JOURNAL OF PUBLIC HEALTH FOR TROPICAL AND COASTAL REGION (JPHTCR)
Journal homepage: http:/ejournal2.undip.ac.id/index.php/jphtr/index
ISSN : 2597-438

The Relationship Between Working Posture and Musculoskeletal Disorders in Waste Pickers at Blondo Landfill

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Abstract

Background: Blondo landfill serves as a final processing site for waste and also a source of livelihood for scavengers. Scavengers are workers who are at risk of musculoskeletal disoders (MSDs) complaints due to heavy, repetitive physical work and poor work postures due to bending. During waste collection and sorting, waste pickers perform repetitive movements with non-ergonomic postures, away from the ideal body position. Based on data from *Puskesmas* Bawen, 45% of 73 waste pickers experienced muscle and joint pain. The purpose of this study was to determine the relationship between working posture and complaints of musculoskeletal disorders.

Methods: This study was an observational analytic research in a cross sectional design. The population in this study were Blondo landfill waste pickers. The subjects were 65 waste pickers who were chosen through purposive sampling technique. Data collection was conducted through interviews using the Nordic Body Map questionnaire, digital camera and REBA (Rapid Entire Body Assessment) sheet. Data analysis were conducted using Spearman rank tests.

Results: The results showed that of the 65 waste pickers, the majority were female (53.3%), aged > 35 years (93.8%), had a working period of more than 5 years (61.5%), and normal nutritional status (56.9%). Scavengers who have moderate risk work posture (81.5%) and moderate musculoskeletal disorders (84.6%). There was a positive correlation between working posture and MSDs with a moderate level (ρ=0.593; p=0.0001).

Conclusion: Work postures that are formed away from the body's gravity which if done continuously and for a long period of time among waste pickers resulted in musculoskeletal disorders.

Keywords: Musculoskeletal disorders, work posture, waste pickers.

Article History: Received: 28th February 2024, revised: 20th April 2024 accepted: 30th April 2024

Introduction

Waste management in Indonesia is regulated in Law No. 18 of 2008 which stated that waste management is a national problem and the management must be carried out as a whole from upstream to downstream and provide economic benefits, healthy for the community and safe for the environment. Therefore, it is necessary to provide facilities and use them correctly so that these problems can

be reduced, and can provide good safety and health for workers.[1] Waste generation in Semarang Regency in 2022 according to the Ministry of Environment and Forestry reached 193.4 tons/year. In Semarang Regency, the amount of waste generated every day reaches 529.9 tons. This regency has a final processing site (TPA) known as the Blondo landfill.[2]

In addition, not only serves as a final processing site for waste, Blondo Landfill also serves as a source of livelihood for waste pickers. Landfill is a workplace, with category room or field that is closed or open, mobile or fixed, where there are workers who work for business purposes and there are sources of danger.[3] The workers at Blondo Landfill consists of administrative staff, heavy equipment operators, and waste pickers. Scavengers are workers who are directly related to waste, although many consider waste as disgusting and useless, for scavengers waste is a source of livelihood for their families.

Every job has its own risks of health problems and occupational hazards.[4] Scavenging is one of the occupations included in the informal workers group that can be at risk of health problems due to the work performed. The risk of health problems in waste pickers is caused by several hazard factors such as chemical, biological and ergonomic hazards.[5] Scavengers also face the risk of ergonomic hazards, such as back pain, muscle and joint injuries due to repetitive movements performed while working. Research by Thakur et.al 2018 shows that workers in end-processing sites are at risk of respiratory diseases, injuries and allergies. The injuries experienced are generally muscle injuries and ligament damage.[6]

According to *Riskesdas* data, the trend of the incidence of musculoskeletal disorders from year to year in Indonesia has increased, this shows that the number of cases of MSDs disorders is still quite high. The data showed that MSDs is one of the important health problems in Indonesia and needs serious attention. As many as 713,783 Indonesians experience joint disease, and data according to the province of joint disease cases in Central Java Province are 96,794 residents.[7] Studies in the United States showed that MSDs represent 40% of injuries. The global prevalence of MSDs ranges from 14% to 42%.[8] Based on data from the Labor Force Survey (LFS) in the Health and Safety Executive (2020), as many as 480,000 workers experienced musculoskeletal disorders due to work.[9]

According to Tarwaka, Musculoskeletal Disorders (MSDs) refer to complaints experienced by someone in the skeletal muscles, ranging from mild to very painful. Workers in industry often experience MSDs complaints such as wrist, neck, back, elbow, and leg pain. If the muscles in these body parts continue to receive repetitive static loads over a long period of time, this can cause damage to tendons, ligaments and joints.[10] According to Megawati, there are several occupational factors that play an important role in skeletal muscle disorders. These factors include repetitive movements, movements that require strong force, pressure, static or non-ergonomic work positions, working period and working time, as well as individual factors such as age, gender, smoking habits, exercise habits, body mass index (BMI), history of musculoskeletal disorders, and physical strength.[11]

Based on several cases that have been studied, the main cause of spinal cord injury (low back pain) is manual handling and lifting work. In addition, about 25% of work accidents also occur due to manual material handling work. Previously, it was reported that 74% of spinal cord injuries were caused by lifting activities and 50-60% of low back injuries were caused by lifting and lowering materials.[12] This kind of activity condition is often found in the work of waste collectors in the landfill environment which is done manually. Manual waste collection work requires physical strength because this work is done repeatedly. This musculoskeletal disorder is one of the work problems that significantly occurs in all workers in the landfill.[13]

Based on the health data of waste pickers in August 2023 from *Puskesmas* Bawen, 45% of the 73 waste pickers

experienced muscle and joint pain. The pain complaints included the neck, shoulders, arms, waist and knees. They work with a bent body position when manually picking and sorting waste. After sorting, the waste is put into a basket that is carried on the back. During waste collection and sorting, waste pickers perform repetitive movements with non-ergonomic postures, away from the ideal or natural body position. Therefore, the purpose of this study is to determine the relationship between work posture and complaints of musculoskeletal disorders in waste pickers at Blondo Landfill.

Methods

This research method was a quantitative method with an observational analytic design with a cross sectional approach. The variables in this study were working posture as the independent variable and musculoskeletal complaints as the dependent variable. The research was conducted at Blondo Landfill with a population of 78 waste pickers. The samples in this study were taken from the population of waste pickers at Blondo Landfill using a non-probability sampling method with purposive sampling technique, so that 65 waste pickers were obtained as the research samples. The REBA sheet was used as a work posture assessment tool, the Nordic Body Map questionnaire to assess the level of musculoskeletal complaints experienced, a digital camera to record and photograph workers' activities while working and angulus (digital arc) to measure the angle formed in the work posture. Data analysis was carried out univariately using a frequency distribution table on each variable and bivariate analysis using the spearman rank test. Before conducting research, especially with human subjects, researchers must register Ethical Clearence (EC) submitted to the Health Research Ethics Commission (KEPK) of Ngudi Waluyo University as a condition for obtaining ethical permission in conducting research. This research has received ethical permission with number 368/KEP/EC/UNW/2023.

Results

Table 1. Individual Characteristics of Waste Pickers at Blondo Landfill

No	Variable	Frequency (n=65)	Percentage
1	Gender		
	Male	31	47.7%
	Female	34	53.3%
2	Age		
	≤ 35 years (Not at risk)	4	6.20%
	> 35 years (At risk)	61	93.8%
3	Period of Employment		
	≤ 5 years (New)	25	38.5%
	>5 years (Old)	40	61.5%
4	Nutritional Status		
	Very Thin (BMI <17,0)	1	1.50%
	Thin (BMI 17-<18,5)	6	9.20%
	Normal (BMI 18,5-25)	37	56.9%
	Fat (BMI >25-27)	10	15.4%
	Obese (BMI > 27)	11	16.9%

Based on data collected from 65 waste pickers, it is found that the majority of waste pickers in Blondo landfill are female, 34 people (53.3%). The majority of waste pickers are > 35 years old, 61 people (93.8%). The majority of waste pickers have a working period of more than 5 years as many as 40 people (61.5%). Nutritional status based on Body Mass Index in waste pickers with the highest number is normal nutritional status as many as 37 people (56.9%).

Table 2. Working Posture

Working Posture	Frequency	Percentage
No Risk	0	0%
Low Risk	4	6.20%
Moderate risk	53	81.5%
High risk	8	12.3%
Risiko Sangat Tinggi	0	0%
Total	**65**	**100,0%**

Based on the table, it shows that scavengers at Blondo Landfill who carry out waste sorting and collection activities perform work with low-risk work postures as many as 4 people (6.2%), moderate risk as many as 53 people (81.5%) and high risk as many as 8 people (12.3%). The categorization of work postures is divided into 5 based on the scores obtained through the REBA worksheet, namely no risk with a score of 1, low risk score 2-3, medium risk score 4-7, high risk score 8-10 and very high risk score 11-15.

Table 3. Musculoskeletal Disorders Complaints

Musculoskeletal Disorders Complaints	Frequency	Percentage
Low	9	13.8%
Moderate	55	84.6%
High	1	1.50%
Total	**65**	**100.0%**

Based on table 3, it is known that scavengers who experience low musculoskeletal disorders are 9 people (13.8%), moderate musculoskeletal disorders are 55 people (84.6%) and high musculoskeletal disorders are 1 person (1.5%).

Table 4. Correlation between working posture and MSDs complaints

Working Posture	Musculo-skeletal Disorders Complaints								P	ρ
	Low		Moderate		High		Total			
	f	%	f	%	f	%	F	%		
Low Risk	2	50	2	50	0	0	4	100	0.000	0.593
Moderate Risk	7	13.2	46	86.8	0	0	53	100		
High Risk	0	0	7	87.5	1	12.5	8	100		
Total	9		55		1		65			

Based on table 4, it shows that scavengers who work with low-risk working postures are 2 people (50%) each experiencing low and moderate musculoskeletal complaints. There were 7 waste pickers (13.2%) who had low musculoskeletal complaints, while 46 waste pickers (86.8%) who had medium-risk work postures had moderate musculoskeletal complaints. Meanwhile, 7 people (87.5%) of waste pickers who work with high-risk work postures experienced moderate musculoskeletal complaints and 1 person (12.5%) of waste pickers who work with high-risk work postures experienced high musculoskeletal complaints. The test used by Spearman rank obtained a p-value of 0.000 (<0.05) and a correlation coefficient of 0.593 with a positive direction, which statistically shows that there is a significant relationship between working posture and musculoskeletal disorders with moderate correlation strength.

Discussion

Based on field observations, it can be seen that waste pickers at Blondo Landfill carry out waste sorting and collection activities with various levels of work posture risks. An overview of the work

postures performed by waste pickers when collecting and sorting waste such as bending over when picking up waste from the ground or low places, waste pickers must also lift or carry heavier waste. This can cause pressure on the back. Unergonomic or awkward work postures can lead to the risk of injury and long-term health problems. Most workers experience health problems due to unergonomic work postures. Ergonomic problems are more likely to occur in occupations that involve frequent manual lifting, carrying, pulling, repeating the same movements throughout the workday, working in awkward or static positions, lifting heavy loads that use excessive force.[14] From the observation, this risky posture is also often done statically or repetitively. In moderate-risk work posture conditions, the torso of most of the waste pickers scored >20º to 83º. Whereas in the high-risk condition, the waste pickers form extreme angles on the torso and legs. All waste pickers scored 1 on the activity score on the REBA sheet, especially repetitive actions. Awkward working postures are a major cause of musculoskeletal disorders. Some awkward work postures include reaching back, twisting, working at overhead height, wrist bending, kneeling, lying down, forward and backward bending and squatting.[15.]

There is a relationship between working posture and complaints of musculoskeletal disorders in scavengers at Blondo Landfill. This is because improper work posture can be seen from the presence of unnatural body parts when doing work. According to Monica, in addition to unnatural work postures, repetitive movements carried out in the long term will exceed the capacity of the worker's muscles to recover, this can cause muscle disorders. When the body moves away from its natural position, it will be further away from the center of gravity, and the higher the skeletal muscle complaints caused.[16] Based on observations, it is known that there are awkward work postures of waste pickers when sorting and picking up waste with manual handling, including sorting and picking up waste in a bent position, placing the load on the shoulders. When sorting and picking up waste, the workers rely on manual handling assisted by a simple tool commonly called a "ganco".

The working posture of waste pickers can be seen from the calculation score using REBA. Working postures that are formed away from the body's gravity which if done continuously and for a long period of time can cause musculoskeletal disorders. It is known that work postures with a high risk of experiencing musculoskelatal complaints are high, this proves that the less ergonomic the working posture, the higher the musculoskeletal complaints felt. Workers who perform activities with non-ergonomic work postures are at risk of musculoskeletal complaints.[17] Scavengers feel a lot of pain in the back and waist because their posture when picking up and sorting garbage, especially in the torso, forms an angle > 20º to the highest forming an angle of 83º. The angle formed illustrates the bending that scavengers do when sorting and picking up waste.

The most common musculoskelatal disorders experienced by waste pickers are on the back and waist area. This can happen because when working, scavengers often have to bend or arch their back and waist to collect garbage. This can cause strain on the muscles in the area. When the bending position is often done repeatedly, there is a risk of more serious occupational diseases. When the muscles of the body receive repeated loads for a long time, it can cause complaints in the form of damage to tendons, joints and ligaments.[18] In addition to the back and waist, complaints of pain felt by scavengers also occur in the neck, knees and calves. Neck complaints can occur because the position of waste pickers when sorting and picking up garbage, which tends to bend, supports greater pressure on the neck. When bending the neck will experience pressure due to the position of the head leaning forward. This can cause strain on the neck muscles and upper spine. In addition to causing pressure on the neck, a slouching position can also cause complaints of pain in the knees and calves. When slouching, the knees support the body weight and experience greater pressure. Apart from the knees, the calves are also involved in slouching. When

slouching, the calves will experience a stronger stretch because they have to support the body weight.

This study is in line with research conducted by Faisal on garbage sorting workers that there is a relationship between work posture and musculoskeletal complaints (p = 0.026), from the results of this study it was found that the respondents at work with an unergonomic attitude. This is because when reaching the garbage, respondents work with a bent work posture and are carried out for a long time so that they are at risk of experiencing musculoskeletal complaints.[19] This research is in line with Purwati's research on laundry workers with the results of p value = 0.016 (p < 0.05), indicating that there is a relationship between work posture and MSDs complaints.[20]

Conclusion

There is a relationship between work posture and complaints of musculoskeletal disorders (p=0.000) with moderate correlation strength (ρ=0.593). Work postures that are formed away from the body's gravity which if done continuously and for a long period of time can cause musculoskeletal disorders. The most common musculoskelatal disorders experienced by waste pickers are the back and waist due to postures that often bend or arch the back and waist when collecting garbage. This can cause strain on the muscles in these areas.

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