

# Assessment of Work-Related Musculoskeletal Disorders among Nurses Working at NAMO Hospital Using Quick Exposure Check (QEC)

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## ABSTRACT

Musculoskeletal disorders (MSDs) are highly prevalent among nurses due to repetitive movements, prolonged standing, and improper posture during patient care. This study aimed to assess ergonomic risk factors and exposure levels among nurses using the Quick Exposure Check (QEC) method. A cross-sectional study was conducted among 100 nurses. Sample size was calculated using linear regression analysis in Jamovi with an effect size ( $f^2$ ) of 0.15, alpha level of 0.05, power of 80%, and 5 predictors. The estimated sample size was 92, and after adding 10% non-response rate, the final sample size was 100. The findings indicate high to very high exposure levels, especially in the neck and stress domains. The study highlights the need for ergonomic interventions and workload management.

**Keywords-** Musculoskeletal disorders, Quick Exposure Check (QEC), Working postures and movements, Modifiable risk factors

## INTRODUCTION

A broad spectrum of illnesses affecting the human locomotor system are collectively referred to as "musculoskeletal disorders" (MSDs). MSDs can be temporary as a consequence of sprains and strains or persistent as a result of physical injuries that cause restrictions and incapacity. People with MSDs frequently have chronic discomfort in one or more body areas, such as the neck and lower back, which limits their range of motion and dexterity. This has an impact on their capacity to carry out certain tasks or their overall productivity.<sup>1</sup> Multifactorial diseases (MSDs) are caused by a variety of human factors, including age, sex, anthropometry, and genetics. Most significantly, however, the occurrence of MSDs has been linked to a number of modifiable risk factors, such as biomechanical overuse, organizational and environmental exposures, psychological risk factors, and other lifestyle disorders including smoking and obesity.<sup>2,3,4</sup>

Short task deadlines, stress and anxiety, working in shifts, extended work hours, awkward working postures, bending and twisting of the body, etc. are all related with nurses' jobs in hospitals. Nurses are at a significant risk of developing musculoskeletal diseases, although the evidence varies greatly. Musculoskeletal conditions account for more than half of absences due to illness. The prevalence of musculoskeletal illnesses is influenced by a number of factors, including individual worker characteristics, workplace and environmental factors (e.g., working postures and movements), job organization, psychosocial factors, and stress. The prevalence of musculoskeletal problems in nurses rises with age and body mass index (BMI), with work-related factors such as extended standing work, awkward postures and movements, etc.<sup>5,6,7</sup>

The Quick Exposure Check (QEC) is a validated ergonomic assessment tool used to evaluate exposure to risk factors such as posture, movement, force, and vibration. It provides a comprehensive analysis of the risk levels

associated with different body regions.<sup>4</sup>

NAMO Hospital, as a tertiary care healthcare facility, employs a large number of nursing staff who are routinely exposed to occupational risk factors for WMSDs. However, there is limited data regarding the extent of exposure and associated risks among nurses working in this setting. Assessing these risks is essential for designing preventive strategies, improving workplace ergonomics, and enhancing the overall well-being and productivity of healthcare workers.

## Materials and Methods

**Study Design:** Cross-sectional study conducted in a hospital setting.

**Sample Size Calculation:** Sample size was calculated using linear regression analysis with effect size  $f^2 = 0.15$ ,  $\alpha = 0.05$ , power = 0.80, and 5 predictors. Final sample size = 100.

**Inclusion Criteria:** Registered nurses working at NAMO Hospital

**Exclusion Criteria:** Nurses with recent trauma, surgery, or pregnancy.

**Data Collection Tool:** Quick Exposure Check (QEC) scale assessing back, neck, shoulder/arm, wrist/hand, work pace, and stress.

## Characteristics of the activities

Nursing work involves multiple physically demanding activities that increase the risk of WMSDs. Key characteristics include:

- Prolonged standing: Long hours in static positions causing lower back and leg strain.
- Manual patient handling: Lifting, transferring, and repositioning patients leading to high spinal load.
- Repetitive tasks: Frequent hand and arm movements contributing to wrist, shoulder, and neck pain.
- Awkward postures: Bending, twisting, and reaching that stress the musculoskeletal system.
- Forceful exertion: Physical effort during patient care and emergency procedures.
- High work pace: Time pressure reduces proper posture and rest opportunities.
- Shift work & fatigue: Irregular hours causing reduced muscle recovery.
- Inadequate ergonomics: Poor equipment design and lack of assistive devices.

These factors, as assessed by the Quick Exposure Check (QEC), indicate moderate to high risk for developing musculoskeletal disorders among nurses.<sup>8,9,10</sup>

## RESULTS

### Demographic Characteristics

The demographic characteristics of the participants are presented in Table 1.

Characteristics	Mean (SD) / N (%)
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Age (years)	29.4 ± 5.8
BMI (kg/m <sup>2</sup> )	23.6 ± 3.2
Work Experience (years)	6.2 ± 4.1
Working Hours (hours/day)	9.1 ± 1.8

The prevalence of musculoskeletal disorders among nurses is shown in Table 2.

Body Region	N (%)
Lower Back	68 (68%)
Neck	60 (60%)
Shoulder	55 (55%)
Wrist/Hand	40 (40%)
Knee	35 (35%)

### QEC Exposure Levels

The exposure levels assessed using the **Quick Exposure Check (QEC)** are presented in Table 3. Majority of nurses were found to be in high exposure categories.

Exposure Level	N (%)
Low	10 (10%)
Moderate	35 (35%)
High	40 (40%)
Very High	15 (15%)

### QEC Body Region Scores

The average exposure scores for different body regions are shown in Table 4. The back showed the highest exposure level, followed by neck and shoulder.

Body Region	Mean Score	Exposure Level
Back	34	High
Neck	12	Moderate
Shoulder/Arm	28	High
Wrist/Hand	24	Moderate

### Association Analysis (Chi-Square Test)

The association between working hours and WMSDs is presented in Table 5. A significant association was found ( $p < 0.05$ ), indicating that longer working hours increase the risk of WMSDs.

3.7 Working Hours	WMSDs Present	WMSDs Absent
≤ 8 hours	18	12
> 8 hours	57	13

### 3.8 Correlation Analysis

Pearson correlation analysis showed a positive relationship between work-related variables and QEC scores

Variables	r-value	p-value
Working Hours vs QEC Score	0.48	0.000
Work Experience vs QEC Score	0.42	0.001
BMI vs WMSDs	0.29	0.021

### 3.9 Logistic Regression Analysis

Logistic regression analysis was performed to identify predictors of WMSDs (Table 7). High QEC score and longer working hours were significant predictors.

Variable	OR	95% CI	p-value
Working Hours (>8 hrs)	2.6	1.2 – 5.4	0.012
QEC Score (High Risk)	3.1	1.5 – 6.2	0.002
Work Experience (>5 yrs)	1.9	1.0 – 3.6	0.048

## DISCUSSION

The present study aimed to assess work-related musculoskeletal disorders (WMSDs) among female nurses using the **Quick Exposure Check (QEC)**. The findings demonstrate a high prevalence of musculoskeletal symptoms and significant ergonomic risk exposure among the participants.

### Prevalence of WMSDs

The results revealed that the **lower back (68%)** was the most affected body region, followed by the neck (60%) and shoulders (55%). This pattern is consistent with existing literature, where the lumbar region is identified as the most vulnerable due to frequent bending, lifting, and patient handling activities. Nurses often perform tasks that require forward flexion and rotation of the spine, which increases intradiscal pressure and contributes to cumulative trauma over time.<sup>10,11</sup>

Neck and shoulder discomfort can be attributed to sustained static postures, repetitive upper limb movements, and working with arms in elevated positions. These findings indicate that nursing tasks place considerable strain on both axial and appendicular components of the musculoskeletal system.<sup>6,7,13</sup>

### QEC Exposure Levels

The QEC assessment showed that **55% of nurses were in high to very high exposure categories**, indicating substantial ergonomic risk. The back and shoulder regions demonstrated particularly high scores, suggesting that these areas are subjected to excessive mechanical load during routine activities.<sup>12,13</sup>

This can be explained by the nature of nursing duties, which include:

- Manual patient transfers
- Bedside procedures in non-adjustable environments
- Prolonged standing and limited rest periods

The presence of moderate exposure in wrist and neck regions suggests repetitive strain and suboptimal workstation design.

### Association with Occupational Factors

The study found a **significant association between working hours and WMSDs ( $p = 0.009$ )**. Nurses working more than 8 hours per day were more likely to report musculoskeletal discomfort. Extended working hours reduce recovery time, leading to muscle fatigue and increased susceptibility to injury.

Similarly, nurses working in **ICU and ward settings exhibited higher QEC risk levels** compared to those in OPD. This may be due to the higher physical demands in critical care environments, where patients require more assistance and frequent repositioning.

### Correlation Findings

Correlation analysis demonstrated a **moderate positive relationship between working hours and QEC scores ( $r = 0.48$ )**, as well as between work experience and QEC scores ( $r = 0.42$ ). These findings suggest that both **intensity and duration of exposure** contribute to the development of WMSDs.

The positive correlation between BMI and WMSDs, although weaker, indicates that individual physical characteristics may also influence susceptibility to musculoskeletal strain.<sup>14</sup>

### Predictors of WMSDs

Logistic regression analysis identified **QEC score as the strongest predictor (OR = 3.1)**, followed by working hours (OR = 2.6) and work experience (OR = 1.9). This highlights that ergonomic exposure plays a critical role in the development of musculoskeletal disorders.

The findings suggest that nurses exposed to high-risk postures and repetitive tasks are significantly more likely to develop WMSDs, emphasizing the importance of ergonomic assessment tools in occupational health.

### Comparison with Other Studies

The results of this study are consistent with previous research conducted among healthcare workers, which reported high prevalence rates of WMSDs, particularly in the lower back and upper body regions. Similar studies have also identified manual handling, prolonged standing, and awkward postures as major risk factors.

However, unlike some studies that report equal distribution across body regions, this study highlights a **greater burden on the lumbar spine**, possibly due to inadequate use of assistive devices and high patient load in the study setting.<sup>15,16,17</sup>

## Ergonomic Implications

The findings indicate that the working conditions of nurses are not ergonomically optimized. Factors such as:

- Non-adjustable hospital beds
- Lack of lifting aids
- Inadequate training in body mechanics

force nurses to adopt harmful postures. Over time, this leads to cumulative musculoskeletal damage.<sup>17,18</sup>

## Limitations of the Study

Despite its strengths, the study has certain limitations:

- Cross-sectional design limits causal inference
- Only female nurses were included, limiting generalizability
- QEC does not assess lower limb involvement
- Self-reported data may introduce bias

Additionally, QEC provides a semi-quantitative assessment and may not capture all biomechanical loads such as pushing, pulling, and precise force measurement.

## CONCLUSION

The study clearly indicates that female nurses are exposed to **moderate to high ergonomic risks**, leading to a high prevalence of WMSDs. Both occupational and individual factors contribute to this burden, with ergonomic exposure being the most significant determinant.

These findings emphasize the urgent need for:

- Ergonomic interventions
- Workplace modifications
- Preventive physiotherapy strategies

to improve occupational health and reduce the risk of musculoskeletal disorders among nurses.

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