
Research Article

Literature Review : Effect Of Static Conditions On Musculoskeletal Disorders (MSDs)

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ABSTRACT

Musculoskeletal disorders are disorders that occur in one of the skeletal organs or muscles of the body such as congenital abnormalities in the upper and lower extremities, nerve and muscle disorders, inflammatory infections of bones and joints, musculoskeletal metabolic disorders, degenerative musculoskeletal disorders (spine, upper extremities) and below). The study aimed To analyze the static condition of the workers' complaints of musculoskeletal disorders (MSDs). Using literature review with scoping review method. The data was collected through internet searches using Google Scholar and PubMed with the keywords static conditions, complaints of MSDs, ergonomic position, musculoskeletal disorders, the influence of static conditions, with a range of research years is 2015-2020. Results found 83 articles matching the keyword. A review of 9 research articles that met the inclusion criteria found 4 aspects, namely the factor of length of work more than 1 year, age, working hours and using the same extremity for a long period of time will increase the risk of MSDs, Doing work in awkward positions for 5- 8 hours/day increases the risk of MSDs in workers, especially nurses, The emergence of MSDs symptoms is higher in women, namely in the lower back and neck area, The pain felt due to MSDs disorders can be severe, namely in the lower back, shoulders, neck, wrists , knees and ankles. There is a relationship with static positions/non-ergonomic conditions at work, these non-ergonomic conditions do not directly cause complaints but in the long term complaints will arise. The female gender is at high risk of experiencing MSDs, the length of work and length of time working will affect the emergence of MSDs, there are 12 static conditions found in someone when doing work, the main complaint that appears in MSDs is pain.

Keywords: static condition, musculoskeletal complaints, MSDs

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Introduction

Musculoskeletal is an integral part of humans consisting of the skeletal structure that supports the body and muscles that can convert the body's chemical energy into mechanical energy so that coordination occurs to move the skeleton [1]. Musculoskeletal disorders (MSDs) are disorders that occur in one of the skeletal organs or muscles of the body. It includes congenital abnormalities in the upper and lower extremities, nerve and muscle disorders, inflammatory infections of bones and joints, musculoskeletal, metabolic disorders, degenerative musculoskeletal disorders (spine, upper and lower extremities). [1].

According to research conducted by Baringbing, the prevalence of musculoskeletal disorders in nurses' work is 40-80%. As many as 81.1% of nurses also experienced musculoskeletal disorders at Dr. RSUP. M Djamil Padang's complaints appear on the shoulder 49.2%, neck and lower back 41.7%, and the upper back 32.6% [2]. In farmers in Iran, it was found that 59.3% had problems with the lower back, 36.9% had problems with the lower extremities, namely the knees, 36.6% had problems with the upper back, 36.5% had problems with the knees, and 36.2% had problems with the neck and shoulders [3]. Besides, a study on convection workers Pademangan, found that 46 (56.8%) workers felt complaints in the neck, 42 (51.9%) in the waist, and 32 (39.5%) on the back during the last 12 months. The problems are because convection workers are required to work in a sitting position for a long time where the muscles work more constantly to support the body in static conditions such as in the neck, back, and waist [4].

Meanwhile, for STIKES workers in Palembang who stated that the results were as many as 20 (62.5%) people experienced Low Back Pain (LBP) with an unergonomic position at work experienced by 20 (62.5%) people. This musculoskeletal disorder will undoubtedly affect one's work and even physical condition [5]. If these MSDs are not given preventive measures, there will be damage/injury to the musculoskeletal system. So it is necessary to watch out if the workers experience complaints in the bones and muscles [6]. Ergonomic studies on nursing actions found that work

positions that are not ergonomic or not static if left continuously, will cause Low Back Pain complaints to appear. This study also mentions several nurse work positions that cause low back pain complaints, such as when performing wound care, taking venous blood, and giving suppository drug therapy. Everyone unconsciously experiences conditions such as the above. In this case, we often call them static conditions or conditions that remain unchanged for a long time [2]. Work position is a condition or body position to carry out physical activities following the scope of work or task requirements. This will cause the body position to be unnatural or not following the original posture or often referred to as an awkward position (awkward posture). As a result of this awkward posture will cause various problems in the body due to inefficient transfer of energy between muscles and skeletal tissue, resulting in injury [3].

Musculoskeletal complaints often appear unnoticed by many people as well as the causes. Some literature discusses this separately on complaints that arise, so the idea occurs to review the literature relating to static conditions that affect the emergence of MSDs.

Materials and Methods

This research used a literature study or literature review method with a scoping review approach. The data used in this study are journals published nationally and internationally in the last five years. The authors searched for journals through Google Scholar and Pubmed, with the keywords: static conditions, complaints of musculoskeletal disorders (MSDs), ergonomic position, musculoskeletal disorders, the influence of static conditions. The criteria for the journal to be reviewed are research study with inclusion criteria, included Indonesia and English language, full-text original research articles, and any kind of job. Besides, Exclusion criteria is review papers, commentaries, editorial, and book.

The analytical method used is to analyze the article's contents. The coding is carried out in each piece utilizing the theme of the influence of ergonomic position, static conditions, and complaints of MSDs. Relevant articles are collected and summarized based on the name

of the researcher, year of publication, country, research objectives, research design used, number and method of samples, and research results or findings.

Results and Discussion

An overview of the types of static conditions experienced by workers

Anyone with different types of work can experience static conditions. The results of this article review identify 12 conditions that cause respondents to experience MSDs. Workers can repeat one condition/position several times a day, and within 12 months, complaints of musculoskeletal disorders (MSDs) appear. Work activities that cause static conditions are rotating the body, holding objects with one hand, walking, sitting to standing positions, dominantly using one hand when working, lifting/moving living/inanimate objects, repeating the same movement, bending, awkward situations, presence of psychological factors and work with a duration of more than 5 hours every day. In the last 12 months, workers had complaints of musculoskeletal disorders as many as 78 people (96.3%). Workers

complained that these disorders had prevented them from doing housework or outside the home in the last 12 months. One study found convection workers that always work in a sitting position with a bent who sometimes does not wear a pillow on the back. The situation refers to as a static position because in a similar condition for a long time [4].

A total of 24 farmers (85.7%) have a high risk of working with musculoskeletal disorder due to poor work attitude, so there is a significant relationship between work posture and musculoskeletal disorder complaints. This lousy work attitude is caused by several factors that do not match the conditions in the field, that all farmers who do a long-standing work attitude without even stretching the slightest [3]. According to the aspects that appear in the article review, doing work in an awkward position for 5-8 hours/day increases MSDs in workers, especially nurses. An awkward position is a body position that experiences significant deviations from a neutral position, categorized as an unsafe position or a dangerous ergonomic position [7].

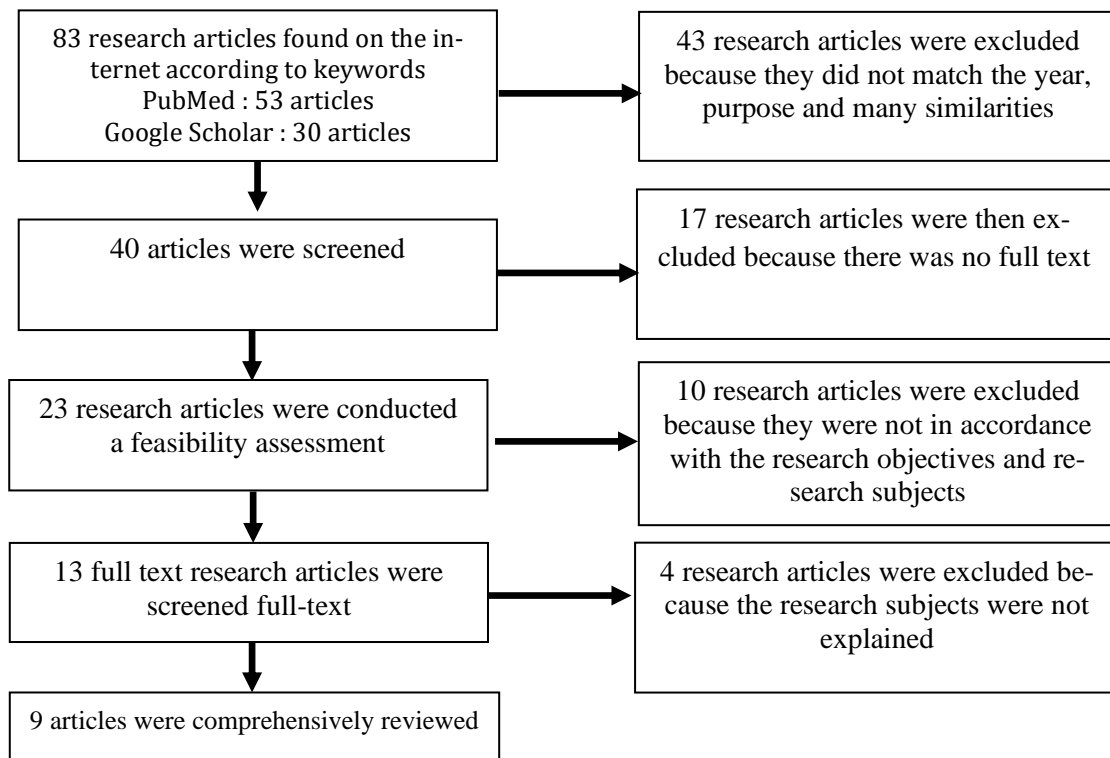


Figure 1. Literature Selection Process

Table 1 Study the Effect of Static Conditions on Complaints of Musculoskeletal Disorders (MSDs)

Researcher, Country	Research purposes	Design, Instruments Methods of Research Analysis	Number of samples, sample method	Findings	Aspect
Hossain MD, Aftab A, Al Imam MH, Mahmud I, Chowdhury IA, Kabir RI, Sarker M. (2018) Bangladesh [8]	To determine the prevalence of work-related MSDs at 9 (nine) body points in garment factory workers in Bangladesh	<i>Cross sectional</i> , the instrument uses a questionnaire about worker demographics, a <i>Nordic Musculoskeletal Questionnaire-Extended</i> (NMQ-E) and <i>Quick Exposure Check</i> (QEC) questionnaire.	To determine the sample, the WHO formula used the formula $n = Z^2 P(1-P)/d^2$ with a precision level of 5% and a <i>confidence interval</i> (CI) of 95%. The number of samples is 232 workers from 9 factories with 46 men and 186 women	Characteristics of respondents , the average age is 31.3 years, education level with primary education is 44%, 49.6% as tailor and 95.7% work overtime. Around 40% of respondents get a monthly salary including overtime pay, 10-15 years work experience as much as 89.7% The average weight, TB and BMI are 55.09kg, 1.53 m and 23.51 kg/m ²	Working longer than 1 year, age, working hours and using the same extremity for a long time will increase the risk of MSDs.
Jain R, Meena ML, Dan-gayach GS, Bhardwaj AK. (2018). Rajasthan, India [9]	to find the prevalence of MSDs and the risk factors that influence it (individual – <i>work related</i>) among farmers who harvest manually	The research was <i>cross sectional</i> . The instrument used was a questionnaire. Data analysis using IBM SPSS version 22.0	The subjects of this study were 140 farmers in the field consisting of 114 men and 26 women The sample selection method used is the formula $S1-ovin's$	The results showed that the high prevalence of MSDs was found in the trunk. As many as 77.9% of respondents had MSDs experience in one or more parts of their body within the last 6 months. The body parts that are often complained of are the fingers (64.2), wrists (55.7) and shoulders (57.1%) about 74% of respondents complained about the lower back.	Working longer than 1 year, age, working hours and using the same extremity for a long time will increase the risk of MSDs.
Aleid, AA, Eid Elsh-nawie, HA, & Ammar, A. (2021). Saudi Arabia [10]	To examine work activities related to the incidence of MSDs in nurses who work in intensive care rooms	This study used a <i>cross sectional</i> design with a questionnaire research instrument with closed questions. Data analysis using IBM SPSS <i>Statistics Program version 25.0 Spearman's rank correlation coefficient</i> analysis	Samples were taken using the <i>convenience sample</i> method for all nurses working in the adult ICU ward, pediatric ICU room, cardiac intensive care unit and emergency room with a confidence level of 93% and a margin of error of 7%.	1. There is a significant relationship between work activities and MSDs in critical care unit nurses. 2. The increasing prevalence of MSDs in nurses is related to various risk factors, namely working <i>long shifts</i> , working in incorrect positions, working conditions with physical stress, handling patients manually.	Doing work in an <i>awkward</i> position for 5-8 hours / day increases the risk of MSDs in workers, especially nurses
Ou, YK, Liu, Y., Chang, YP, & Lee, BO (2021). Taiwan [11]	To increase understanding of the settings that contribute to the occurrence of MSDs in nurses	The research design used cross sectional. Data analysis using SPSS version 22.0. The research instrument used is a questionnaire	The sample in this study were nursing staff at a Taiwan teaching hospital. Subjects were collected by means of open and voluntary invitations.	Based on the results of demographic data , there is a large gender gap, namely 98.3% (115 people) of respondents are women and 1.7% (2 people) are men, 28.2% (33 people), for a history of pregnancy of (71.8%) There are significant difference in the lower limb risk of respondents in different departments. The results of the post hoc test showed that the risk	Doing work in an awkward position for 5-8 hours / day increases the risk of MSDs in workers, especially nurses

Ride G, Khan MR. (2020). India [12]	To evaluate the prevalence of musculoskeletal risks inherent in floor mopping duties among cleaning professionals in India	The design of this research is experimental with a cross sectional research method approach The research instrument used was a questionnaire, <i>surface EMG</i> and RULA analysis (<i>rapid upper limb assessment</i>). The statistical analysis used is IBM SPSS statistics version 24.0 , <i>Pearson's correlation</i>	The sample used is 132 workers, the sampling method is not explained in this article	factor with the highest score was experienced by respondents in the emergency department (17.36), Based on the results of the characteristics of the respondents, it was found : Age ranged from 20 - 59 years and height 1.42 - 1.78 m, female sex of which there were 55 respondents from 45.5% of the population, the majority of the population 45.5% had elementary school education (SD), illiterate (31.1%), high school education (21.2%), bachelor degree (2.3%). About half of the respondents selected for the questionnaire study had done cleaning work with experience of MSDs in various limbs of 1-5 years of mopping attendants. There is a relationship between work experience and musculoskeletal pain	Factors that work longer than 1 year, age, working hours and using the same extremity for a long time will increase the risk of MSDs.
Nguyen, TH, Hoang, DL, Hoang, TG, Pham, MK, Bodin, J, Dewitte, JD, & Roquelauve, Y. (2020) Vietnamese [13]	To describe the prevalence and multisite musculoskeletal characteristics among district hospital nurses in Hai-phong Vietnam	Research Design : <i>cross sectional</i> Research instrument : using two questionnaires, namely the <i>Modified Nordic Questionnaire</i> which is a questionnaire based on the <i>Standardized Nordic Questionnaire</i> Statistical Test Analysis : SPSS version 19.0, to test statistical data using <i>Chi Square Test</i> or <i>Fisher's calculation</i>	Research sample: all nurses who work in 15 district hospitals in Hai-pong city, Vietnam with a total of 1179/127 with an average respondent of 92.2% of nurses surveyed. 100 of them refused to be respondents because they were not present at the interview Not clearly explained	Sociodemographic characteristics : 81.3% of respondents are women, the average age of male respondents is 32.3 years and female respondents is 32.6 years, there are two types of work positions in this study, namely: administrative nurse 9.4% and clinical nurse 90.6%, mostly nurses have worked for a long time in their position: 94.7% worked > 1 year, 65.4% > 5 years, 31% > 10 years, and 15.5% > 15 years	The emergence of MSDs symptoms is higher in women, namely in the lower back and neck area
Zhang, Y., ElGhaziri, M., Nasuti, S., & Duffy, JF (2020) USA [7]	To describe the prevalence of comorbid MSDs and depression in hospital nurses and to examine the association of comorbidities with various physical and psychosocial work conditions among hospital nurses.	Research Design : Cross Sectional Instrument used: a questionnaire with a Linkert scale to assess MSDs and pain felt by nurses Analysis/Statistical Test: <i>SPSS Software version 24.0</i> using <i>T-test</i> and <i>Chi-Square test</i> , then to test the relationship between working conditions using <i>Spearman Correlation</i>	The sample in this study were registered nurses and licensed practicing nurses at an independent and nonprofit community hospital in the northern US with a total of 397 nurses. <i>Non-probability sampling method</i>	MSDs Disorders : almost half of respondents 47.4% reported MSDs of some degree (moderate, severe or extreme pain in one part of the body). The musculoskeletal pain was felt in the following areas: lower back 63.0%, shoulder 42.4%, neck 50.6%, wrist 24.2%, knee 35.0% and ankle/foot 39.3%. There is a significant relationship between comorbidities with work control and family conflict. There is no significant relationship between shift work and nurse comorbidities	The pain felt due to MSDs can be severe, namely in the lower back, shoulders, neck, wrists, knees and ankles.

<p>Thinkhamrop, W., Sawaengdee, K., Tangcharoensathien, V., Theerawit, T., Lao-hasiriwong, W., Saengsuwan, J., & Hurst, CP (2017) Thailand [14]</p>	<p>To estimate the prevalence of MSD among nurses</p>	<p>Research design : Cohort Study with data collection from the Thai Nurse Cohort Study (TNCS). Instrument used: questionnaire. Statistical analysis/test used: STATA version 13 using Chi Square-test and Odds Ratio</p>	<p>Number of samples: 50,209 nurses Sample method: random sampling with probability</p>	<p>Prevalence of MSDs: the prevalence of MSDs at 12 months was 47.8%. The prevalence of MSDs was higher among the older age group, those with long work duration, high body mass index and those who worked night shifts.</p>	<p>Factors that work longer than 1 year, age, working hours and will increase the risk of MSDs using the same extremity for a long time</p>
<p>Dong, H., Zhang, Q., Liu, G., Shao, T., & Xu, Y. (2019). China [7]</p>	<p>To determine the prevalence of work-related MSD among healthcare professionals (HCP) in tertiary hospitals in Mainland China and to measure the association of potential factors associated with MSD in various body locations.</p>	<p>Research design : not explained The instrument used is a questionnaire, with 4 question points, namely the characteristics of the respondents, modifications of the Standardized Nordic Questionnaire, ergonomic factors, and psychosocial factors. Analysis/Statistical Test : Multivariable logistic regression to examine the relationship between psychology, ergonomics, organizational and individual factors with MSDs</p>	<p>Number of samples: 14,720 healthcare professionals in 8 tertiary hospitals : random cluster sampling</p>	<p>Ergonomic factors, low back MSDs associated with frequent bending of the body, lifting heavy/awkward weights and bending/turning the neck, knee MSDs associated with walking/standing for long periods, and shoulder MSDs associated with maintaining shoulder adduction for a long time and bending/ twist neck</p>	<p>Doing work in an awkward position for 5-8 hours / day increases the risk of MSDs in workers, especially nurses</p>

Overview of complaints that appear on MSDs

Based on the results of the article review, it can be identified that the complaints that arise in MSDs are a pain in the area that is experiencing the disorder that preceded by a sense of discomfort in that area. Work that lasts for a long time without rest will reduce the body's ability and cause pain in these limbs. Workers who work between 7-8 hours every day will cause the muscles to work more so that the risk of back pain will increase. The study was conducted on batik workers concluded that there was a significant relationship between tenure and the incidence of complaints of low back pain. Work that is done continuously, physical stress over a period of time will cause disturbances in the body, reduced performance in muscles. The complaints often felt by farmers are in the abdominal, back, and spine muscles [3].

Overview of the effect of static conditions on MSDs complaints

Based on the article review results, there is a relationship between position/static conditions at work on MSDs complaints. There is a solid relationship between work posture and complaints of MSDs, and this is evidenced by the Spearman coefficient (r) of 0.770 [6]. Another study found a significant relationship between MSDs and the Rapid Upper Limb Assessment (RULA). Correlation analysis showed a meaningful relationship in the neck, shoulders, and back areas. These workers have 2 (two) risks, namely high levels of MSDs and high ergonomic risks as well. At least 88.4% of employees experience MSDs in one of their limbs due to poor posture in their workplace [15].

Based on the analysis results, the presence of MSDs in workers is caused because many employees do not use chairs while working, do not use armrests. The arms are supported by a table which often causes elevation of the shoulders, causing an increase in neck and shoulder muscle tension [15]. The position of the mouse on the table and the type of chair used by office workers were associated with shoulder pain in female workers ($p < 0.05$), working in the office in a sitting position for a long time and the level of work stress had a positive relationship with

pain complaints—feet in female workers ($p < 0.05$). Workplace and shoulder position when working at a desk have a relationship with wrist pain in female workers ($p < 0.05$). In addition, individual characteristics such as Body Mass Index (BMI), daily exercise habits have a relationship with complaints of wrist pain in male workers ($p < 0.05$) [16].

Conclusion

There are 12 static conditions found when a person is doing work, namely turning the body, holding objects with one hand, walking, sitting to standing positions, dominantly using one hand when working, lifting/moving living/inanimate objects, repeating the same movement, bending, positioning awkward, psychological factors and work with a duration of more than 5 hours every day.

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