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Work Postural Analysis and Individual Characteristics with Musculoskeletal Disorder's Occurrence in Formal Sector Employees at PT Bumi Suksesindo Pesanggaran Banyuwangi

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ABSTRACT

Musculoskeletal Disorders is a group of symptoms that affect the normal functions of the smooth tissue of the musculoskeletal system which accumulates continuously over a relatively long time which can be in a matter of days, months and years, depending on the severity of the trauma. Preliminary studies conducted by researchers at PT. Bumi Suksesindo Banyuwangi revealed that the prevalence using the Nordic Body Map questionnaire on 15 workers found that there were MSDs complaints both at work and at the time they finished working. PT. Bumi Suksesindo is one of the gold mining companies in Banyuwangi which 90% of the administrative staff at PT. Bumi Suksesindo works by using a computer with a sitting position and has individual characteristics in the form of gender, age, BMI, years of service, smoking habits and exercise habits. The purpose of this study was to analyze the relationship between work posture and individual characteristics (gender, age, years of service, smoking habits, and exercise habits) with the incidence of musculoskeletal disorders (MSDs) in formal sector employees of PT. Bumi Suksesindo Pesanggaran Banyuwangi. This research was quantitative with analytic observational method with Cross Sectional design. The sample of this study was 45 formal sector employees at PT. Bumi Suksesindo Banyuwangi which were taken by using simple random sampling. Logistics regression was used to analyze the data. Based on the test results, there was a relationship of age (p-value: 0,000), BMI (p-value: 0,023) smoking habits (p-value: 0,003) and exercise habits (p-value: 0,000) on MSDS existence.

Keywords: work postural; individual characteristic; musculoskeletal disorder's

INTRODUCTION

Background

Musculoskeletal Disorders is a group of symptoms that affect the normal functions of the smooth tissue of the musculoskeletal system which accumulates continuously over a relatively long time, which can be in a matter of days, months and years, depending on the severity of the trauma. Musculoskeletal disorder (MSDs) generally refers to a form of pain, injury, or abnormality in the skeletal system, including nerve tissue, tendons, ligaments, muscles or joints. Working with pain can reduce work productivity and if it continues it will cause disability which ultimately eliminates the work for the workers⁽¹⁾.

One of the explanations for this relationship is that the increasing age, bone degeneration will occur at the age of 30 years⁽²⁾. One of the explanations about the relationship between MSDs and smoking habits is that smoking can cause MSDS complaints. This happens because the nicotine content in cigarettes will increase

plasma epinephrine which can cause insomnia and reduce the mineral content in the bones which cause the pain due to cracks or damage to bones⁽³⁾. The Body Mass Index (BMI) assessment represents a person's nutritional status, if the BMI is good then it can be said to be of good nutritional status and if the nutritional status is good it will increase productivity, but if the nutritional status is bad it will reduce their work productivity⁽⁴⁾. Msds is influenced by years of work, the longer a person works in a place the more likely they are to be exposed to work environment factors that can cause work-related health problems so that it can lead to a decrease in the efficiency and productivity of someone's workforce⁽⁵⁾.

In addition, MSDS is also influenced by exercise habits. If a person lacks exercising then he will lose his weakness and flexibility in the muscles and if the exercise is done properly and correctly in accordance with the recommendations it can help increasing his physical fitness which will improve his physical endurance. The most influential factor includes the joint angle, vertical inclination of the body, head, hands and feet and the degree of addition or reduction in the shape of the spinal curve.

In addition, working in a long time with a fixed position / both standing and sitting will cause discomfort. The attitude of working seated for a long time will make the workers always try to balance the position of his body so as to cause static workload on the muscles of the back and legs. This condition also causes blood being gathered in the lower body. While the working attitude of sitting for a long time without any adjustments can cause softening of the abdominal muscles, curvature of the spine and disorders of the respiratory and digestive organs⁽⁶⁾.

The prevalence of MSDS complaints at PT. Bumi Suksesindo Banyuwangi shows a fluctuating pattern. From a preliminary study conducted on the workers, it showed complaints of MSDS both at work and at the time of completion of the work felt by the workers. This is influenced by age, BMI, smoking habits, and exercise habits, with the existence of these complaints further studies are needed to analyze the factors related to MSDS for PT. Bumi Suksesindo Employees in Pesanggaran Banyuwangi.

Purpose

The research analyzed the correlation between work posture and individual characteristics (gender, age, years of service, smoking habits and exercise habits) with the incidence of musculoskeletal disorders (MSDs) in formal sector employees of PT. Bumi Suksesindo Pesanggaran Banyuwangi.

METHODS

Type and Design

This research method used observational analytic. The research design was cross sectional. This research was conducted at PT. Bumi Suksesindo Pesanggaran Banyuwangi.

Population and Sample

The population in this study were all formal sector employees of PT. Bumi Suksesindo Pesanggaran Banyuwangi. The sample in this study were formal sector employees of PT. Bumi Suksesindo Pesanggaran banyuwangi who met the inclusion and the exclusion criteria. The sampling technique was simple random sampling.

Data Collection and Data Analysis

The data needed in this study were primary data and secondary data. The data collection techniques used questionnaires, interviews, and observations. The data processing included editing, coding, data entry, and tabulating. The data analysis techniques employed logistic regression, the time of the study began on January 1, 2018 at PT. Bumi Suksesindo Pesanggaran Banyuwangi.

RESULTS

Distribution of Individual Characteristics in Formal Sector Employees of PT. Bumi Suksesindo Banyuwangi

Table 1 shows the description of individual characteristics of respondents.

Table 1. Distribution of individual characteristics in formal sector employees of PT. Bumi Suksesindo Banyuwangi

Variables	MSDs							
	Low		Moderate		High		Total	
	n	%	n	%	n	%	n	%
Gender								
a. Male	1	3.6	13	46.4	14	50	28	62
b. Female	3	17.6	12	70.6	2	11.8	17	38
Age								
a. <35 Years	4	23.5	13	76.5	0	0	17	38
b. ≥35 Years	0	0	12	42.9	16	57.1	28	62
BMI								
a. Obesity	0	0	11	61.1	7	38.9	18	40
b. Overweight	1	6.25	8	50	7	43.75	16	36
c. Normal	2	20	6	60	2	20	10	22
d. Underweight	1	100	0	0	0	0	1	2
Years of Service								
a. < 2 years	1	33.3	2	66.7	0	0	3	7
b. ≥ 2 years	3	7.1	23	54.8	16	38.1	42	93
Smoking Habits								
a. Yes	0	0	13	48.1	14	51.9	27	60
b. No	4	22.2	12	66.7	2	11.1	18	40
Exercise Habits								
a. Yes	4	33.3	8	66.7	0	0	12	27
b. No	0	0	17	51.5	16	48.5	33	73

Distribution of Ergonomics Risk Levels of PT. Bumi Suksesindo Pesanggaran Banyuwangi

Table 2. Distribution of Ergonomics Risk Levels of PT. Bumi Suksesindo Pesanggaran Banyuwangi

Variable	n	%
Ergonomic Risk		
a. Moderate	28	62.2
b. High	17	37.8

The results revealed that there were respondents who worked with a moderate level of ergonomic risk as many as 28 people (62.2%), while those who worked with a high level of ergonomic risk were 17 people (37.8%).

Details of MSDs Complaints on PT. Bumi Suksesindo Pesanggaran Banyuwangi

Table 3. Details of MSDs Complaints on PT. Bumi Suksesindo Pesanggaran Banyuwangi

No	Complaints Area	Level of pain							
		0 (Painless)		1 (Little Sick)		2 (Sick)		3 (Very Sick)	
		n	%	n	%	n	%	n	%
0	Upper neck	3	7%	3	7%	16	36%	23	51%
1	Nape	2	4%	9	20%	12	27%	22	49%
2	Left shoulder	1	2%	20	44%	12	27%	12	27%
3	Right shoulder	0	0%	10	22%	16	36%	19	42%
4	Left upper arm	11	24%	5	11%	14	31%	15	33%
5	Back	0	0%	16	36%	9	20%	20	44%
6	Right upper arm	5	11%	15	33%	17	38%	8	18%
7	Waist	2	4%	10	22%	18	40%	15	33%
8	Hip	3	7%	15	33%	15	33%	12	27%
9	Butt	9	20%	14	31%	16	36%	6	13%
10	Left elbow	17	38%	12	27%	15	33%	1	2%
11	Right elbow	9	20%	17	38%	15	33%	4	9%
12	Left forearm	8	18%	18	40%	13	29%	6	13%
13	Right forearm	7	16%	13	29%	18	40%	7	16%
14	Left Wrist	3	7%	20	44%	16	36%	6	13%
15	Right wrist	9	20%	17	38%	11	24%	8	18%
16	Left hand	10	22%	17	38%	16	36%	2	4%
17	Right hand	10	22%	15	33%	17	38%	3	7%
18	Left thigh	4	9%	17	38%	10	22%	14	31%
19	Right thigh	13	29%	17	38%	8	18%	7	16%
20	Left knee	9	20%	13	29%	18	40%	5	11%
21	Right knee	2	4%	13	29%	18	40%	12	27%
22	Left calf	9	20%	21	47%	6	13%	9	20%
23	Right calf	34	76%	2	4%	6	13%	3	7%
24	Left ankle	12	27%	12	27%	9	20%	12	27%
25	Right ankle	23	51%	8	18%	8	18%	6	13%
26	Left foot	27	60%	12	27%	6	13%	0	0%
27	Right foot	25	56%	12	27%	8	18%	0	0%

Based on table 3, it showed that the MSDs complaints felt by employees with the highest level of pain were 51% in the upper neck, 49% in the neck and 44% in the back. Whereas the lowest MSDs complaints were 76% in the right calf, 60% in the left foot and 56% in the right foot.

Occurrence (MSDs) at PT. Bumi Suksesindo Pesanggaran Banyuwangi

Table 4. MSDs of BSI Employees

Variables	n	%
MSDs		
a. Low	4	8.9
b. Moderate	25	55.6
c. High	16	35.6

Based on table 4, it showed that it is known that all respondents experienced MSDs. The respondents who felt MSDs complaints included 4 respondents (8.9%) felt low complaints, 25 respondents (55.6%) felt moderate complaints and 16 respondents (35.6%) felt high complaints. Indicators of MSDs complaints in this study were based on 27 body parts of respondents based on the Nordic Body Maap questionnaire format.

Relationship between Individual Characteristics and MSDS complaints at PT. Bumi Suksesindo Pesanggaran Banyuwangi

Table 5. Relationship between Individual Characteristics and MSDS complaints at PT. Bumi Suksesindo Pesanggaran Banyuwangi

Variables	MSDs								p-value	
	Low		Moderate		High		Total			
	n	%	n	%	n	%	n	%		
Gender										
c. Male	1	36	13	46.4	14	50	28	62	0.20	
d. Female	3	17.6	12	70.6	2	11.8	17	38		
Age										
c. <35 Years	4	23.5	13	76.5	0	0	17	38	0.000	
d. ≥35 Years	0	0	12	42.9	16	57.1	28	62		
BMI										
e. Obesity	0	0	11	61.1	7	38.9	18	40		
f. Overweight	1	6.25	8	50	7	43.75	16	36	0.023	
g. Normal	2	20	6	60	2	20	10	22		
h. Underweight	1	100	0	0	0	0	1	2		
Years of Service										
c. < 2 years	1	33.3	2	66.7	0	0	3	7	0.185	
d. ≥ 2 years	3	7.1	23	54.8	16	38.1	42	93		
Smoking Habits										
c. Yes	0	0	13	48.1	14	51.9	27	60	0.003	
d. No	4	22.2	12	66.7	2	11.1	18	40		
Exercise Habits										
c. Yes	4	33.3	8	66.7	0	0	12	27	0.000	
d. No	0	0	17	51.5	16	48.5	33	73		

Based on table 5, it showed that individual characteristics which are age with P value of 0,000, BMI with P value of 0.023, smoking habits with P value of 0.003 and exercise with P value of 0,000. It could be concluded that the P value <0.05 means there is a meaningful relationship between age, BMI, smoking habits, exercise habits with complaints of Musculoskeletal Disorders (MSDs), while the characteristics that are not related to MSDs complaints are gender and working period because of the p value of >0.05.

Relationship between Work Posture and MSDS Occurrence in Employees with PT. Bumi Suksesindo Pesangaran Banyuwangi

Table 6. Relationship between Work Posture and MSDS Occurrence in Employees with PT. Bumi Suksesindo Pesangaran Banyuwangi

Work Posture	MSDs								p-value
	Low		Moderate		High		Total		
	n	%	n	%	n	%	n	%	
a. Moderate	4	8.9	24	53.3	0	0	28	62.2	0,000
b. High	0	0	1	2.2	16	35.6	17	37.8	

Based on table 6, it showed that 28 respondents (62.2%) with the risk level of moderate work posture, all people felt complaints of MSDs with the following details: 4 respondents (8.9%) felt low complaints and 24 respondents (53.3%) felt moderate complaints. While from 17 respondents (37.8%) with a high risk level of work posture, 1 respondent (2.2%) felt moderate complaints and 16 respondents (35.6%) felt high complaints. Based on the results of the analysis, the p value of 0,000 <0,05 indicated that there is a significant relationship between work posture and MSDs complaints.

DISCUSSION

Gender is not related to MSDS complaints. Gender is not related to MSDs because most of the study samples are male. This research is in line with other studies which state that there is no relationship between gender and symptoms of CTDs in lumpia skin printing workers in Kranggan sub-district of Semarang Regency⁽⁷⁾. Even though a person with male and female sex has physiological differences but this is not a dominant factor in influencing muscle complaints.

Age is one of the factors associated with MSDS complaints for employees. MSDs are also felt by employees over the age of 35 years. This is because age affects the pain in the skeletal muscles associated with the aging process, with the increase of age, including bone degeneration which cause an increased risk of pain in parts of the skeletal muscles. Age is a thing that cannot be ignored, considering that age affects someone's mental and physical strength and at a certain age a worker will experience changes in his work performance. In line with other studies which state that age affects the capacity of workers to do their jobs⁽⁸⁾. At the age of 35 years and above, the maximum oxygen capacity in the body will gradually decrease. This is also in accordance with research stating that workers in Sweden show around 70% of them experience complaints on their backs aged between 35-40 years⁽⁹⁾. This happens because at middle age, muscle strength and endurance begin to decline and the risk of complaints increases. The longer a person works with the increasing age, there will be degeneration in the form of tissue damage, tissue turnover into scar tissue, and tissue reduction so that it causes reduced bone and muscle stability.

Body mass index is associated with MSDS complaints. Most of the employees in PT. Bumi Suksesindo's who feel MSDs complaints have BMI in the obesity category which is equal to 40%. In the morning, the employees do breakfast at their homes and during breaks they get lunch, drinks and snacks from the company and most employees do not exercise regularly so that the number of calories that goes in exceeds the body's need to do work. In line with the study which states that the results of a statistical analysis of body mass index (BMI) with musculoskeletal complaints have a relationship⁽¹⁰⁾. This can be influenced by the weight of the load sustained by the body continuously which causes the body's ability to support the body's burden which makes the body to feel pain. The link between BMI and the risk of MSDs is the more fat a person is, the

greater the risk of developing WMSDs. This is because someone who has a high BMI will try to support the weight from the front by contracting the lower back muscles, if this continues it will cause emphasis on the spinal cord pads which can result in the nucleus pulposus hernia⁽¹¹⁾.

Working period is not related to the occurrence of MSDS. In this study most employees who felt MSDS complaints had a work period of more than 2 years. This study is not in line with the research which states that there is no relationship between years of service with MSDS complaints on tailors in Patua Suranaya street⁽¹²⁾. This can be caused by adjustments experienced by tailors who have a long working period can adjust to work activities, compared with new workers. Adjustment to the body to work activities carried out continuously causes the body's resistance to pain. Also, the behavior of someone who relaxes himself when he feels pain in the body while working. The absence of a relationship between subjective complaints and years of service is caused by a work adaptation process that can have a positive effect which can reduce tension and increase work activities or performance⁽¹³⁾. Respondents adapted to their work and did not complain too much about complaints that were usually felt because they were accustomed to working, so the respondents assumed that complaints that were felt sooner or later would arise automatically so that respondents enjoyed their work regardless of their complaints.

Smoking habits are associated with MSDS complaints. In this study, most employees of PT. Bumi Suksesindo had a smoking habit of 60%, while non-smoking employees were 40%. Employees smoke during working hours and during work breaks. Smoking employees are provided with a smoking area outside the work space. Smoking can cause MSDS complaints, this is because the nicotine content in cigarettes will increase plasma epinephrine which can cause insomnia and reduce the mineral content in the bones causing pain due to cracks or damage to bones⁽¹⁴⁾. This study is in line with the results of a survey by the Annuals of Rheumatic Diseases which states that there is a relationship between smoking habits and the emergence of MSDS complaints and it is reported that smokers have a 50% greater risk of experiencing MSDS⁽¹⁵⁾.

Exercise habits are related to Complaints of MSDS. Most of PT. Bumi Suksesindo's employees in this study did not exercise regularly. This may be because when he comes home from work, the employee feels exhausted and has a busy life at home so there is no time to exercise. The negative impact being lack of exercise is weakness and flexibility in the muscles that will reduce someone's physical health. The results of this study are in line with other studies that there is a significant relationship between exercise habits and complaints of Musculoskeletal Disorders (MSDs)⁽¹⁵⁾. These results can also be influenced by the level of someone's exercise habits, generally having enough time to exercise and vice versa, for people working in their daily lives needing a lot of energy and not getting enough rest will often experience muscle complaints. The low level of body fitness will increase the risk occurrence of muscle complaints, the attitude of work done depends on the conditions of the existing work system. In relation to this research, the employees are required to have good physical strength, to facilitate and relieve all work activities and the work assigned to the employees. Physical strength can be obtained by routinely exercising to keep the body strong, healthy and fit.

Work posture relates to MSDS complaints. The results of the work posture assessment indicated that the employees at PT .bumi Suksesindo have a moderate and high level of ergonomic risk. This is because the work posture is not ergonomic. Non-ergonomic work posture will make workers to make a forced attitude in doing their work. The farther the position of the body part to the center of gravity, the higher the risk of MSDS will be. The position of the body that deviates significantly from the normal position while doing work can cause local mechanical stress in the muscles, ligaments, and joints. This results in injury to the neck, spine, shoulders, wrists and others. This is in line with other studies which state that the highest level of symptoms of WRMSD is felt by the shoulder and the lowest part occurs in the arms and elbows (16). The results of the logistic regression analysis showed that symptoms in the shoulder were caused by physical burden, and symptoms of the arms, wrists and elbows, were caused by ergonomic factors. In addition, the existence of repetitive movements over a long period of time will exceed the ability of the workers' muscles to perform recovery, this can encourage the occurrence of disorders in the muscles.

CONCLUSION

Based on the results of the study, it can be concluded that age, BMI, smoking habits and sports related to MSDS complaints, while gender and years of service are not related to MSDS complaints, it is possible for respondents who are both male and female to have MSDS complaints and respondents who have a work period of less than 2 years or more than 2 years both feel MSDS complaints. Therefore, it takes effort to change diet, routine physical activity with exercise, and change posture when working according to ergonomics, so as to reduce the occurrence of MSDS complaints.

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