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# Occupational Risk of Work-Related Musculoskeletal Disorders in Healthcare and Non-Healthcare Workers

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**Abstract**

**Background**: Work-related musculoskeletal disorders (WMSDs) are among the most common occupational health issues worldwide, significantly affecting worker productivity and well-being. This study aims to assess the prevalence and risk levels of WMSDs among various professions at Dr. M. Djamil General Hospital, Padang, highlighting high-risk occupations and proposing preventive strategies.
**Method:** A cross-sectional study was conducted on 476 hospital staff using a proportional random sampling technique. The Nordic Body Map (NBM) Questionnaire was employed to identify musculoskeletal complaints, and data were analyzed using descriptive statistics. Ethical approval was obtained from the institutional review board (IRB), and informed consent was secured from all participants..
***Result**:* Among the respondents, 7 individuals (1.5%) were identified as having a high risk of developing WMSDs, with the most affected professions being nutrition processors (n=3), hospital orderlies (n=2), and nurses (n=2). Severe pain was reported primarily in the lower back (9 respondents, 1.9%) and right leg (9 respondents, 1.9%), followed by the left leg (8 respondents, 1.7%).
**Conclusion**: WMSDs pose a significant occupational health challenge, particularly among high-risk hospital staff. To mitigate these risks, ergonomic interventions, such as improved workstation design and periodic stretching exercises, should be implemented. Future research should explore additional risk factors, including workload and psychological stress, to develop more comprehensive preventive strategies..

***Keywords:*** *Hospital ergonomics, work-related musculoskeletal disorders (WMSDs), ergonomics, occupational health, nordic body map*

## Introduction

A hospital is a place where comprehensive healthcare services are provided, including promotive, preventive, curative, and rehabilitative efforts to ensure patient well-being and optimize healthcare delivery[1]. As a complex work environment, hospitals expose staff to various occupational health risks, particularly work-related musculoskeletal disorders (WMSDs), which result from poor ergonomics, repetitive tasks, and prolonged physical strain. Hospital employees, both healthcare and non-healthcare staff, are vulnerable to these risks, affecting not only their productivity but also overall hospital efficiency[2]. Therefore, hospitals must implement preventive measures to ensure the health and safety of their employees, including ergonomic workplace adjustments, health promotion programs, and early risk detection strategies.

Every employer and workplace, including hospitals, must take various measures to protect employee health. In Indonesia, legal frameworks such as Law No. 36 of 2009 on Health and Law No. 44 of 2009 on Hospitals mandate that hospitals provide occupational health protection for their workers by implementing workplace safety programs and medical surveillance[2,3]. These efforts must be supported by employers until employees can return to work normally. Despite these regulations, hospital workers continue to experience a high prevalence of WMSDs, particularly due to prolonged working hours, improper posture, and the physical demands of their

tasks.[4] These conditions contribute to absenteeism, decreased work efficiency, and potential long-term disabilities if left unaddressed.

WMSDs are among the most common occupational health issues, affecting muscles, tendons, and nerves due to improper work positions, repetitive movements, and excessive physical strain.[5] Studies indicate that hospital workers, particularly those performing physically demanding tasks such as patient handling, prolonged standing, and manual lifting, are at greater risk.[6] Research on nurses in intensive care units (ICUs) at Dr. M. Djamil General Hospital found that many suffered from moderate to high WMSD risks, as assessed using the Rapid Entire Body Assessment (REBA) method.[7] Similarly, studies on surgical and non-surgical inpatient nurses in Indonesia reported musculoskeletal complaints in areas such as the neck, shoulders, and lower back.[8,9]

Although numerous studies have examined WMSDs in hospitals, most research has primarily focused on nurses, leaving a gap in understanding the risks faced by other healthcare and non-healthcare staff.[10,11] Many studies overlook WMSDs in hospital professions such as nutrition processors, hospital orderlies, administrative personnel, and IT staff, despite their involvement in physically demanding tasks. Additionally, previous research has not sufficiently explored ergonomic risks among non-clinical hospital staff, who may also experience WMSDs due to prolonged sitting, repetitive movements, or improper workstation design.[12] Moreover, while existing studies highlight ergonomic risks, few provide comprehensive statistical analyses and targeted intervention strategies based on specific job roles.[13]

Based on these gaps, this study aims to assess the prevalence and risk levels of WMSDs among various professions at Dr. M. Djamil General Hospital, Padang. By identifying high-risk occupations and analyzing musculoskeletal complaints, this research seeks to provide evidence-based recommendations for workplace ergonomic improvements and occupational health policies. The findings will contribute to a broader understanding of WMSDs in hospitals and help design more effective prevention programs for healthcare and non-healthcare workers alike.

## Methods

### *Study Design*

This study utilizes a cross-sectional design to examine the types of musculoskeletal complaints and assess the risk levels of work-related musculoskeletal disorders (WMSDs) among staff at Dr. M. Djamil General Hospital, Padang. This study was conducted in December 2022 and it utilized a proportional random sampling technique to ensure representation across various job categories.[7]

### *Population and Sampling*

The study population consisted of all adult hospital employees working in various departments, including healthcare and non-healthcare professions. The inclusion criteria encompassed hospital employees aged 18 years and older who had been employed for at least six months. The exclusion criteria encompassed workers on extended medical leave or those with pre-existing musculoskeletal disorders unrelated to their occupation.

A proportional random sampling method was used to ensure adequate representation of all job categories. The total number of hospital workers was estimated before determining the sample size, resulting in 476 respondents representing 24 different professions. The sample size was determined using an appropriate statistical formula for cross-sectional studies, ensuring a confidence level of 95%.

### *Variables and Operational Definitions*

The dependent variable in this study is musculoskeletal complaints, defined as self-reported pain or discomfort experienced in different body regions. These complaints were classified into three risk categories: low, moderate, and high, based on symptom severity and frequency.

The independent variables include job categories and work-related factors that may contribute to musculoskeletal disorders, such as working posture, workload, and duration of employment. These factors were assessed to determine their association with the prevalence of musculoskeletal complaints among hospital employees.

*Data Collection Technique*

Data were collected using the Nordic Body Map (NBM) Questionnaire, a validated tool widely used for assessing musculoskeletal complaints in occupational health studies. The questionnaire was self-administered, and participants were instructed to report any pain or discomfort experienced in different body regions. To minimize bias, all respondents were given the same instructions on how to complete the questionnaire, and a trained research assistant was available to clarify any questions. Medical records and job descriptions were also reviewed to supplement the questionnaire data.

*Data Analysis*

The collected data were analyzed using descriptive statistics to assess the prevalence and distribution of WMSDs among hospital staff. Categorical variables, such as profession and risk levels, were examined using frequency distributions and percentages. For continuous variables, including age and years of work experience, means and standard deviations were calculated. Data analysis was performed using SPSS software to ensure accuracy and consistency in statistical computations.[13]

*Ethical Considerations*

This study received ethical approval from the Ethics Committee of Dr. M. Djamil General Hospital under approval number LB.02.02/5.7/429/2022. All participants were informed about the study's objectives, and written informed consent was obtained prior to data collection. Participant confidentiality was upheld throughout the study, and respondents had the right to withdraw at any time without facing any repercussions.[12]

## Results

This study was conducted on staff working at Dr. M. Djamil General Hospital, Padang, with a total of 476 samples. The distribution of respondent characteristics that may influence musculoskeletal complaints is presented in the following table:

**Table 1.** Frequency Distribution of Respondent Characteristics

| Respondent Characteristics | f | (%) |
|---|---|---|
| **Gender** | | |
| Male | 108 | (22.7) |
| Female | 368 | (77.3) |
| **Age** | | |
| 20-30 | 144 | (30.3) |
| 31-40 | 189 | (39.7) |
| 41-50 | 99 | (20.8) |
| >50 | 44 | (9.2) |
| **Weight (kg)** | | |
| 35-50 | 58 | (12.2) |
| 51-75 | 344 | (72.3) |
| 76-100 | 68 | (14.3) |
| >100 | 6 | (1.3) |
| **Height(cm)** | | |

| | | |
|---|---|---|
| 140-155 | 164 | (34.5) |
| 156-170 | 289 | (60.7) |
| 171-185 | 20 | (4.2) |
| >185 | 3 | (0.6) |
| **Work Durations (Years)** | | |
| <6 | 186 | (39.1) |
| 6-10 | 65 | (13.7) |
| 11-20 | 154 | (32.4) |
| 21-30 | 47 | (9.9) |
| >30 | 24 | (5.0) |
| **Profession** | | |
| Administration (Patient Services) | 9 | (1.9) |
| Laboratory Analyst | 17 | (3.6) |
| Pharmacist | 5 | (1.1) |
| Midwife | 42 | (8.8) |
| Doctor | 13 | (2.7) |
| Driver | 2 | (0.4) |
| Physiotherapist | 3 | (0.6) |
| Public Relations | 1 | (0.2) |
| IT | 11 | (2.3) |
| Management | 52 | (10.9) |
| Sterilization Executor | 1 | (0.2) |
| Anesthesia Technician | 3 | (0.6) |
| nutrition processing | 22 | (4.6) |
| Nurse | 182 | (38.2) |
| Hospital Orderlies or *concierge* | 27 | (5.7) |
| Radiographer | 15 | (3.2) |
| Medical Records | 20 | (4.2) |
| Housekeeping | 2 | (0.4) |
| Sanitarian | 5 | (1.1) |
| Laundry Staff | 8 | (1.7) |
| CSSD Staff | 1 | (0.2) |
| Forensic Staff | 2 | (0.4) |
| Technician | 11 | (2.3) |
| Pharmacy Technician | 22 | (4.6) |

From Table 1, it can be seen that this study was conducted on 476 respondents, with the majority being female, totaling 368 individuals (77.3%). Previous research has indicated that women's muscle strength is only 60% that of men's, which supports the reason why women are more likely to experience musculoskeletal disorders earlier than men. The largest group of respondents was in the age range of 31-40 years, totaling 189 people (39.7%), followed by the age range of 20-30 years with 144 people (30.3%). This is consistent with a study by Norus Sholeha, which explains that musculoskeletal disorders are mostly felt by respondents aged 30-43 years. [15] Another study by Brian Sri Prahastuti also proved that respondents aged 38 years and above have a high chance of experiencing musculoskeletal complaints .[16]

This study includes respondents with a wide range of body weights, with the majority falling within the 51-75 kg range, totaling 344 individuals (72.3%), followed by the 76-100 kg range with 68 individuals (14.3%). Previous research has shown that body weight is a factor that increases the risk of musculoskeletal complaints because

people who are overweight will try to support their weight by contracting the lower back muscles, which, if done continuously, will cause pressure on the spinal disc .[17]

The respondents in this study mostly fall within the height range typical of the average height of Indonesians, with the highest percentage in the 156-170 cm range, totaling 289 individuals (60.7%). The percentage of respondents with less than 6 years of work experience is the highest, totaling 186 individuals (39.1%), followed by respondents with 11-20 years of work experience, totaling 154 individuals (32.4%).

The number of respondents in the study is based on the professions present at Dr. M. Djamil General Hospital Padang. These respondents were selected considering the number of personnel in each profession to represent the respective profession in describing the possible complaints experienced according to their profession.

**Table 2.** Frequency Distribution of Responses to Questions on Experienced Complaints

| Complaints Experienced | Complaints | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | NP | (%) | SP | (%) | P | (%) | VP | (%) |
| Upper Neck Pain | 298 | 62.6 | 124 | 26.1 | 50 | 10.5 | 4 | 0.8 |
| Lower Neck Pain | 285 | 59.9 | 143 | 30 | 45 | 9.5 | 3 | 0.6 |
| Left Shoulder Pain | 312 | 65.5 | 113 | 23.7 | 49 | 10.3 | 2 | 0.4 |
| Right Shoulder Pain | 311 | 65.3 | 113 | 23.7 | 50 | 10.5 | 2 | 0.4 |
| Upper left Arm Pain | 385 | 80.9 | 67 | 14.1 | 23 | 4.8 | 1 | 0.2 |
| Back Pain | 244 | 51.3 | 150 | 31.5 | 76 | 16 | 6 | 1.3 |
| Upper Right Arm Pain | 373 | 78.4 | 72 | 15.1 | 29 | 6.1 | 2 | 0.4 |
| Lower back pain | 201 | 42.2 | 161 | 33.8 | 105 | 22.1 | 9 | 1.9 |
| Buttock pain | 340 | 71.4 | 95 | 20 | 37 | 7.8 | 4 | 0.8 |
| Lower Buttock Pain | 379 | 79.6 | 65 | 13.7 | 29 | 6.1 | 3 | 0.6 |
| Left Elbow Pain | 432 | 90.8 | 35 | 7.4 | 8 | 1.7 | 1 | 0.2 |
| Right Elbow Pain | 437 | 91.8 | 31 | 6.5 | 8 | 1.7 | 0 | 0 |
| Left Forearm Pain | 407 | 85.5 | 55 | 11.6 | 13 | 2.7 | 1 | 0.2 |
| Right Forearm Pain | 414 | 87 | 48 | 10.1 | 12 | 2.5 | 2 | 0.4 |
| Left Wrist Pain | 408 | 85.7 | 50 | 10.5 | 17 | 3.6 | 1 | 0.2 |
| Right Wrist Pain | 402 | 84.5 | 54 | 11.3 | 19 | 4.0 | 1 | 0.2 |
| Left Hand Pain | 407 | 85.5 | 45 | 9.5 | 21 | 4.4 | 3 | 0.6 |
| Right Hand Pain | 396 | 83.2 | 56 | 11.8 | 23 | 4.8 | 1 | 0.2 |
| Left Thigh Pain | 408 | 85.7 | 46 | 9.7 | 20 | 4.2 | 2 | 0.4 |
| Right Thigh Pain | 400 | 84 | 56 | 11.8 | 18 | 3.8 | 2 | 0.4 |
| Left Knee Pain | 341 | 71.6 | 93 | 19.5 | 39 | 8.2 | 3 | 0.6 |
| Right Knee Pain | 358 | 75.2 | 79 | 16.6 | 34 | 7.1 | 5 | 1.1 |
| Left Calf Pain | 313 | 65.8 | 120 | 25.2 | 39 | 8.2 | 4 | 0.8 |
| Right Calf Pain | 311 | 65.3 | 117 | 24.6 | 44 | 9.2 | 4 | 0.8 |
| Left Ankle Pain | 385 | 80.9 | 63 | 13.2 | 26 | 5.5 | 2 | 0.4 |
| Right Ankle Pain | 382 | 80.3 | 62 | 13 | 29 | 6.1 | 3 | 0.6 |
| Left Leg Pain | 350 | 73.5 | 81 | 17 | 37 | 7.8 | 8 | 1.7 |
| Right Leg Pain | 338 | 71 | 94 | 19.7 | 35 | 7.4 | 9 | 1.9 |

Note: NP (Not Pain), SP(Slightly Pain), P(Pain), VP (Very Pain)

Based on the above table 2, it is known that the complaint of severe pain is most felt in the lower back and right leg, namely by 9 people (1.9%), then in the left leg by 8 people (1.7%) and severe pain in the back by 6 people (1.3%). Based on the results above, it can be caused by imperfect work attitudes or positions, one of which is due to the high mobility in working. This must be considered in determining the causes and prevention so that the pain felt by officers can be reduced and not cause losses both to officers and work productivity.

**Table 3.** The Distribution of Frequency and Risk Levels of Musculoskeletal Disorder Complaints

| Risk | f | (%) |
|---|---|---|
| Low | 416 | (87.4) |
| Moderate | 53 | (11.1) |
| High | 7 | (1.5) |
| Sum | 476 | 100.0 |

In Table 3, based on the research findings, it was found that respondents with a low risk level of musculoskeletal disorder complaints numbered 416 people (87.4%), respondents with a moderate risk level numbered 53 people (11.1%), and those with a high risk level numbered 7 people (1.5%). For respondents with a high risk level, corrective actions are necessary to prevent this risk from progressing and causing work-related illnesses among the personnel.

## Discussions

Professions showing a high risk of musculoskeletal disorders at Dr. M. Djamil General Hospital Padang are nutrition processor with 3 individuals, followed by hospital orderlies/concierge with 2 individuals, and nurses with 2 individuals. The questionnaire revealed that these 7 individuals predominantly stand while performing their duties. This finding aligns with previous research conducted by Zifriyanthi et al., which demonstrated that nurses in surgical and non-surgical units experience musculoskeletal complaints.[8] Research by Fitri Annisa also concluded that nurses responsible for bathing patients in the ICU at Dr. M. Djamil General Hospital Padang have a high risk of musculoskeletal complaints.[7]

According to researchers, further studies are needed to identify factors that contribute to the high risk of musculoskeletal disorders among nurses. This is crucial for minimizing occupational health risks and improving the health of healthcare workers.

The study also found that the highest complaints were reported by nutrition processor , totaling 3 individuals. This indicates that nutrition processor at Dr. M. Djamil General Hospital Padang face a greater risk of musculoskeletal complaints compared to nurses and other professions. This could be due to various factors, including their predominant standing posture while working, as indicated by the questionnaire. Previous research has shown that nutrition service workers at Grhasia Mental Hospital also have a high risk of musculoskeletal disorders.[18,20] Researchers suggest further investigation into job positions and other factors contributing to complaints among nutrition processor at Dr. M. Djamil General Hospital Padang.

Another profession with a high-risk score in this study is hospital orderlies/concierge, known for their dominant standing and walking positions. This correlates with research on receptionists/guards at a hospital in Thailand, which found that improper work positions and postures contribute to low back pain among these workers.[19]

*Risk Managementand Preventive Strategies*

One initial step in controlling the risk of musculoskeletal complaints is to improve ergonomic interventions based on specific job demands. For nutrition processors, workstation adjustments such as height-adjustable tables and anti-fatigue mats should be considered. Nurses and hospital orderlies should be provided with training on safe patient handling techniques, and the use of assistive lifting devices should be encouraged.[13]

To reduce musculoskeletal strain, hospitals should implement scheduled stretching exercises, rotation of high-risk job tasks, and periodic ergonomic assessments. Future research should explore additional workplace modifications, such as adjusting shift durations and workload distribution, to further reduce the risk of musculoskeletal disorders.[11,12,21,22]

## Conclusions

Based on the measurement results of work-related musculoskeletal disorder (WMSD) risk levels using the Nordic Body Map (NBM) questionnaire, this study identified the prevalence and distribution of musculoskeletal complaints among different hospital professions at Dr. M. Djamil General Hospital, Padang. The findings indicate that nutrition processors, hospital orderlies, and nurses are the professions with the highest WMSD risk levels, primarily due to prolonged standing, repetitive movements, and heavy lifting tasks. The most frequently reported pain locations were the lower back and right leg (9 respondents, 1.9%), followed by the left leg (8 respondents, 1.7%) and upper back (6 respondents, 1.3%).

To mitigate these occupational health risks, hospitals should implement structured ergonomic interventions tailored to high-risk professions. These may include height-adjustable workstations for nutrition processors, assistive lifting devices for nurses and hospital orderlies, and periodic ergonomic assessments to ensure workplace safety. Additionally, mandatory ergonomic training and scheduled stretching exercises should be introduced to help reduce musculoskeletal strain and improve worker health.

Future research should explore additional factors influencing WMSD risk, such as shift work duration, workload intensity, and psychosocial stressors. Longitudinal studies could provide deeper insights into the progression of WMSDs over time and the effectiveness of ergonomic interventions. By addressing these occupational health concerns, hospitals can improve worker productivity, reduce absenteeism, and create a safer working environment for healthcare and non-healthcare staff alike.

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## Declarations of competing interest

No potential competing interest was reported by the authors.

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