different body mass index (BMI) groups was assessed, showing no significant association with the Chi-square value of ($x^2$ = 1.030, df = 2, p = 0.597) as shown in Table 5.

***Table 3. Association between weekly working hours and Low back pain***


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| Weekly Working Hours | Present N(%) *n*=148 | Absent N(%) *n*=67 | P-value |
|---|---|---|---|
| hours 20-5<br>hours 30-21<br>hours +30 | (%54.7) 81<br>(%29) 43<br>(%16.2) 24 | (%76.1) 51<br>(%11.9) 8<br>(%11.9) 8 | 0.007<br>($X^2$ 9.698; *df* 2) |

***Table 4. Association between years of employment and Neck pain***

| Years of Employment | Present N(%) n=113 | Absent N(%) n=102 | p-value |
|---|---|---|---|
| 1-10 years | 21 (52.5%) | 19 (47.5%) | 0.720<br>(X2 0.658; df 2 ) |
| 11-20 years<br>21+ years | 29 (28.3%)<br>63 (54.7%) | 31 (51.6%)<br>52 (45.2%) | |

***Table 5. Chi-square test for the relationship between BMI groups and Knee pain***

| BMI Group | Present N(%) n=104 | Absent N(%) n=111 | P-value |
|---|---|---|---|
| Normal<br>Overweight<br>Obese | 17 (16.3%)<br>37 (35.5%)<br>50 (48%) | 22 (19.8%)<br>43 (38.7%)<br>46 (41.4%) | 0.597<br>(X2 1.030; df 2) |

Logistic regression analysis was conducted to examine the associations between age, years of employment, weekly working hours and body mass index (BMI) with the presence of WRMSDs. As illustrated in table 6. The results indicated that none of these variables were significantly associated with WRMSDs. While the odds ratio for BMI was slightly above 1 (1.106), suggesting a possible trend towards a higher risk with higher BMI, this association was not statistically significant (p-value = 0.062).

***Table 6. Logistic regression analysis predicting work-related Musculoskeletal disorders***

| | | | | | |
|---|---|---|---|---|---|
| Age | 0.041 | 0.033 | 1.042 | [0.97-1.11] | 0.222 |
| Years of employment | 0.017 | 0.028 | 1.017 | [0.96-1.07] | 0.550 |
| Weekly hours | 0.015 | 0.030 | 1.015 | [0.95-1.07] | 0.610 |
| BMI | 0.101 | 0.054 | 1.106 | [0.99-1.23] | 0.062 |

## Discussion

This study aimed to investigate the prevalence and risk factors associated with work-related musculoskeletal disorders (WRMSDs) among registered nurses working at polyclinics in Benghazi. It represents the first research effort focused on WRMSDs in this specific group in Benghazi. Due to the lack of prior studies on this issue in Libya, directly comparing our results with local data is challenging. However, comparisons can be drawn with similar studies conducted internationally.

Given the startling total incidence of 92.1% highlights how urgently WRMSDs in this population need to be addressed. Our finding is consistent with the study conducted by SA E et al. (2023), which reported a prevalence of 88% among nurses at Main Assiut University Hospital in Egypt [9]. We can also compare our findings to those reported by EE et al. (2018), who found a prevalence of 85.9% among nurses at Mansoura University Children Hospital [10]. This high prevalence of WRMSDs in Benghazi polyclinics can be explained by work overload, poor working conditions, and a lack of awareness among nurses regarding the prevention of WRMSDs. Another study done by Akodu and Ashalejo (2019) reported a prevalence of 70.4% for work-related musculoskeletal disorders among hospital nurses in Nigeria [11]. A systematic review by Soylar and Ozer (2018) concluded that the rate of WRMSDs in different parts of the world has varied between 33% and 88% [12]. In our survey, 68.8% of nurses reported having low back pain. This is congruent with Attar's (2014) findings, who reported a frequency of 65.7% among nurses at a tertiary center in Jeddah, Saudi Arabia [13]. This suggests that the physical demands of nursing, such as patient handling and prolonged standing, have a major impact on this illness.

Neck pain affected 52.6% of participants, which is congruent with the findings of Azma et al. (2016), who reported a 48.9% prevalence among nursing workers [14]. In comparison, the elbow was the least impacted, with a 14.4% frequency. This finding is consistent with Heidari et al. (2018), who reported a 16.3% frequency among nurses [15]. Previous research has found that musculoskeletal diseases considerably impair daily performance and contribute to higher absenteeism among nursing personnel [16]. In our survey, 41.9% said that low back discomfort interfered with their daily activities, and 43.7% had pain in the previous seven days. In addition, 30.2% of respondents reported neck pain in the previous week and 28.8% said it interfered


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with their ability to function normally. Additionally, 32.6% of participants reported having knee pain within the previous seven days, and 30.7% said that knee pain interfered with their daily activities. These findings represent the significant impact of WRMSDs on everyday activities, emphasizing the importance of effective measures to address these prevalent issues.

Our study found no significant correlations between the existence of WRMSDs and demographic characteristics such as age, years of employment, or body mass index, despite the high incidence of WRMSDs. This is consistent with the findings of Alabri et al. (2024), who found no association between these demographic characteristics and the presence of work-related musculoskeletal disorders among nurses in Oman [17]. In contrast, Krishnan et al. (2021) discovered a significant association between work-related musculoskeletal problems and other demographic characteristics [18]. While the odds ratio for body mass index approached significance (1.106) it did not reach statistical significance (p=0.062), suggesting that other factors might play a more crucial role in the development of WRMSDs among nurses. This finding aligns with Attarchi et al. (2014) indicating that while BMI can influence musculoskeletal health, other ergonomic and workplace factors such as work organization, equipment used, and training, may be more pertinent in this context [19] Conversely, a study by Lin et al. (2020) found that body mass index was a significant predictor of WRMSDs [20]

The association we found between weekly working hours and the prevalence of low back pain (p=0.007), in accordance with Schmidt et al. (2012), further emphasizes the importance of addressing workload by optimizing scheduling practices and potentially reducing long shifts [21]. It is crucial to evaluate if an increase in workload leads to a higher incidence of WRMSDs, particularly during periods of heightened patient demand, as the nurses in our study worked an average of 19 hours per week.

Several strategies must be implemented to address the high prevalence of work-related musculoskeletal disorders (WRMSDs) among nurses. First and foremost, healthcare facilities must offer regular, required training sessions on ergonomics and appropriate body mechanics that are specifically tailored to nursing activities. Second, in order to identify high-risk regions and modify the physical environment appropriately, polyclinic administrators should do ergonomic evaluations of the workplace. Third, in order to lessen the physical strain on nurses, policy changes that require shorter shifts or rotating schedules are required. Finally, creating national occupational health guidelines in Libya that address the risk faced by healthcare workers can contribute to long-term health and safety improvements across the sector.

The study's cross-sectional design and reliance on self-reported data are among its limitations; if participants overreport or underreport their symptoms, bias may be introduced. Due to the skewed distribution of our sample—94.9% female and 5.1% male—we are unable to fully investigate potential gender disparities in the prevalence of work-related musculoskeletal disorders (WRMSDs). As a result of this gap, the connection between musculoskeletal problems and gender was not statistically significant. In contrast, a survey by Mirmohammadi et al. (2015) found that gender can influence the prevalence and nature of work-related musculoskeletal disorders, reporting higher rates among females [22]. Additionally, the sample size was limited due to several closed polyclinics for maintenance. Future research should use larger, more balanced samples and longitudinal designs to better understand the progression of work-related musculoskeletal disorders. While this study provides valuable insights into WRMSDs in Libya, more research is needed to confirm these findings in other healthcare settings.

## Conclusion

This study highlights a concerning prevalence of work-related musculoskeletal disorders (WRMSDs) among nurses in polyclinics in Benghazi, with an alarming 92.1% affected. These results echo global research and underscore the pressing need for targeted interventions to address issues such as work overload and inadequate working conditions. The findings show that the incidence of WRMSDs in the lower back, neck, and knees is notably higher, reflecting the physical demands associated with nursing. Notably, while factors like age and BMI did not show a significant correlation with WRMSDs, there was a clear relationship between weekly working hours and low back pain. This suggests that improving work schedules could be essential in reducing some of these problems. It is also essential to recognize the study's limitations, such as the high proportion of female participants and the dependence on self-reported data. Future studies should focus on bigger and more varied samples to have a better understanding of WRMSDs. Addressing these diseases is critical not just for the nurse's health but also for providing high-quality patient care.

### *Conflicts of Interest*

The authors declare that there is no conflict of interest.

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