



# Musculoskeletal Disorders Mapping among Workers of Community Health Center

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## ABSTRACT

**Background:** The second most common work-related disease has been identified as musculoskeletal disorders (MSDs). That affect muscles, tendons, ligaments, joints, peripheral nerves, and supporting structures are inflammatory and degenerative conditions. This study identified the job activity of community health centers with the risk of MSDs.

**Methods:** The Nordic musculoskeletal questionnaire (NMQ) was identified as a non-professional way of determining MSDs risk with modifications from statistical investigation models. The study was

conducted with fifty-seven respondents of workers at a community health center (CHC).

**Results:** The majority of respondents were female (82%) and showed obesity categories I and II. The correlation between age and work experience is 0.9. A prevalence of MSDs at the hand and wrist of 49% was found.

**Conclusion:** Workers at CHC experienced the mild category of MSDs in the hand and wrist regions. Age and work experience are risk factors for MSDs in CHCs.

**Keywords:** community, ergonomic, Nordic musculoskeletal questionnaire, musculoskeletal disorder, worker.

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## INTRODUCTION

The International Labor Organization (ILO) reports that 160 million work-related diseases occur annually worldwide. Musculoskeletal disorders (MSDs) have been identified as the second most prevalent work-related illness. MSDs are inflammatory and degenerative disorders that affect muscles, tendons, ligaments, joints, peripheral nerves, and supporting structures.<sup>1</sup> MSDs are a source of reduced quality of life, and musculoskeletal discomfort has become a public health issue. These previously reported findings point to the necessity for an epidemiological study of MSDs and their consequences on various populations in Indonesia, including Malang City, East Java Province. The high point of MSDs and the current trend toward pathology digitization prompted us to investigate the pattern and extent of muscle activity involved in their utilization of different types of devices. MSDs account for 1.7% and 3.4% of the total disease burden in developing and developed countries, respectively. That disorder accounted for 21.3% of the years spent disabled in the world (YLD).<sup>2,3</sup>

Workstations, positions, and professions are factors in MSDs in healthcare professions that account for more than 75%. Reports of healthcare workstations that have MSDs risk include surgeons, dentists, nurses, osteopaths, and physiotherapists. Previous studies specifically only described MSDs in certain professions.<sup>4,5</sup> MSDs were also reported in outdoor and indoor jobs with high physical

loads. However, this study mapped MSDs at each workstation in the first-level health service. Each workstation has different procedures following the level, task modification, and professional practice.<sup>5</sup>

Health and safety surveys can be used to investigate the relationship between job activities and MSDs. This can stymie the development of workplace prevention methods and early interventions.<sup>6,7</sup> There are classified methods for assessing MSDs, that are categorized into three; (1) direct methods is HADA Move-Human, Kinect System<sup>8</sup>, (2) indirect methods is Nordic Musculoskeletal Questionnaire (NMQ)<sup>9,10</sup>, Quick Exposure Check (QEC)<sup>10</sup>, Michigan Questionnaire<sup>11-13</sup>, Keyserling Questionnaire<sup>8</sup>, and (3) semi-direct method is Rapid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA)<sup>9,10,14</sup>, Ovako Working Posture Analysis System (OWAS)<sup>15</sup>, Posture Activity Tools and Handling (PATH), Body Discomfort Map, PLIBEL, Occupational Repetitive Action (OCRA)<sup>9</sup>, NIOSH Lifting Equation, Health and Safety Executive (HSE), Instituto de Biomechanica de Valencia (IBV)<sup>9</sup>, Psychophysical Upper Extremity Data, Posture and Repetition Risk Factor Index (PRRFI).<sup>8,16,17</sup>

This investigation uses the semi-direct NMQ as a non-professional way of determining the MSDs risk.<sup>6,17</sup> NMQ with the Indonesian version has a validity value of 0.8 and reliability above 0.9 based on Cronbach's alpha. The alpha value shows that all question items are consistently perfectly reliable. NMQ is also commonly utilized by researchers

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since it is simple to use and understand for various people. The NMQ body map is divided into nine anatomical regions. The regions analyzed for the right and left sides together were the neck, back, shoulder, elbow or forearm, hand or wrist, and legs or feet.<sup>18,19</sup> Meanwhile, the CHC workers perform repetitive movements in the same pattern every day. This pattern includes all elements in the NMQ assessment.<sup>5</sup> So this research aims to map the MSDs complaint region for all CHC workers. In addition to this, this study also aims to identify the dominant regions that experience MSDs.

## METHODS

This study aims to map MSDs in workers at all workstations. The mapping is to find out which workstations have the potential for MSDs. This research was conducted in September 2022 and has obtained research permission from the institutional review board of Universitas Muhammadiyah Malang, Indonesia with registration number 440/226/35.73.402.014/2022. This study was carried out after obtaining written informed consent from all participants. The stage of study is adopted and modified from statistical investigation models.<sup>9</sup>

### Participants

Participation in this study amounted to 57. The study used total sampling on CHC workers in Mojolangu Malang, East Java-Indonesia. The participants worked daily of 8 hours (07:00 AM-14:00 PM). The variables data characteristics were collected are sex, age, body mass index (BMI), job activity, and work duration.<sup>9,12</sup>

### Instrument and analysis data

The participant study included all workforce with various physical demands (repetitive, workspace, and forceful or awkward movement). The NMQ questionnaire was distributed to all participants. To facilitate completion, the questionnaire was used in the Indonesian language. The original questions consist of 28 items with right and left body maps to the presence of MSDs.<sup>4,9</sup>

This questionnaire can find out about the muscle that has problems with a ranging rate from not pain, rather a pain, pain, and very painful. The NMQ results can estimate the types and levels of problems, fatigue, and pain in the muscle felt by the worker.<sup>19</sup> The assessment process was carried out by respondents to provide a checklist of four-level categories. The participant-checked questionnaires were gathered. Each NMQ acquired has been estimated as a stage in the interpretation process.

The scoring is interpreted through the classification of risk levels or the Likert scale. The scale in the form of information has not been found with improvement measures with a scale of 1 (28-49), may be needed in the future measures with a scale of 2 (50-70), immediate measures with a scale of 3 (71-90), and a thorough action as soon as possible with a scale of 4 (92-122).<sup>9,10</sup>

The overall data obtained through the interpretation of the questionnaire is presented using tables and diagrams. The presentation uses descriptive studies to analyze the frequency and percentage of respondents' demographic characteristics, MSD complaints, and the dominance of professional level with MSDs risk.

## RESULTS

The population in the study included 57 respondents with a mean age of 36 years. The majority of respondents were female (82%), and a body mass index (BMI) of  $\geq 27$  kg/m<sup>2</sup> showed obesity category grade I and II (Table 1). The correlation between age and work experience was positive 0.9, indicating duration is the factor or determinant of the occurrence of MSDs.

The statistics Table 2 shows the deviation of the study results from the mean value of each characteristic. The four characteristics show that the standard deviation (SD) value is less than the mean value. In other words, the point value of each character is not further from the mean value.<sup>9</sup> Therefore, Table 2 represents the absence of the average distribution of data deviations.

Figure 2 shows a tabulation of the job activity at CHCWs. Midwifery (21%) is the most common job activity, followed by medical records (16%) and nursing (14%) in order. The other percentages are equally divided by dentistry, doctor, public health, and environment at 7%, pharmacy, nutrition, accounting, health analysis at 5%, cleaning service at 4%, ambulance driver, and parking officer at 2%.

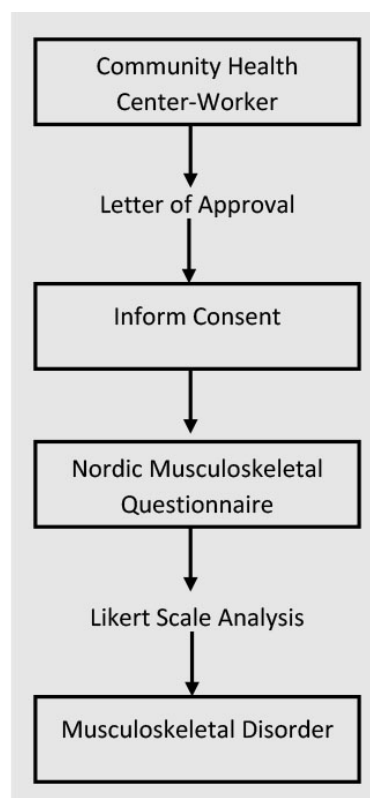
Figure 3 illustrates that there are three major issues among all respondents to the NMQ. Issues in the hand and wrist region had a mild category of 49%, and in the neck region, they had a moderate category of 37%. At the same time, interference in the back area of 14% is considered severe. Respondents over the age of 41 with long years of service account is the highest severity category. However, this study concentrates on the most common problems in the NMQ in general, specifically in the hand and wrist region. Respondents in this region complained about the average when they were  $\leq 30$  years old and had worked for  $\leq 5$  years (Table 1).

**Table 1.** Demographic characteristics of the respondent

Characteristics	Number of Respondents (n)	Presentation (%)
<b>Respondents</b>	57	100
<b>Age</b>		
21-30 years	25	44
31-40 years	16	28
41-50 years	10	18
≥51 years	6	11
<b>Gender</b>		
Male	10	18
Female	47	82
<b>Body Mass Index (BMI)</b>		
25-29.9	6	11
≥30	51	89
<b>Work Experience</b>		
≤5 years	24	42
6-10 years	3	5
11-15 years	14	25
16-20 years	8	14
≥21 years	8	14

**Table 2.** Descriptive characteristics of respondent

Characteristics	Statistics		
	Range	Mean	Standard Deviation
Age (years)	20-59	35.8	10.4
Work experience (years)	01-21	11.3	10.8
Body Mass Index (kg/m <sup>2</sup> )	27-53	37.7	6.14
Likert Scale of NMQ	28-98	51.0	20.0

**Figure 1.** Stage of study MSDs.

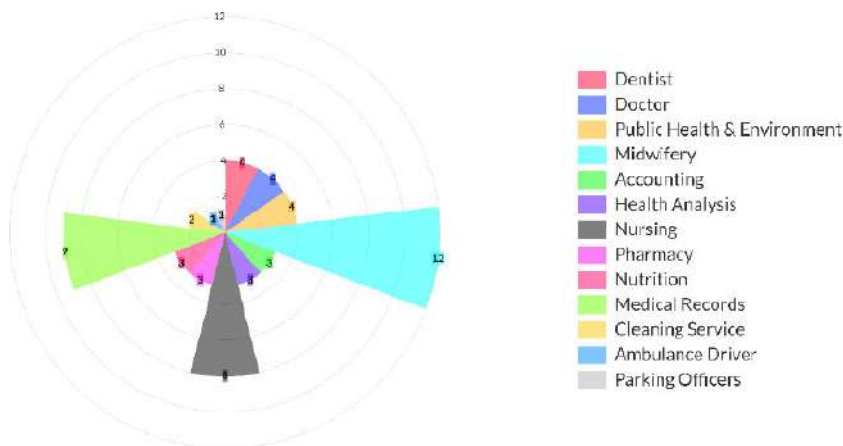
## DISCUSSION

Early detection is important to determine MSDs. The high NMQ grading points show that it is important to properly solve MSDs.<sup>20</sup> for CHC in the city of Malang, East Java, Indonesia. Problems in the hand and wrist region had the highest prevalence of the nine regions that were mapped (Figure 3). This prevalence also occurs in Europe.<sup>17</sup> The hand and wrist function is to work properly in all directions without any limitations. Normal hand and wrist function is a major part of daily life. The hand and wrist are fascinating biological motor systems that perform gross and fine motor activities.<sup>6,21</sup>

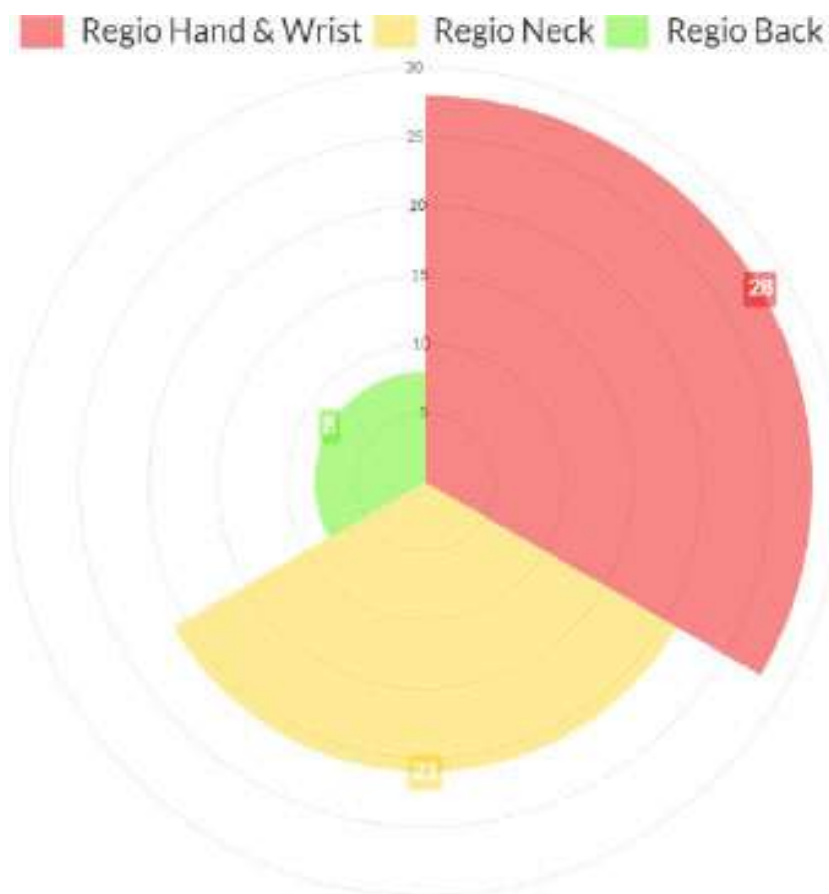
The prevalence in Figure 3 is dominated by respondents in the age range of 21-30 years with <5 years of work experience. The respondents averaged midwives, nurses, and medical records with a BMI category of 27 kg/m<sup>2</sup> (Figure 2). The NMQ remains reliable and valid in identifying the MSDs with normal or obese BMI categories. A pilot study on BMI ≥ 30 kg/m<sup>2</sup> conducted by Alberto Rassi Hospital (HGG), Goiânia, Brazil, showed sensitivity and specificity in all NMQ regions reaching 85%.<sup>18</sup>

Ergonomic behavior patterns in the usage of gadgets<sup>22</sup>, workstations, and mouse or keyboards are triggers for the disease in this study.<sup>23,24</sup> The hand and wrist are the most common regions for MSD problems. Tingling, numbness, and discomfort over the nerve distribution area are all common symptoms of muscle dysfunction.<sup>24</sup> The discussion of this study focuses on the ergonomics of input devices with corrected functional and ergonomic characteristics. Ergonomics, education, exercise, physiotherapy, and occupational health are some of the strategies for preventing MSDs. When particular intervention categories were examined, it was discovered that ergonomic interventions involving keyboard, mouse, and wrist rest adjustments did not have the desired effect on the tested conditions. Input devices are the most applicable interfaces for data entry and navigation. Intensive use of input devices with repetitive motion as well as wrist deviation, causes MSDs. The recommended use of input devices is less than 20 hours per week and more than that can result in carpal tunnel syndrome (CTS).<sup>3</sup> The design of input devices must be standard and ergonomic. Requirements for input devices involving the hand and wrist are suggested accordingly: neutral anatomical posture, improved movement of the hand and wrist or devices, minimizing pronation, and fitting and proper use of the user's hand.<sup>25</sup>

When ergonomic interventions were combined with or compared with education, positive results were obtained. Ergonomic hand and wrist



**Figure 2.** Polar graph of job activity at community health centers.



**Figure 3.** Polar graph of MSDs.

positions in neutral positions with modifying accessory settings (keyboard, mouse, wrist rest, and workstation) can reduce exposure. At the same time, education can be interpreted as a medium for studying to change workplace habits. Primary prevention device to intervene in workplace cultural aspects. Optimal results are shown when combined with physical exercise for 60-75 minutes. According to Nguyen, interventions that can prevent MSDs include education, assistive devices, regular control, and multi-interventions.<sup>26</sup>

The limitation of this study is that it does not ensure the anthropometric fit and proper operation of the input devices on CHC.<sup>24</sup> However, there is an interesting phenomenon the average level of complaints occurs in the young age group with a working period of  $\leq 5$  years. Whereas in previous studies, MSDs were influenced by the age factor.<sup>27</sup> The assumption is that this is influenced by productivity factors or senior-centricity in the service process. This assumption is reinforced by the relevance of job title and superior clinical care as risk factors for MSDs in the hospital environment.<sup>28</sup> Work culture factors in work activities are interesting themes to be discussed in future research.

## CONCLUSION

CHC workers in Mojolangu generally suffer from MSDs with mild severity in the hand and wrist regions. At the same time, the midwifery job activity has the highest potential for MSDs compared to others.

## CONFLICT OF INTEREST

The author declares there is no conflict of interest regarding the publication of this study.

## ETHICAL CONSIDERATION

This study has obtained research permission from the institutional review board of Universitas Muhammadiyah Malang, Indonesia, with registration number 440/226/35.73.402.014/2022, and each participant agreed to participate and signed the written informed consent.

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## AUTHORS CONTRIBUTIONS

BP conceived the study design, collected the data, and drafted the manuscript; AHB, MYN, and WW collected the data, searched the literature, drafted the manuscript, and reviewed the manuscript.

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