



RISK FACTORS FOR MUSCULOSKELETAL DISORDERS (MSDS) IN HIP WORKERS AT FOOD AGENTS

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ABSTRACT

Musculoskeletal Disorders (MSDs) are one of the most common occupational health problems, especially among workers who do heavy physical work, such as porters. This study aims to identify risk factors for MSDs in porters at grocery agents in Prabumulih City, South Sumatra, using a cross-sectional study design. This study involved seven main variables, namely work posture, age, nutritional status, length of service, workload, smoking habits, and exercise habits. The research method used was a quantitative approach with a cross-sectional design, with a sample of 73 respondents selected by simple random sampling. The instruments used in this study included a characteristic questionnaire, Nordic Body Map (NBM), Quick Exposure Checklist (QEC), and Cardiovascular Load (%CVL) measurements. Data analysis was carried out univariately and bivariate using the Chi-Square test. The results showed a significant relationship between work posture ($p=0.003$), age ($p=0.045$), nutritional status ($p=0.004$), length of service ($p=0.002$), workload ($p=0.001$), and exercise habits ($p=0.014$) with MSDs complaints. Meanwhile, smoking habits ($p=0.072$) did not show a significant relationship with MSDs complaints. Based on these findings, it can be concluded that ergonomic factors and worker characteristics play an important role in the emergence of MSDs complaints.

Keywords: musculoskeletal disorders (MSDs) complaints; NBM; pelvic pain; QEC; %CVL

How to cite (in APA style)

Fitriand, K., Waldani, D., Lestari, M., & Fujianti, P. (2025). Risk Factors for Musculoskeletal Disorders (MSDs) in Hip Workers at Food Agents. *Indonesian Journal of Global Health Research*, 7(5), 537-552. <https://doi.org/10.37287/ijghr.v7i5.6750>.

INTRODUCTION

Musculoskeletal Disorders (MSDs) are one of the most frequently reported occupational diseases in various employment sectors, both formal and informal. MSDs refer to complaints or disorders that occur in the muscular, skeletal, and connective tissue systems, caused by repeated exposure to non-ergonomic work postures, excessive physical loads, and individual factors such as age and lifestyle. Common symptoms include pain, tingling, stiffness, and muscle fatigue, which can interfere with workers' productivity and quality of life. Based on a report from the International Organization for the Study of Occupational Diseases program, MSDs are the most common occupational health problem among the 27 countries surveyed. In Japan, in 2011, there were 7,779 cases of MSDs, with the most dominant complaint in the lower back. In Indonesia, based on BPS data in 2017, there were 365,580 cases of work-related disorders related to the musculoskeletal system, and the survey stated that around 11.9% of workers experienced these complaints (Purba & Lestari, 2017; Sholicha et al., 2019).

In Prabumulih City, porters are part of the informal sector that plays an important role in distributing basic necessities at wholesale agents, warehouses, and traditional markets. Their work activities rely heavily on physical strength and take place in a repetitive work cycle throughout the day. The work process begins by taking goods in the form of sacks of rice, sugar, flour, oil, or other basic necessities from trucks, warehouses, or shelves. These goods usually do not use tools, but are carried directly on the back or lifted manually using both hands. Next, workers will lift the items using a variety of techniques—most of which involve

bending or twisting to reach items on the floor or in low positions. Once the items are lifted, workers will then carry the load 10 to 30 meters to the stacking or delivery area. During this phase, body stability is highly dependent on the strength of the back, shoulder, and lower extremity muscles. The loads carried can range from 25 to 100 kilograms depending on the type of item, and are repeated 100–200 times per day. The final stage is placing the items in a stack or onto a customer's vehicle, which often requires workers to bend again or raise their arms above their shoulders if they have to stack items on high shelves. All of these activities are carried out in a 6–10-hour workday, often without adequate rest breaks and without the use of ergonomic aids. The cumulative risk of musculoskeletal disorders is very high, especially in the lower back, shoulders, and knees.

In addition to physical factors, individual characteristics also play an important role in the incidence of MSDs. Age >35 years, abnormal nutritional status (either thin or obese), long working hours, and unhealthy habits such as smoking and lack of exercise have been shown to correlate with increased muscle and joint complaints (Tarwaka, 2015; Supardi, 2004; WHO, 2020). Conversely, the habit of exercising regularly can increase body flexibility and strengthen muscle endurance against workload. To obtain a comprehensive picture of the incidence of MSDs and the factors that influence them, several measurement methods were used in this study. First, the Nordic Body Map (NBM) is used as an instrument to identify body parts that experience specific pain complaints. NBM has a subjective scale from no pain to very pain, which makes it easy to group the severity of complaints based on respondent perceptions. Second, the Quick Exposure Checklist (QEC) is applied as a measuring tool for objective work posture assessment. QEC assesses postural risk exposure to the upper body such as the back, neck, shoulders, and wrists based on workload, duration of activity, psychological stress, and direct input from workers. This method also takes into account vibration, work speed, and multitasking elements that often occur in porters. This assessment produces an exposure score which is then converted into a risk level (low, moderate, high) which determines the urgency of intervention. Third, to measure physiological workload, the % CVL (Cardiovascular Load) calculation method is used, namely the percentage of workload based on the worker's work pulse and maximum pulse. This method is useful for seeing whether work activities fall into the light, moderate, or heavy category in terms of heart and blood vessel capacity.

By integrating the three methods above NBM, QEC, and %CVL this study attempts to provide a comprehensive analysis of the risk of MSDs from both subjective (individual complaints) and objective (ergonomic evaluation and work capacity) aspects. This study specifically aims to analyze the relationship between seven independent variables, namely work posture, workload, age, nutritional status, length of service, smoking habits, and exercise habits, with complaints of Musculoskeletal Disorders in porter workers at grocery agents in Prabumulih City. The purpose of this study was to determine the risk factors for Musculoskeletal Disorders (MSDs) in porter workers at grocery agents in Prabumulih City, South Sumatra.

METHOD

This study is a quantitative analytical study with a cross-sectional design conducted from April to May 2025 at several grocery agents in Prabumulih City. The population of this study consisted of all 90 porter workers, with a sample of 73 respondents selected using a simple random sampling technique. The instruments used in this study included a questionnaire on respondent characteristics (age, nutritional status, length of service, smoking habits, exercise habits), Nordic Body Map (NBM) to map MSDs complaints, Quick Exposure Checklist (QEC) to assess work posture and exposure to ergonomic risks, and %CVL (Cardiovascular Load) measurements to classify workload based on pulse rate. NBM provides subjective

information on pain location, while QEC provides an action score based on upper body evaluation, work frequency, and psychological stress. %CVL is used to determine the category of light or heavy workload. Data were analyzed univariate and bivariate analysis using the Chi-Square test, with a significance level of $p < 0.05$ to assess the relationship between seven independent variables (work posture, workload, age, nutritional status, length of service, smoking, and exercise) with Musculoskeletal Disorders (MSDs) complaints.

RESULT

Table 1. Lifting Goods

Posture Activity Images	Body Part Posture	Information
	Back	In the first and second photos, the worker is bending without bending his knees. In contrast, in the third photo, the worker uses a more ergonomic squat technique and shifts the load to the leg muscles, reducing the risk of back injury. However, if done for a long duration, both still have the potential to cause MSDs complaints.
	Neck	Both postures show neck flexion during picking up objects. In QEC, this is considered a moderate to high risk if repeated. Static tension in the levator scapulae and trapezius muscles can cause complaints of neck pain, which are common in NBM respondents.
	Shoulder	The shoulder position in both photos shows the pressure on the deltoid muscle and rotator cuff to maintain stability while reaching for the cardboard. The QEC considers this posture to be a moderate risk factor, and can lead to supraspinatus tendonitis and long-term upper shoulder pain.
	Hand/Wrist	Both postures show the wrist in a gripping and flexed position and if continued for a long time can cause carpal tunnel syndrome, such as complaints of tingling and pain in the wrist.
	Legs/Knees	The stark difference is visible here. The first photo shows the legs straight and the knees unbent, channeling the load to the lower back. Whereas in the second photo, the knees are in the ergonomically ideal flexed position.

Table 2.
Carrying Goods

Posture Activity Images	Body Part Posture	Information
    	Back	When workers lift cardboard, the lower back bears a heavy load. If it continues to be done, it can cause complaints of lower back pain. Then for workers who lift sacks, the load of the sack is carried on one side of the shoulder. This makes the waist work unbalanced and can trigger pain.
	Neck	The neck also bends towards the object. This position, if maintained for a long time, can cause stiffness and tension in the neck muscles.
	Shoulder	The shoulder supports the load when the cardboard is lifted. Heavy loads can trigger pain and fatigue of the shoulder muscles. Then the shoulder supports the heavy load of the sack on one side. This position can cause the shoulder to quickly become tired and sore.
	Hand/Wrist	The hands grip the cardboard tightly enough. If there is no break, the wrists are at risk of experiencing soreness and pressure. Then the hands help support and maintain the position of the sack. This static movement can cause soreness and pressure on the wrists.
	Legs/Knees	Kaki menopang tubuh dan beban. Posisi kaki yang tidak ideal dapat mempercepat kelelahan pada bagian lutut.

Table 3.
Placing Items

Posture Activity Images	Body Part Posture	Information
	Back	When placing items, workers bend forward. This posture makes the lower back work hard and is at risk of pain if done continuously.
	Neck	The neck is bent towards where the item is placed. This position can cause neck muscles to become tense if not interspersed



	with rest.
Shoulder	Shoulders move down when objects are lowered. Heavy loads can cause shoulder fatigue and pain.
Hand/Wrist	Hands adjust the position of objects in a narrow space. This movement can cause stress on the wrist if done repeatedly.
Legs/Knees	The legs support the posture when bending. If the position of the legs is not right, it can make the knees tired quickly.

Respondent Characteristics

From the research that has been conducted, the distribution of respondents of porters at the Prabumulih City grocery agents is as follows:

Table 4.

Frequency Distribution of Respondent Characteristic Categories of Porters

Respondent Characteristic Categories	f	%
Age		
At Risk	48	65.8
Not at Risk	25	34.2
Nutritional Status		
Abnormal	30	41.1
Normal	43	58.9
Work Duration		
Long-term Worker	37	50.7
New Worker	36	49.3
Smoking Habit		
Smoker	51	69.9
Non-Smoker	22	30.1
Exercise Habit		
Insufficient	55	75.3
Sufficient	18	24.7
Total	73	100

Based on the results of the study in table 4, the results show that the frequency distribution of the risky age category (≥ 35 years) in porters at the Prabumulih City Grocery Agent is 48 respondents (65.8%), while the frequency distribution for non-risk ages (< 35 years) is 25 respondents (34.2%). Based on the nutritional status category, the results show that the frequency distribution of the abnormal nutritional status category ($BMI < 18.5$ and $BMI > 25.0$) in porters at the Prabumulih City Grocery Agent is 30 respondents (41.1%), while the frequency distribution for normal nutritional status ($BMI 18.5-25.0$) is 43 respondents (58.9%). Based on the category of work period, the results show that the frequency distribution of the category of work period with old workers (≥ 5 years) in porters at the Prabumulih City Grocery Agent is 37 respondents (50.7%), while the frequency distribution for work period with new workers (< 5 years) is 36 respondents (49.3%). Based on the category of smoking habits, the results show that the frequency distribution of the category of smoking habits (smoking and ever smoking) in porters at the Prabumulih City Grocery Agent is 51 respondents (69.9%), while the frequency distribution for smoking habits with non-smoking workers is 22 respondents (30.1%). Then based on the category of exercise habits, the results show that the frequency distribution of the exercise habit category with workers who have poor exercise habits (< 150 minutes or $5x/week$) among porters at the Prabumulih

City Grocery Agent is 55 respondents (75.3%), while the frequency distribution for exercise habits with workers who have sufficient exercise habits (>150-299 minutes or >5x/week) is 18 respondents (24.7%).

Measurement of Musculoskeletal Disorders (MSDs) Complaints using the Nordic Body Map (NBM) Questionnaire

This study was conducted on 73 respondents, namely porters at the Prabumulih City Grocery Agent, to assess Musculoskeletal Disorders (MSDs) complaints using the Nordic Body Map (NBM) questionnaire. This questionnaire is in the form of a picture of the human body where the entire body consists of 28 parts that can be analyzed in the questionnaire. These complaints are divided into two categories, namely the severe category with a score of 42-84 and the mild category with a score of 0-41. The following is a table of the frequency distribution of Musculoskeletal Disorders (MSDs) complaints from 73 porter respondents:

Table 5.

Frequency Distribution of Complaints of Musculoskeletal Disorders (MSDs) in Porters at the Sembako Agent in Prabumulih City

Musculoskeletal Disorders (MSDs) Complaints	f	%
Heavy	59	80,8
Light	14	19,2
Total	73	100

The results of the frequency distribution of Musculoskeletal Disorders (MSDs) complaints in porters at the Prabumulih City Grocery Agent showed that out of 73 porters, 59 respondents (80.8%) experienced MSDs complaints in the severe category, while 14 respondents (19.2%) experienced MSDs complaints in the mild category. These results indicate that porters at the Prabumulih City Grocery Agent who experienced MSDs complaints in the severe category were more than those who experienced complaints in the mild category.

Table 6.

Frequency Distribution of Respondents Based on Body Part Complaints of Musculoskeletal Disorders (MSDs) in Porters

Body Part	Severe Complaint		Mild Complaint	
	f	%	f	%
Upper Neck	27	37	46	63
Lower Neck	21	28.8	52	71.2
Left Shoulder	29	39.7	44	60.3
Right Shoulder	23	31.5	50	68.5
Left Upper Arm	20	27.4	53	72.6
Back	24	32.9	49	67.1
Right Upper Arm	11	15.1	62	84.9
Waist	22	30.1	51	69.9
Below Waist	20	27.4	53	72.6
Buttocks	19	26	54	74
Left Elbow	25	34.2	48	65.8
Right Elbow	22	30.1	51	69.9
Left Forearm	23	31.5	50	68.5
Right Forearm	30	41.2	43	58.9
Left Wrist	25	34.2	48	65.8
Right Wrist	25	34.2	48	65.8
Left Han				

Based on table 6, the results show that porters at the Prabumulih City Grocery Agent felt the most complaints in the right knee, namely 32 respondents (43.8%), in the right lower arm, namely 30 respondents (41.1%), and in the left shoulder, namely 29 respondents (39.7%).

Measuring Work Posture Using the Quick Exposure Checklist (QEC) Questionnaire

From the research that has been conducted, the distribution of respondents based on work posture of porters at the Prabumulih City grocery agent is as follows:

Table 7.

Distribution of Porter Categories Based on Work Posture

Age Category	f	%
At risk	46	63
No Risk	27	37
Total	73	100

Based on the research results in table 7, the results show that the frequency distribution of the risky work posture category (QEC Score $\geq 50\%$) in porters at the Prabumulih City Grocery Agent is 46 respondents (63%), while the frequency distribution for non-risky work postures (QEC Score $< 50\%$) is 25 respondents (34.2%).

Table 8.

Recapitulation of Worker Exposure Scores

Respondents	Back	Shoulder	Wrist	Neck	Driving	Vibration	Work_Pace	Strenuous	QEC Total	Exposure Level (%)
1	10	8	24	4	1	1	1	1	50	28,4
2	22	26	42	8	1	1	9	16	125	71
3	20	12	12	4	1	1	1	1	52	29,5
4	22	26	40	8	1	1	9	9	116	66
5	22	20	22	6	1	1	1	1	74	42
6	22	26	46	8	1	1	9	16	129	73,3
7	20	16	28	4	1	1	1	4	75	42,6
8	10	8	10	4	1	1	1	1	36	20,4
9	16	12	12	4	1	1	1	1	48	27,3
10	22	26	46	8	1	1	9	9	122	69,3
11	22	26	46	8	1	1	9	9	122	69,3
12	22	26	32	8	1	1	9	16	115	65,3
13	14	8	18	4	1	1	1	4	51	29
14	22	26	34	8	1	1	9	9	110	62,5
15	22	26	40	8	1	1	4	9	111	63
16	22	26	36	8	1	1	4	9	107	60,8
17	22	26	46	8	1	1	4	9	117	66,5
18	22	26	32	8	1	1	4	9	103	58,5
19	22	20	20	8	1	1	1	4	77	43,7
20	22	26	46	8	1	1	4	16	124	70,4
21	22	26	38	8	1	1	9	9	114	65
22	22	26	44	8	1	1	6	9	117	66,4
23	16	12	12	4	1	1	2	1	49	28
24	22	26	42	8	1	1	4	9	113	64,2
25	22	16	22	8	1	1	1	4	75	42,6
26	22	26	42	8	1	1	9	9	118	67
27	22	20	14	6	1	1	4	4	72	41
28	22	26	42	8	1	1	9	16	125	71
29	22	26	40	8	1	1	4	16	118	67
30	20	16	26	8	1	1	1	1	74	42,
31	22	26	32	8	1	1	9	16	115	65,3
32	22	26	40	8	1	1	9	9	116	66
33	22	26	38	8	1	1	4	16	116	66
34	20	16	28	6	1	1	4	4	80	45,4
35	22	26	38	8	1	1	9	16	121	69
36	22	26	40	8	1	1	4	16	118	67
37	14	16	26	4	1	1	1	4	67	38,1

Respondents	Back	Shoulder	Wrist	Neck	Driving	Vibration	Work_Pace	Strenuous	QEC Total	Exposure Level (%)
38	22	26	46	8	1	1	4	9	117	66,5
39	22	26	34	8	1	1	9	9	110	62,5
40	22	26	46	8	1	1	4	16	124	70,4
41	22	16	20	4	1	1	4	1	69	39,2
42	22	26	40	8	1	1	4	16	118	67
43	22	26	46	8	1	1	9	9	122	69,3
44	22	26	34	8	1	1	4	16	112	63,6
45	22	26	34	8	1	1	4	16	112	63,6
46	22	26	42	8	1	1	4	16	120	68,2
47	22	26	44	8	1	1	4	9	115	65,3
48	22	26	36	8	1	1	4	16	114	65
49	22	24	16	8	1	1	4	1	77	44
50	22	16	20	8	1	1	4	4	76	43,2
51	22	24	20	6	1	1	1	4	79	45
52	20	16	26	6	1	1	1	4	75	43
53	22	26	32	8	1	1	9	16	115	65,3
54	22	26	42	8	1	1	4	9	113	64,2
55	22	26	30	8	1	1	9	16	113	64,2
56	22	26	32	8	1	1	4	16	110	62,5
57	14	8	10	4	1	1	1	1	40	23
58	22	26	46	8	1	1	9	16	129	73,3
59	22	26	42	8	1	1	9	16	125	71
60	22	26	46	8	1	1	9	16	129	73,3
61	14	12	16	4	1	1	1	1	50	28,4
62	16	16	20	4	1	1	4	1	63	36
63	16	12	26	8	1	1	4	4	72	41
64	20	12	22	4	1	1	1	4	65	37
65	14	8	24	8	1	1	4	1	61	35
66	22	26	36	8	1	1	9	16	119	68
67	22	26	36	8	1	1	4	9	107	61
68	22	26	38	8	1	1	9	9	114	65
69	22	26	46	8	1	1	4	16	124	70,4
70	16	12	20	4	1	1	4	1	59	33,5
71	22	26	38	8	1	1	4	16	116	66
72	22	26	32	8	1	1	9	16	115	65,3
73	16	12	12	4	1	1	1	1	48	27,2

Based on the recapitulation of exposure level values, porter workers at the Prabumulih City Grocery Agent have higher risk exposure values (Exposure Level > 50%) than those who are not at risk (Exposure Level < 50%).

Workload Measurement Using Cardiovascular Load (%CVL)

From the research that has been conducted, the distribution of respondents based on the workload of porters at the Prabumulih City grocery agent is as follows:

Table 8.

Distribution of Workload Categories for Porters at Grocery Agents in Prabumulih City

Workload Category	f	%
Heavy	59	80,8
Light	14	19,2
Total	73	100

Based on the research results in table 8, the results show that the frequency distribution of the heavy workload category (%CVL > 30%) for porters at the Prabumulih City Grocery Agent is

59 respondents (80.8%), while the frequency distribution for the work period with the light category (%CVL < 30%) is 14 respondents (19.2%).

Table 9.
Classification Results Cardiovascular Load (%CVL)

Respondent	Cardiovascular Load (%CVL)	%CVL Category
1	66.4	Heavy
2	43.9	Heavy
3	50.7	Heavy
4	41.2	Heavy
5	29.7	Light
6	32.8	Heavy
7	61.1	Heavy
8	63.1	Heavy
9	59.7	Heavy
10	33.7	Heavy
11	47.8	Heavy
12	22.7	Light
13	70.2	Heavy
14	22.1	Light
15	26.7	Light
16	51.3	Heavy
17	16.2	Light
18	21.2	Light
19	64.7	Heavy
20	28.3	Light
21	46.3	Heavy
22	24.0	Light
23	54.4	Heavy
24	54.7	Heavy
25	53.8	Heavy
26	20.5	Light
27	69.5	Heavy
28	41.5	Heavy
29	42.2	Heavy
30	29.6	Light
31	56.7	Heavy
32	72.5	Heavy
33	46.4	Heavy
34	26.6	Light
35	38.8	Heavy
36	66.3	Heavy
37	27.8	Light
38	42.6	Heavy
39	40.9	Heavy
40	46.6	Heavy
41	28.3	Light
42	49.1	Heavy
43	52.1	Heavy
44	48.5	Heavy

Respondent	Cardiovascular Load (%CVL)	%CVL Category
45	56.4	Heavy
46	33.6	Heavy
47	56.4	Heavy
48	60.2	Heavy
49	57.7	Heavy
50	72.3	Heavy
51	46.5	Heavy
52	27.6	Light
53	49.0	Heavy
54	47.4	Heavy
55	56.3	Heavy
56	69.1	Heavy
57	61.5	Heavy
58	74.5	Heavy
59	64.7	Heavy
60	44.1	Heavy
61	34.2	Heavy
62	35.4	Heavy
63	31.5	Heavy
64	62.6	Heavy
65	35.2	Heavy
66	68.7	Heavy
67	30.9	Heavy
68	57.6	Heavy
69	39.6	Heavy
70	49.5	Heavy
71	34.8	Heavy
72	39.8	Heavy
73	67.7	Heavy

The Relationship Between Work Posture and Musculoskeletal Disorders (MSDs)

Table 10.

Relationship between Work Posture and Complaints Musculoskeletal Disorders (MSDs)

Work Posture	Complaint MSDs				Total		p-Value	PR (95% CI)
	Heavy		Light					
	f	%	f	%	f	%		
At risk	42	57,5	4	5,5	46	63	0,003	6,176 (1,702–22,419)
No								
At risk	17	23,3	10	13,7	27	37		

Table 10 shows that out of 27 respondents (37%) with non-risky work postures, there were 10 respondents (13.7%) who experienced mild MSDs complaints, and 17 respondents (23.3%) who experienced severe MSDs complaints. On the other hand, out of 46 respondents (63%) with risky work postures, 42 respondents (57.5%) experienced severe MSDs complaints, while only 4 respondents (5.5%) experienced mild complaints. The p-value obtained from the Pearson Chi-Square test was 0.003 ($p < 0.05$), which indicated a significant relationship between work posture and Musculoskeletal Disorders (MSDs) complaints. The Prevalence Ratio (PR) value for severe MSDs complaints was 6.176 (95% CI: 1.702–22.419), which indicated that workers with risky work postures were 6.18 times more likely to experience severe MSDs complaints compared to workers with non-risky work postures.

Relationship Between Age and Musculoskeletal Disorders (MSDs) Complaints

Table 11.

Relationship between Age and Complaints <i>Musculoskeletal Disorders</i> (MSDs)								
Worker Age	Complaint MSDs				Total		<i>p-Value</i>	PR (95% CI)
	Heavy		Light					
	f	%	f	%	f	%		
At risk	42	57,5	6	8,2	48	65,7	0,045	3,924 (0,993–10,927)
No								
At risk	17	23,3	8	11	25	34,3		

Table 11 shows that respondents with non-risk age were 25 respondents (34.3%), there were 8 respondents (11%) who experienced mild MSDs complaints, and 17 respondents (23.3%) experienced severe MSDs complaints. Meanwhile, of the 48 respondents (65.7%) with the age of workers at risk, there were 42 respondents (57.5%) who experienced severe MSDs complaints and only 6 respondents (8.2%) who experienced mild complaints. The p-value obtained from the Pearson Chi-Square test was 0.045 ($p < 0.05$), which indicates a significant relationship between work posture and Musculoskeletal Disorders (MSDs) complaints. The Prevalence Ratio (PR) value for severe MSDs complaints was 3.924 (95% CI: 0.993–10.927), which shows that workers with a risky age (>35 years) are four times more likely to experience severe MSDs complaints compared to workers who are younger and have a non-risk posture (<35 years).

The Relationship Between Nutritional Status and Musculoskeletal Disorders (MSDs) Complaints

Table 12.

Relationship between Nutritional Status and Complaints Musculoskeletal Disorders (MSDs)									
Nutritional status		Complaint MSDs				Total		<i>p-Value</i>	PR (95% CI)
		Heavy		Light					
		f	%	f	%	f	%		
No	Normal	29	39,7	1	1,4	30	41,1	0,004	12,567 (1,543–102,316)
	Normal	30	41,1	13	17,8	43	58,9		

Table 12 shows that out of a total of 30 respondents with abnormal nutritional status, 29 respondents (39.7%) experienced severe MSDs complaints, and 1 respondent (1.4%) experienced mild MSDs complaints. Meanwhile, in the group with normal nutritional status, there were 30 respondents (41.1%) who experienced severe MSDs complaints, and 13 respondents (17.8%) who experienced mild MSDs complaints. The p value obtained from the Pearson Chi-Square test was 0.004 ($p < 0.05$), which indicated a significant relationship between nutritional status and Musculoskeletal Disorders (MSDs) complaints. The Prevalence Ratio (PR) value for severe MSDs complaints was 12.567 (95% CI: 1.543–102.316), which indicated that respondents with abnormal nutritional status were approximately 12.6 times more likely to experience severe MSDs complaints compared to respondents with normal nutritional status.

Relationship Between Length of Service and Complaints of Musculoskeletal Disorders (MSDs)

Table 13.

Relationship between Length of Service and Complaints Musculoskeletal Disorders (MSDs)										
Years of service			Complaint MSDs				Total		<i>p-Value</i>	PR (95% CI)
			Heavy		Light					
			f	%	f	%	f	%		
Power	Work	Long	35	48	2	2,7	37	50,7	0,002	8,750 (1,794-42,673)
Power	Work	New	24	32,9	12	16,4	36	49,3		

In Table 13, it can be seen that out of 73 respondents, 35 respondents (48%) with long working periods experienced severe MSDs complaints, and 2 respondents (2.7%) experienced mild MSDs complaints. Meanwhile, in the group with new working periods, there were 24

respondents (32.9%) who experienced severe MSDs complaints, and 12 respondents (16.4%) experienced mild MSDs complaints. The p-value obtained from the Pearson Chi-Square test was 0.002 ($p < 0.05$), which indicated a significant relationship between working period and Musculoskeletal Disorders (MSDs) complaints. The Prevalence Ratio (PR) value for severe MSDs complaints was 8.750 (95% CI: 1.794–42.673), which indicated that respondents with long working periods were 8.75 times more likely to experience severe MSDs complaints compared to respondents with new working periods

The Relationship Between Workload and Musculoskeletal Disorders (MSDs) Complaints

In Table 14, it can be seen that from a total of 73 respondents, 52 respondents (71.2%) with heavy workload (%CVL > 30%) experienced severe MSDs complaints, and 7 respondents (9.6%) experienced mild MSDs complaints. On the other hand, in the group with light workload (%CVL < 30%), there were 7 respondents (9.6%) who experienced severe MSDs complaints, and 7 respondents (9.6%) who experienced mild MSDs complaints. The p-value obtained from the Pearson Chi-Square test was 0.001 ($p < 0.05$), which indicates a significant relationship between workload and Musculoskeletal Disorders (MSDs) complaints. The Prevalence Ratio (PR) value for severe MSDs complaints was 7.429 (95% CI: 2.001–27.575), which indicates that respondents with a heavy workload are 7.4 times more likely to experience severe MSDs complaints compared to respondents with a light workload.

Table 14.

Relationship Between Workload and Complaints Musculoskeletal Disorders (MSDs)								
Workload	Complaint MSDs				Total		<i>p-Value</i>	PR (95% CI)
	Heavy		Light					
	f	%	f	%	f	%		
Heavy	52	71,2	7	9,6	59	80,8	0,001	7,429
Light	7	9,6	7	9,6	14	19,2		(2,001–27,575)

Excessive workloads, especially those involving repeated lifting and moving of heavy objects, put significant stress on the muscles, ligaments, and joints of the body. Porters in grocery agents are often forced to lift very heavy loads, with very high lifting frequencies. This causes continuous muscle tension, which can eventually lead to muscle fatigue, pain, and musculoskeletal injuries. Heavy loads cause muscles to contract continuously to support the load, which can reduce the supply of oxygen and nutrients to the muscles, inhibit the recovery process, and cause muscle damage (Sari, 2019). This study is in line with the findings of Wahyu Sekar Nur Fadila et al. (2024), which showed that heavy workloads have a direct relationship with MSDs complaints in workers in wholesale markets and grocery agents. In the study, workers who lifted goods weighing more than 50 kg per lift experienced MSDs complaints more often than workers who lifted lighter loads. This finding is also supported by Sari's research (2019), which revealed that work involving heavy loads and poor posture increases tension in muscles and joints, which ultimately worsens MSDs complaints.

The Relationship Between Smoking Habits and Musculoskeletal Disorders (MSDs)

Table 15.

Relationship between Smoking Habits and Complaints Musculoskeletal Disorders (MSDs)								
Smoking Habit	Complaint MSDs				Total		<i>p-Value</i>	PR (95% CI)
	Heavy		Light					
	f	%	f	%	f	%		
Smoking/Ever Smoke	44	60,3	7	9,6	51	69,9	0,072	1,492
No Smoke	15	20,5	7	9,6	22	30,1		(0,865-2,571)

In Table 15, it can be seen that out of 51 respondents who have a habit of smoking or have smoked, as many as 44 respondents (60.3%) experienced severe Musculoskeletal Disorders (MSDs) complaints, and 7 respondents (9.6%) experienced mild MSDs complaints.

Meanwhile, in the group of respondents who did not smoke, out of 22 respondents, there were 15 respondents (20.5%) who experienced severe MSDs complaints and 7 respondents (9.6%) who experienced mild MSDs complaints. The p-value obtained from the Chi-Square test was 0.072 ($p > 0.05$), which indicates that there is no significant relationship between smoking habits and Musculoskeletal Disorders (MSDs) complaints in porter workers at the Prabumulih City grocery agent.

The Relationship Between Exercise Habits and Musculoskeletal Disorders (MSDs)

Table 16.

Relationship Between Exercise Habits and Complaints Musculoskeletal Disorders (MSDs)								
Exercise Habits	Complaint MSDs				Total		<i>p-Value</i>	PR (95% CI)
	Heavy		Light					
	f	%	f	%	f	%		
Not enough	48	65,7	7	9,6	55	75,3	0,014	4,364 (1,268–15,013)
Enough	11	15,1	7	9,6	18	24,7		

In Table 16, it can be seen that out of 73 respondents, 48 respondents (65.8%) with poor exercise habits experienced severe MSDs complaints, and 7 respondents (9.6%) experienced mild MSDs complaints. Meanwhile, in the group with sufficient exercise habits, there were 11 respondents (15.1%) who experienced severe MSDs complaints, and 7 respondents (9.6%) experienced mild MSDs complaints. The p value obtained from the Pearson Chi-Square test was 0.014 ($p < 0.05$), which indicated a significant relationship between exercise habits and Musculoskeletal Disorders (MSDs) complaints. The Prevalence Ratio (PR) value for severe MSDs complaints was 4.364 (95% CI: 1.268–15.013), which means that respondents with poor exercise habits were 4.4 times more likely to experience severe MSDs complaints compared to those with sufficient exercise habits.

DISCUSSION

The Relationship Between Work Posture and Musculoskeletal Disorders (MSDs)

Porter workers at grocery agents in Prabumulih City are often exposed to physical work that requires them to lift heavy loads with non-ergonomic body postures. Based on the data collected, improper body posture, such as bending, twisting, or bending the body repeatedly for a long time, increases the risk of injury to the parts of the body that receive the most load, such as the lower back, shoulders, neck, and wrists. A bent or twisted body position can put additional pressure on the spine and muscles, which in the long term can cause damage to the musculoskeletal system. Research by Lestari et al. (2022) also supports these findings, which show that non-ergonomic body posture is one of the main causes of MSDs complaints among physical workers, especially in the lower back and shoulders. Based on these results, it can be concluded that controlling non-ergonomic body posture is an important step in preventing and reducing MSDs complaints among porter workers at grocery agents.

Relationship Between Age and Musculoskeletal Disorders (MSDs) Complaints

As age increases, physiological changes occur in the body, especially in the musculoskeletal system. Workers over the age of 35 years experience a degenerative process in the intervertebral discs, which results in decreased elasticity and stability of the spine. This degeneration causes a decrease in the ability of the discs to protect the spine from excessive pressure. This degenerative process can worsen MSDs complaints and cause pain in the lower back, shoulders, and other parts of the body. Based on the results of this study, it is clear that older workers, especially those aged ≥ 35 years, are more susceptible to MSDs complaints, especially those related to the back and joints. Based on the results of this study, it can be concluded that age has a significant effect on MSDs complaints in porter workers at the Prabumulih City grocery agent. Workers aged ≥ 35 years have a higher risk of experiencing severe MSDs complaints compared to younger workers, so that age is the main risk factor for Musculoskeletal Disorders (MSDs) in porter workers at the Prabumulih City grocery agent.

The Relationship Between Nutritional Status and Musculoskeletal Disorders (MSDs) Complaints

Poor nutritional conditions can affect musculoskeletal health in direct and indirect ways. Workers who are malnourished, especially those lacking protein, calcium, and vitamin D, tend to have weaker muscles and are more susceptible to injury. Calcium deficiency, for example, can cause decreased bone density, which makes bones more fragile and more susceptible to fractures or injuries due to excessive physical exertion and vice versa (Purba & Lestari, 2017).

This study is in line with the findings conducted by Azzahri Lira M. (2020), which showed that workers with poor nutritional status are more susceptible to injuries and musculoskeletal problems. The results of this study are also supported by research by Purba & Lestari (2017), which shows that poor nutritional status can worsen the musculoskeletal conditions of workers, especially those involved in physical work involving heavy lifting. Research by Sari (2019) also emphasizes that nutritional status plays a major role in muscle endurance and body recovery, which reduces the risk of injury.

Relationship Between Length of Service and Complaints of Musculoskeletal Disorders (MSDs)

Workers who have worked for long periods of time, especially in jobs that involve heavy lifting and repetitive movements, are at risk of experiencing damage to their musculoskeletal system. Over time, the body will experience an accumulation of workloads that put pressure on the muscles, joints, and spine, which in turn causes injuries and MSDs complaints. This process is known as "wear and tear," which is gradual damage that occurs to the body's structure due to repeated physical loads. This is reinforced by the findings in a study by Purba & Lestari (2017), which stated that long working periods cause decreased elasticity of muscles and joints, which increases the likelihood of muscle or ligament injuries, especially in the lower back and neck. This accumulation of biomechanical stress leads to musculoskeletal disorders that can worsen workers' quality of life.

The Relationship Between Workload and Musculoskeletal Disorders (MSDs) Complaints

One reason why smoking habits do not show a significant relationship with MSDs complaints is because other factors that are more directly related to physical work may have a more dominant influence on workers' musculoskeletal conditions. Heavy workloads, unergonomic postures, and long working hours are the main factors that more directly affect musculoskeletal health in the context of porter work. Workers who are exposed to heavy physical tasks such as lifting weights without paying attention to good posture, or who have long work schedules with little time to rest, are at higher risk of experiencing MSDs complaints. Based on the results of this study, although there was no significant relationship between smoking habits and MSDs complaints in porter workers, it is important to continue to pay attention to the negative impacts of smoking on body health.

The Relationship Between Exercise Habits and Musculoskeletal Disorders (MSDs)

According to research by Lestari et al. (2022), workers who regularly exercise, such as gymnastics or muscle strengthening exercises, have better resistance to injury. Exercise can help improve posture and strengthen the core muscles needed to support the spine and maintain body balance when lifting weights. This certainly reduces the possibility of injury and MSDs complaints in workers involved in physical work. This study supports the findings of several previous studies showing that exercise plays an important role in preventing and reducing MSDs complaints. For example, research by Azzahri Lira M. (2020) shows that workers who exercise regularly have a lower risk of experiencing musculoskeletal injuries compared to workers who rarely exercise. Research by Purba & Lestari (2017) also shows

that exercise habits can strengthen muscles and joints, thereby increasing the body's resistance to physical stress caused by heavy work.

CONCLUSION

The results of this study indicate that Musculoskeletal Disorders (MSDs) complaints in porter workers at Prabumulih City grocery agents have a fairly high prevalence. There is a significant relationship between work posture, workload, age, length of service, nutritional status, and exercise habits with the incidence of MSDs complaints. Workers with non-ergonomic work postures, heavy workloads, age >35 years, length of service >5 years, abnormal nutritional status, and those who do not have exercise habits tend to experience higher MSDs complaints. Meanwhile, smoking habits do not show a significant relationship. These findings emphasize the importance of controlling ergonomic factors and promoting a healthy lifestyle in efforts to prevent MSDs complaints, especially in informal workers who have a high risk of physical work.

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