The Correlation Between Working Posture and Musculoskeletal Disorders of Rice Porters in Malang

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Abstract. Musculoskeletal disorders are the most common subjective complaints on the skeletal muscle that felts by the workers, which can be fatal for the worker's safety and health. This study aims to analyse the correlation between working posture and musculoskeletal disorders on rice porters in Malang. This research uses quantitative methods with an observational analytic research design. The Nordic Body Map was used to determine the level of musculoskeletal disorders, while the working postures were analysed with the OWAS (Ovako Work Posture Analysis System) method. The population in this study was 30 rice porters at the Rice Warehouse in Malang. Data correlation analysed on Chi-Square and Contingency Coefficient association. This research results in no relationship between working posture and musculoskeletal disorders on rice porters at the Rice Warehouse in Malang. Nevertheless, there are other factors associated with musculoskeletal disorders, including age, years of service, activity repetition, and the worker's body mass index, which have not been analysed yet.

Keywords: ergonomic · working posture · musculoskeletal disorders · rice porters

1 Introduction

The International Labor Organization estimates that 2.78 million workers die each year due to work accidents and there are around 374 million cases of occupational diseases and injuries [1]. Based on data from the Directorate General of Binwasnaker and K3 Quarter IV of 2020 which has been processed by the Pusdatinaker, the number of work accidents in East Java province is 345 cases [2]. Regulation of the Minister of Health of the Republic of Indonesia Number 56 of 2016 concerning the Implementation of Occupational Disease Services, defines Occupational Diseases (PAK) as diseases caused by work factors or working environmental conditions. One of the causes of occupational diseases due to ergonomic factors that are specifically related to human endurance and

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strength is musculoskeletal disorder. This disease is a disorder that affects the normal function of the skeletal muscle system due to the repeated effects of various risk factors in the workplace, one of which is ergonomics [3]. According to the World Health Organization, musculoskeletal disorders are the second largest disability supporter in the world which later becomes the main cause of disability globally with complaints of low back pain [4]. According to Riskesdas data in 2018, the prevalence of musculoskeletal diseases diagnosed by medical personnel is 7.3%, while the prevalence of musculoskeletal diseases based on labour characteristics is 6.10% [5]. One type of work whose activities have the potential to experience musculoskeletal complaints is workers in the lifting and transport sector who are carried out manually [6].

Almost 25 percent of work accidents in Indonesia are caused by manual handling work [7]. Activities carried out manually with certain heavy loads make workers work excessively and can result in awkward postures such as bending or twisting when carrying loads [8]. According to the ILO, one of the risk factors for musculoskeletal disorders in the workplace is work posture [9]. The wrong posture of workers will risk the occurrence of fatigue and pain and even musculoskeletal disorders [10]. Manual handling activities carried out in an inappropriate manner have the potential to cause losses such as musculoskeletal complaints in the neck, back, hands, especially the wrists and elbows, and on the feet, and even cause work accidents [4].

Malang Warehousing Complex is one of the scopes of which is engaged in logistics management. One of the activities carried out in Malang rice warehousing complex is loading and unloading activities by lifting and carrying goods in the form of rice from transport trucks to storage warehouses or vice versa which is carried out by rice porters using manual handling methods. Based on a preliminary study conducted by researchers, at least every rice porter lifts a 50 kg sack of rice. In interviews with rice porters related to musculoskeletal disorders, it can be concluded that workers complain of pain after loading and unloading rice in warehouses, especially in the neck and back muscles. The loading and unloading of rice activities carried out in one of the warehouses belonging to Perum Rice includes work with the category of high force and high repetition risk factors which can increase the risk of pain complaints in certain muscle parts due to the presence of repetitive activities using certain body parts [11].

Therefore, the researcher considers that there is a need for research on the correlation between workers' body posture and the occurrence of musculoskeletal disorders in the article entitled The Correlation Between Working Posture and Musculoskeletal Disorders of Rice Porters in Malang.

2 Method

This research is an observational analytic study with a cross sectional approach, namely the measurement and observation of the research subject is carried out with one observation where this study takes data on the dependent variable (neck and back muscle disorders) and the independent variable (work posture) at the same time. This research was conducted at Malang Warehousing Complex, in February-April 2022. The sampling technique used was in purposive sampling involving 30 rice porters. The Nordic Body Map instrument is used to determine the presence of disorders or subjective complaints

of muscles in certain body parts. The Ovako Work Posture Analysis System (OWAS) method is carried out at several stages of the work process (lifting, carrying, moving, and placing loads) by recording when the research subjects carry out their work activities. The OWAS method is also used to obtain coding posture on the back, hands, and feet as well as the weight of the worker's load so that the category of work posture can be determined. The analysis in this study consisted of univariate analysis and bivariate analysis using the Chi Square test with the Contingency Coefficient with the help of the SPSS application which was then presented in the form of a research report. This research has received ethical approval by the Health Research Ethics Commission of the Health Polytechnic of the Ministry of Health of Malang with Ethical Approval Reg.No.:307/KEPK-POLKESMA/2022.

3 Results

According to the data from the research that has been done, the characteristics of respondents based on age and working period of all rice porters in Malang Warehousing Complex are that all respondents are male, dominated by workers aged 31–35 years by 20% and most of the respondents with a working period of 1–5 years and for 6–10 years, each of which is 20% of the population (Table 1).

In the first work stage, more than half of the population performed dangerous work postures, namely 17 people (57%), in the second work stage most respondents performed dangerous work postures, as many as 24 people (80%), in the third work stage most respondents performed work postures. Which are very dangerous as many as 24 people (80%), and in the fourth working stage half of the respondent population performs dangerous work postures as many as 15 people (50%) of the population.

Table 2 shows that half of the population who complain of disorders of the neck muscles are 15 people (50%) and 13 people (44%). Meanwhile, respondents who complained of neck and back muscle disorders were included in severe category was 15 people (50%).

Table 3 shows the results of the correlation between working posture and musculoskeletal disorders on rice porters in Malang. Based on the results in Table 3, it can be seen that there is no significant relationship between work posture and neck and back muscle disorders in rice porters because the p value > 0.05, while the contingency coefficient (CC) shows the level of relationship between work posture and muscle disorders. Neck and back of rice porters in the very low, low, and medium yield ranges.

Statistical test analysis using Chi-Square test with Contingency coefficient obtained the p-value > 0.05, so it can be concluded that there is no relationship between working posture and musculoskeletal disorders of rice porters in Malang.

4 Discussion

This research was conduct due to several references regarding musculoskeletal disorders, especially in the neck and back muscles experienced by rice porters in Malang. Based on the obtained references, the researchers tried to collect the research data and other additional information, including for musculoskeletal disorders risk factors. Respondents

Table 1. Respondents working posture based on OWAS

Working Posture	n	%
Phase 1		
Not Dangerous	1	3
Quite Dangerous	1	3
Dangerous	17	57
Very Dangerous	11	37
Phase 2		
Not Dangerous	2	7
Quite Dangerous	1	3
Dangerous	24	80
Very Dangerous	3	10
Phase 3		
Not Dangerous	2	7
Quite Dangerous	0	0
Dangerous	4	13
Very Dangerous	24	80
Phase 4		
Not Dangerous	3	10
Quite Dangerous	2	7
Dangerous	15	50
Very Dangerous	10	33

in this study were rice porters who worked at Malang Warehousing Complex. One type of work that has the potential to experience musculoskeletal disorders is manual lifting and transport [6]. Malang Warehousing Complex cannot be separated from the role of rice porters who work manually, whom at risk of having musculosceletal disorders, especially in the neck and back muscles.

Based on the results of the analysis that has been carried out by researchers, it is known that there is no relationship between work posture and neck and back muscle disorders of rice porters at the Warehouse Complex in Malang. The results of this study are supported by research by Basahel, which states that there is no significant relationship between work posture and back and neck muscle disorders in warehouse workers in Saudi Arabia [12]. This study is following the results of previous research by Setyowati that there is no relationship between the posture of lifting or lowering goods with complaints of neck pain in porters at the Merak-Banten Ferry Crossing Port [13].

Researchers tried to collect information in the form of data and other information including risk factors for musculoskeletal disorders experienced by rice porters at the

Table 2. Muscluskeletal disorders based on nordic map analysis

Muscluskeletal Disorders	n	%
Neck		
No Pain	8	27
Mild Pain	6	20
Pain	15	50
Severe Pain	1	3
Back		
No Pain	4	13
Mild Pain	6	20
Pain	13	44
Severe Pain	7	23
Neck and Back		
Mild Pain	6	20
Medium Pain	9	30
Severe Pain	15	50

Warehouse Complex in Malang. Several factors are related to the occurrence of musculoskeletal complaints, including gender, age, work position, body mass index, years of service, and length of work [14]. In line with research by Aprianto the result shows two risk factors can affect the occurrence of musculoskeletal disorders are individual factors (gender, age, and the presence of psychosocial factors) and work factors (work posture, repetitive work movements, working time, workload, working period, and work climate) [15].

Based on interviews, most of the respondents did not have a history of muscle disease but complained of pain when doing work because there might be other influencing factors. According to Tarwaka, fatigue can be caused by the heavy load supported by workers, especially on the back [16]. Fatigue is a condition of weakening energy when carrying out activities accompanied by decreased productivity and efficiency at work and can result in decreased muscle function [17]. The greater the energy used by workers and the more irregular work posture in supporting the load, the fatigue can arise faster and lead to muscle disorders and even work accidents [18].

The respondent's age is dominated by workers with an age range of 31–35 years with a total of 6 people with a percentage of 20%. Workers in Malang warehouse have various age ranges, start from the youngest 30 years old, to the oldest more than 65 years. According to Chaffin and Guo in Tarwaka, generally, workers with a working age of 25 to 65 years suffer more muscle complaints and it will increase along with the worker age [19]. The results of the Meruntu study found a relationship between age and musculoskeletal complaints in farmer workers in Kanonang Dua village, West Kawangkoan

Table 3. The correlation of working posture with musculoskeletal disorders on rice porters in Malang

Working Posture	Musculoskeletal Disorders						P-value	Contingency coef.
	Mild		Medium		Severe			
	n	%	n	n	%	n		
Phase 1								
Not Dangerous	1	3,3	0	0,0	0	0,0	0,272	0,449
Quite Dangerous	0	0,0	1	3,3	0	0,0		
Dangerous	4	13,3	5	16,7	8	26,7		
Very Dangerous	1	3,3	3	10,0	7	23,3		
Phase 2								
Not Dangerous	0	0,0	0	0,0	2	6,7	0,609	0,361
Quit Dangerous	0	0,0	0	0,0	1	3,3		
Dangerous	6	20,0	8	26,7	10	33,3		
Very Dangerous	0	0,0	1	3,3	2	6,7		
Phase 3								
Not Dangerous	0	0,0	1	3,3	1	3,3	0,943	0,158
Quite Dangerous	0	0,0	0	0,0	0	0,0		
Dangerous	1	3,3	1	3,3	2	6,7		
Very Dangerous	5	16,7	7	23,3	12	40,0		
Phase 4								
Not Dangerous	1	3,3	1	3,3	1	3,3	0,231	0,461
Quite Dangerous	0	0,0	1	3,3	1			
Dangerous	2	6,7	2	6,7	11			
Very Dangerous	3	10,0	5	16,7	2			

District, Minahasa Regency. Based on interviews, it was found that most of the respondents have been accustomed to work for a relatively long time as the respondent's age increase and considered to have longer working experience, especially if the respondent has similar work experience lifting work [20].

The working period is the period of time a person works, starting from the beginning until the end of the worker's activities [21]. According to Ohlsson, tenure is one cause of muscle complaints, especially in workers who need and have high-performance abilities and strengths [22]. Apart from that, with the higher load and working period, the risk of experiencing muscle disorders is increasing. It happens because the working period is a combination of work activities over a long period of time and on an ongoing basis so there is physical stress on the workers' muscles [23]. Research conducted by Komarliawati, there is a relationship between years of service and musculoskeletal complaints in PT X transport workers in 2018. However, based on observations made of rice porters at Warehousing Complex, it was found that the majority of workers had a working period more than 6 years [24].

According to Tarwaka, repetitive activities are one of the causes of musculoskeletal disorders [25]. Repetitive activities which are carried out repeatedly can be seen in the work of lifting and transporting. Musculoskeletal complaints are caused by excessive pressure for a long duration on muscles that contract continuously due to the workload [26]. In line with Raya's research, the intensity of physical activity is significantly related to the level of back complaints. The musculoskeletal disorders that porters complain about are influenced by physical and repetitive activities such as lifting goods, carrying and moving goods and putting things in piles. Based on field studies on rice porters, it is known that workers work alternately and together in the process of loading and unloading goods manually. In addition, workers have time to relax while waiting for several trucks transporting goods to arrive at the warehouse unit so that workers can rest to relieve pain while working. Complaints of pain experienced by workers will decrease when workers perform repetitive activities correctly [27].

Muscle disorders felt by workers are related to the size of the worker's body, generally caused by the condition of the skeletal structure when supporting the load, both the worker's own body weight and the additional load supported by the body [28]. Based on observations made by researchers on porters at Malang Warehousing Complex, it was observed that the majority of workers have medium body sizes. According to Tan and Horn, an abnormal body mass index of workers, which is above the normal range, will increase the risk of muscle complaints [29]. This condition was caused when a person tries to hold his weight by moving his back muscles. If done repeatedly, it can cause pressure on the spinal cord [22]. This research is in line with Pangestuti which found that there is a relationship between body mass index and complaints of low back pain in transportation workers at the East Jakarta Main Market [30].

5 Conclusion

Based on the results of this study, it can be concluded that there is no correlation between working posture and musculoskeletal disorders of rice porters. It is found that there are other factors associated with musculoskeletal disorders, including age, years of service,

repetitive activities, and the body size of workers. Based on the results of this study, the researcher recommends that respondents, namely rice porters at Malang Warehousing Complex, are expected to pay attention to the use of correct work postures and work carefully so that the level of musculo-skeletal complaints complained of can be reduced. For Malang Warehousing Com-plex, this research can improve their programs and policies, especially related to Occupational Safety and Health in the warehouse complex so they can minimize the occurrence of occupational diseases and work accidents. For further research, it is needed to examine other risk factors that affect musculoskeletal complaints, includ-ing weight, age, years of work, repetitive activities, and the worker's body size.

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