ANALYSIS OF ERGONOMIC RISK FACTORS ON THE LIKELIHOOD OF MUSCULOSKELETAL DISORDER COMPLAINTS AMONG NURSES IN THE ICU, CVCU, AND PICU AREAS OF ARIFIN ACHMAD HOSPITAL, RIAU PROVINCE

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Abstract
Musculoskeletal disorders (MSDs) are a common health problem in health workers, especially nurses in intensive care units. This study aims to analyze the relationship between ergonomic risk factors and MSDs complaints in nurses. This study was conducted in March 2025, with a sample of 69 intensive care nurses and the technique used was purposive sampling using data taken from the questionnaire. The research method used was descriptive analysis with a Cross Sectional design. The results of the analysis carried out using the Spearman Rank test explained that there was a relationship between work posture variables and MSDs complaints with a p value 0.05. Based on this study, it is recommended that nurses control the risk of musculoskeletal disorders by paying more attention to ergonomic body posture. This can be done through special training on body posture and redesigning the work environment to be more ergonomic, so that the health and safety of nurses are maintained.

Keyword: Ergonomic Risk, MSDs, REBA, NBM, Intensive Care Nurses.

INTRODUCTION

Musculoskeletal Disorders (MSDs) are soft tissue injuries caused by exposure to repetitive movements, force, vibration, and awkward positions [1]. Most of these occurrences are due to incorrect posture while working or Work-Related Musculoskeletal Disorders (WMSDs) [2]. Musculoskeletal disorders are the second leading causes of disability worldwide, measured in terms of years of productive life lost due to disability (Years Lived with Disability (YLDs)) [3].

Nurse charged to provide comfort to patients so that they can improve intensive care Based on research their quality of life, one of which is in nurses conducted by Sezgin (2015) in Fitri [4], it was that intensive care nurses are at high risk in found with terms of ergonomics. Compared to clinical other, nurses working in critical care units exert significant physical effort to meet patient needs, increasing their vulnerability to MSDs. Over the past two decades, the development of MSDs has been reported more frequently in critical care unit nurses compared to clinical care unit nurses [5]. A study conducted by Amer [6], reported that nurses working in the Intensive Care Unit have a higher risk of experiencing lower back pain (79.3%), knee pain (72.4%), shoulder pain (72.4%), neck pain (62.1%), and elbow pain (8.6%). This is understandable given the activities of nurses such as performing TTV examinations,

administering medication, setting up IVs, bathing patients, and moving patient beds, which are that work often involve the use of joint muscles [7].

The World Health Organization (WHO) states that musculoskeletal disorders can occur due to various factors, both related to the individual, such as age, gender, fitness, and anthropometry, as well as occupational factors, such as repetitive movements at work and non-ergonomic working positions. Furthermore, physical environmental factors, such as vibration and temperature, can also contribute to these disorders. Improper work posture is one of the ergonomic factors that most influence the emergence of musculoskeletal complaints. Therefore, an ergonomic risk evaluation is necessary to identify and mitigate their impact.

Arifin Achmad Regional General Hospital is a healthcare facility that provides inpatient and outpatient services, as well as various other medical services. This hospital serves as a workplace for medical and non-medical personnel who are at risk of facing various potential hazards, including nurses who are at high risk in this work environment.

A preliminary study conducted by researchers through interviews with nine intensive care nurses at Arifin Achmad Regional General Hospital, Riau Province, found that six of the nine nurses experienced musculoskeletal disorders, with the most common complaints being in the back and calves. In addition to pain, other complaints included burning, aching, tingling, and throbbing. One respondent also complained of prolonged pain that limited their activities. This occurs because some jobs still require manual labor without the aid of tools, such as lifting patients with varying weights. Although the work is carried out by more than one nurse, it does not rule out the possibility for nurses to maintain an ergonomic body position so that this can trigger musculoskeletal complaints in nurses caused by non-ergonomic work postures.

Therefore, to find out what factors most influence musculoskeletal complaints in intensive care nurses, this study aims to analyze ergonomic risk factors for the possibility of musculoskeletal disorders in nurses in the ICU, CVCU and PICU rooms of Arifin Achmad Regional Hospital, Riau Province.

RESEARCH METHOD

This study employed a quantitative research method using a descriptive design with a cross-sectional approach. The population consisted of 84 nurses, with a sample size of 69 nurses (purposive sampling). The research variables consisted of independent variables (age, length of service, work period, body mass index, work posture) and dependent variables (complaints of musculoskeletal disorders (MSDs)). The data collection techniques used were questionnaires and observations.

The questionnaires used were the Nordic Body Map questionnaire to measure respondents' musculoskeletal complaints, and the Rapid Entire Body Assessment (REBA) questionnaire, which was completed by observing and measuring the angles of each point described in the REBA questionnaire by taking pictures of one of the nurses' actions to be analyzed. The data analysis used includes three methods: univariate analysis, bivariate analysis (Spearman rank test), and multivariate analysis (multiple linear regression), which will be tested in SPSS software.

RESEARCH RESULTS
Univariate Analysis
a.   Respondent Characteristics

Table 1. Distribution of respondents based on characteristics

Age	Number N	Precentage (%)
Early Adulthood (25-35)	29	42.0
Mature End (36-45)	31	44.9
Early Elderly (46-55)	8	11.6
Late Elderly (56-65)	1	1.4
Total	**69**	**100**
Gender	Number N	Precentage (%)
Male	4	5.8
Female	65	94.2
Total	**69**	**100**
Length of Service	Number N	Precentage (%)
< 8 hours	39	56.5
8 hours	23	33.3
> 8 hours	7	10.1
Total	**69**	**100**
Work Period	Number N	Precentage (%)
< 5 years	14	20.3
5 years	8	11.6
> 5 years	47	68.1
Total	**69**	**100**
BMI	Number N	Precentage (%)
Underweight	1	1.4
Normal	44	63.8
Overweight	18	26.1
Obesity	6	8.7
Total	**69**	**100**

Source: Primary Data, 2025

Based on Table 1, the data shows that the majority of respondents were in the late adult age group (36-45) years old, 31 respondents (44.9%), with the majority being female, 65 respondents (94.2%), the majority worked for < 8 hours, 39 respondents (56.5%), worked for > 5 years (47 respondents, 68.1%), and a normal BMI range (44 respondents, 63.8%).

b.   Respondent Work Posture

Table 2. Distribution of Respondents based on Work Posture

Work Posture	Number	Precentage
	N	(%)
Risk Ignored	3	4.3
Low	13	18.8
Moderate	43	62.3
High	10	14.5
Total	**69**	**100**

Source: Primary Data, 2025

Based on Table 2, it was found that the majority of respondents with a moderate work posture category numbered 43 (62.3%).

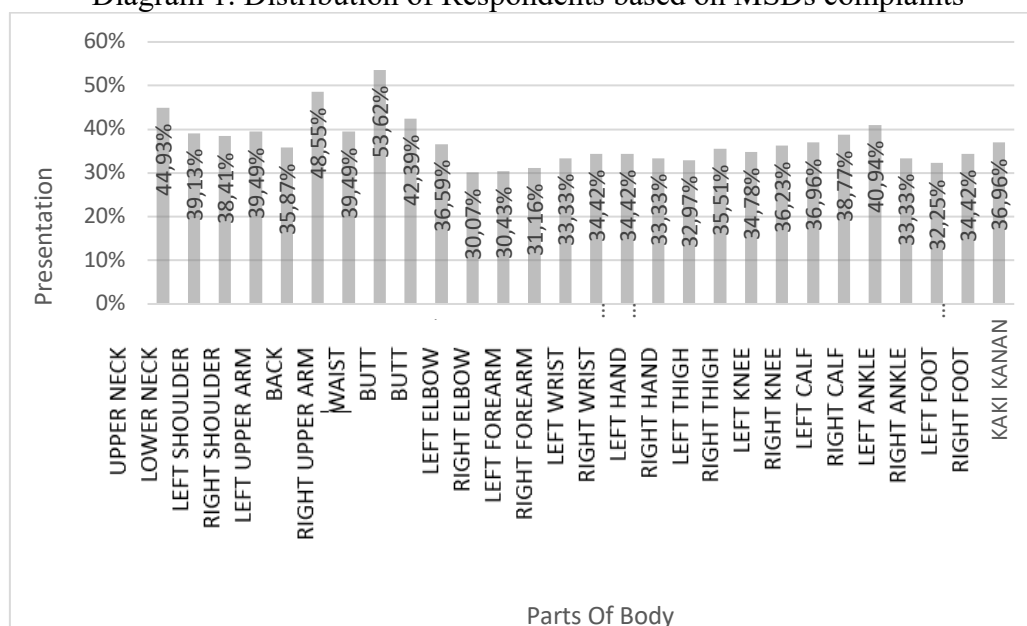c.   Musculoskeletal Complaints

Table 3. Distribution of Respondents Based on Musculoskeletal Complaints

Musculoskeletal Complaints	Number N	Precentage (%)
Low	52	75.4
Moderate	16	23.2
High	1	1.4
Total	**69**	**100.0**

Source: Primary Data, 2025

Based on Table 3, it was found that the majority of respondents experienced low-level MSDs, namely 52 (75.4%).

Diagram 1. Distribution of Respondents based on MSDs complaints

Source: Primary Data, 2025

Based on Diagram 1, it was found that the majority of respondents experienced musculoskeletal complaints in the waist area (53.62%), followed by complaints in the back (48.55%) and upper neck (44.93%).

Bivariate Analysis

a. Analysis of the Relationship between Age and MSD Complaints

Table 4. Analysis of the Relationship between Age and MSD Complaints

Variables	r	P value
Age Complaints MSDs	0,190	0,117

Source: Primary Data, 2025

Based on Table 4 above, the results of the correlation test using the Spearman's rank correlation test obtained a p-value of 0.117>0.05, which can be interpreted as indicating that there is no relationship between age and MSD complaints.

b. Analysis of the Relationship between Length of Service and MSD Complaints

Table 5. Analysis of the Relationship between Length of Service and MSD Complaints

Variables	r	P value
Length of Service MSDs Complaints	-0,152	0,212

Source: Primary Data, 2025

Based on Table 5 above, the results of the correlation test using the Spearman's rank correlation test obtained a p-value of 0.212 > 0.05 which can be interpreted as indicating no relationship between length of service and MSD complaints.

c. Analysis of the Relationship between Work Period and MSDs Complaints

Table 6. Analysis of the Relationship between Work Period and MSDs Complaints

Variables	r	P value
Work Period MSDs Complaints	0,013	0,917

Source: Primary Data, 2025

Based on Table 6 above, the results of the correlation test using the Spearman's rank correlation test obtained a p-value of 0.917 > 0.05 which can be interpreted as indicating no relationship between Work Period and MSD complaints.

d. Analysis of the Relationship between BMI and MSDs Complaints

Table 7. Analysis of the Relationship between BMI and MSD Complaints

Variables	r	P value
BMI MSDs Complaints	-0,222	0,067

Source: Primary Data, 2025

Based on Table 7 above, the results of the correlation test using the Spearman's rank correlation test obtained a p-value of 0.067 > 0.05 which can be interpreted as indicating that there is relationship between BMI and MSD no complaints.

e.   Analysis of the Relationship between Work Posture and MSD Complaints

Table 8. Analysis of the Relationship between Work Posture and MSD Complaints

Variables	r	P value
Work Posture MSDs Complaints	0,287	0,017

Source: Primary Data, 2025

Based on Table 8 above, the results of the correlation test using the Spearman's rank correlation test obtained a p-value of 0.017 < 0.05 which can be interpreted as indicating a relationship between work posture and MSD complaints. The relationship between the two is moderate (0.26-0.50) with a correlation coefficient (r) value of 0.287, which means that the work posture variable has a positive or unidirectional relationship with the MSD complaints variable.

Multivariate Analysis

Table 9. Analysis of the Influence of Age, Length of Service, Work Period, BMI, and Work Posture on MSDs Complaints

Variables	P value	Partial Hypothesis Test (t)	Simultaneous Hypothesis Test (F)	R Square	Regression Coefficient (β)
Age	0.563	0.582			0.157
Length of Service	0.474	-0.720			-0.480
Work Period	0.929	0.089	2.849 Sig. 0,022	0.429	0.031
BMI	0.055	-1.959			-0.817
Work Posture	0.008	2.731			1.304

Source: Primary Data, 2025

Based on Table 9, it can be seen that the result for the age variable has a p-value of 0.563 > 0.05 with a calculated t-value (0.582) < t-table (1.999). This indicates that there is no effect of the age variable on MSD complaints.

The results for the length of service variable with a p-value of 0.474 > 0.05 with a calculated t-value (-0.720) < t-table (1.999). This indicates that there is no effect of the length of service variable on MSD complaints.

Results for the work period variable with a p-value of 0.929 > 0.05 with a t-value of (0.089) <t-table (1.999). This indicates that there is no effect of the work period variable on MSD complaints.

The results for the BMI variable with a p-value of 0.055 0.05, with a t-value of (-1.959) < t-table (1.999). This indicates that there is no effect of the BMI variable on MSD complaints.

The results for the work posture variable with a p-value of 0.008 < 0.05, with a t-value of (2.731) > t-table (1.999). This indicates that there is an effect of the work posture variable on MSD complaints, with a positive correlation coefficient, which can be interpreted as meaning that if the work posture variable increases, MSD complaints will also increase.

The results of the simultaneous hypothesis test (F) had a p-value of 0.022 <0.05, and the calculated F (2.849) was greater than the table F (2.36). This means that the five independent variables (age, length of service, work period, BMI, and work posture) collectively influence or have a significant relationship with the dependent variable of MSD complaints.

The regression coefficient (β) is used to determine which variable has the greatest influence on the MSD complaints variable. The larger the beta value, the greater its influence on the dependent variable. In the results above, it is known that the independent variable with the greatest influence is work posture with a beta value of 1.304.

Thus, it can be concluded that this multiple regression model is valid for use, and the independent variables, which include age, length of service, work period, BMI, and work posture, have a simultaneous effect on the dependent variable of MSD complaints. The coefficient of determination (R square) is 0.429, where the five independent variables can explain the MSDs variable by 0.429 * 100 = 42.9% while the remaining 57.1% is explained by other variables outside the variables studied.

DISCUSSION

1. Relationship between Age and MSDs Complaints

The results of the study showed that, among 69 respondents, there was no relationship between age and MSD complaints. This is consistent with the results of the multivariate test, which showed that the age variable had a p-value of 0.563 (> 0.05), with a calculated t-value of (0.582) < t-table (1.999). This indicates that there is no effect of age on MSD complaints.

This study aligns with research conducted by Hastuti et al [8]. Data analysis using the chi-square test yielded a p-value of 0.080 (p > 0.05). This means that Ha is rejected and Ho is accepted. Therefore, it can be concluded that age has no relationship with MSD complaints.

This study aligns with research conducted by Faisal et al [9], which found that worker age was not associated with musculoskeletal complaints, with a p-value of 0.066. During the study, the researchers found that the sorting respondents working in Talang Gulo ranged in age from 20 to 60 years. This is understandable, as the majority of respondents were under 35 years of age.

This study disagrees with research conducted by Koreani et al [10], which showed a statistical test result of (p-value = 0.044), indicating a significant relationship between age and musculoskeletal complaints.

According to the researchers' assumptions, there is no relationship between age and MSD complaints because the majority of respondents in this study were in late adulthood (36-45 years). Musculoskeletal complaints are usually experienced by people in the working age group over 50 years, and the level of complaints increases with age.

2. Relationship between Length of Service and MSDs Complaints

The results of the study showed that out of 69 respondents, there was no relationship between length of service and MSD complaints. This is consistent with the results of the multivariate test, which showed that length of service had a p-value of 0.474 (> 0.05), with a calculated t-value (-0.720) < t-table (1.999). This indicates that length of service has no effect on MSD complaints.

This study aligns with research conducted by Nopriani & Apriyandi [11]. The Spearman rank test results for the correlation between length of service and the incidence of musculoskeletal disorders showed a p-value of $0.130 > \alpha = 0.05$, indicating that H0 is accepted, indicating no significant relationship between length of service and the incidence of musculoskeletal disorders among nurses at Pusri Hospital in Palembang in 2024.

This study aligns with research conducted by Simorangkir et. al [12], which found a statistical test using the chi-square test with a p-value of $0.079 > 0.05$. This means that H0 is accepted, meaning there is no significant relationship between length of service and musculoskeletal disorders (MSDs) in Siatas Barita District, North Tapanuli Regency.

According to the researcher's assumption, there is no relationship between length of service and MSDs because nurses work dynamically, moving around, and not statically. Therefore, when nurses work, they often engage in exercise.

3. Relationship between Work Period and MSDs Complaints

The results of the study showed that out of 69 respondents, there was no relationship between work period and MSD complaints. This is consistent with the results of the multivariate test, which showed that the BMI variable had a p-value of 0.055 (> 0.05), with a calculated t-value (-1.959) $<$ t-table (1.999). This indicates that there is no effect of BMI on MSD complaints.

This study aligns with research conducted by Balaputra [13], which found that work period had no correlation with musculoskeletal disorders, with a p-value > 0.05.

This study aligns with research conducted by Nuryaningtyas & Martiana [14] on the relationship between work period and musculoskeletal disorders. Based on the chi-square test, all values obtained a p-value (0.082) $> \alpha$, indicating no significant relationship between work period and musculoskeletal disorders.

According to the researchers' assumption, there is no relationship between work period and MSDs because nurses with longer tenure become accustomed to their work, thus reducing musculoskeletal complaints.

4. Relationship between Body Mass Index (BMI) and MSDs complaints

The results showed that out of 69 respondents, there was no relationship between BMI and MSD complaints. This was in accordance with the multivariate test results, which showed that the BMI variable had a p-value of 0.055 (> 0.05), with a t-value of (-1.959) $<$ t-table (1.999). This indicates that BMI does not influence MSD complaints.

This study is in line with the research conducted by Rahayu et al [15], where the statistical test results obtained a p-value of 0.066, indicating that there is no significant relationship between BMI and MSD complaints.

This study is in line with the research conducted by Fanjaniaina et al [16]. The results of the chi-square test conducted on BMI with the presence of BMI complaints obtained a p-value of 0.661 ($p > 0.05$) This indicates that HO is accepted and Ha is rejected, so there is no relationship between BMI and MSD complaints.

According to the researcher's assumption, there is no relationship between BMI and MSD complaints because in this study, the majority of nurses' BMI was within the normal range for workers with obese have a greater risk of pain because the load on their bones, muscles, and joints will increase.

5. Relationship Between Work Posture and MSD Complaints

The results showed that out of 69 respondents, there was a relationship between work posture and MSD complaints. This was consistent with the multivariate test results, which showed that the work posture variable had a p-value of 0.008 (<0.05), with a t-value of 2.731 > t-table (1.999). This indicates that the work posture variable has an influence on MSD complaints.

This study is in line with the research conducted by Suryaningadi & Sangadji [17]. Based on the results of the study, it is known that there is a significant relationship between work posture and musculoskeletal disorders (MSDs) in workers in 2024, due to the p-value ($p < 0.05$)

This study is in line with the research conducted by Rahmawati & Dewi [18]. The results of the bivariate test showed that 25% of the expected counts were less than 5. Therefore, the alternative test used was the Fisher's exact test with a sig (p-value) of 0.023 ($p < 0.05$) so H0 was rejected. It can be concluded that there is a statistically significant relationship between work posture and MSD complaints.

According to the researcher's assumption, there is a relationship between work posture and MSD complaints because non-ergonomic postures can cause excessive strain on muscles, ligaments, or tendons. Work positions such as bending, squatting, or awkward positions that are monotonous and static.

CONCLUTIONS

Based on the results of the research that has been conducted, it can be concluded that there is a relationship between work posture and musculoskeletal complaints in ICU, CVCU and PICU nurses at Arifin Achmad Hospital and there is no relationship between age, length of service, work period and BMI with musculoskeletal complaints in ICU, CVCU and PICU nurses at Arifin Achmad Hospital.

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