

## Relationship between age, water consumption and working posture with complaints of musculoskeletal disorders in concrete production workers in PT Wijaya Karya Beton Tbk Pasuruan

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### Abstract

The human body has been designed to be able to carry out daily activities and has a large muscle mass in weight exceeding half the body weight that makes humans able to move their bodies. Data from the Statistical Office of the European Communities (Eurostat) report shows that MSDs cases are the most common cases of PAK found in workers in various fields of work, where MSDs cases account for 45% of the total PAK cases. This study included quantitative research with an analytical observational type of research. The research design used was cross sectional. The population of this study was all workers of line I production and repetition unit at PT Wijaya Karya Beton Tbk. Pasuruan with a total sample of 35 people. Respondents who had complaints of Musculoskeletal Disorders (MSDs) at a mild level of 40% were as many as 14 workers. Then respondents who had complaints of Musculoskeletal Disorders (MSDs) at a moderate level of 37.1%, namely as many as 13 workers. While respondents who had complaints of Musculoskeletal Disorders (MSDs) at a high level of 22.9%, namely as many as 8 workers. There is a significant relationship between age and complaints of Musculoskeletal Disorders (MSDs) with p-value of 0.000 with a value of  $r = 0.23$  which shows a weak correlation. In addition, there is also a significant relationship between water consumption and complaints of Musculoskeletal Disorders (MSDs) with a p-value of 0.000 with a value of  $r = -0.705$  which shows a strong correlation. There is a relationship between the variables of age and water consumption with complaints of Musculoskeletal Disorders (MSDs). While there was no relationship between work posture and complaints of Musculoskeletal Disorders (MSDs).

**Keywords:** Age; Water consumption; Musculoskeletal Disorders; Production Unit

### 1. Introduction

The fact is that the human body has been designed to be able to carry out daily activities and has a large muscle mass in weight exceeding half the body weight that makes humans able to move their bodies. When humans work, their bodies can accommodate loads coming from outside. That burden can be either a physical burden or a mental burden. In this case, humans must be able to balance the burden of work with the body's ability, in order to avoid diseases that may be caused by work (PAK) (1).

Occupational Disease (PAK) is a disease suffered by workers as a result of exposure to factors arising from work activities in the work environment(2). Based on data from the ILO (International Labour Organization) 380.000 deaths were caused by work accidents while around 2.4 million other deaths were caused by occupational disease(3). Data from the Statistical Office of the European Communities (Eurostat) report shows that MSDs cases are the most common cases of PAK found in workers in various fields of work, where MSDs cases account for 45% of the total PAK cases(3).

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In the program made by the ILO, namely The Prevention Of Occupational Diseases resulted that among 27 countries, MSDs are the most common occupational health disorders(4). The results of the Ministry of Health's study on the profile of health problems in Indonesia in 2005 showed that about 40.5% of illnesses suffered by work-related workers. According to a study of 9,482 workers in 12 cities and regencies in Indonesia, usually in the form of musculoskeletal diseases (16%), cardiovascular (8%), nervous disorders (6%), respiratory disorders (3%) and ENT disorders (1.5%) (4).

Musculoskeletal disorders (MSDs) are disorders of the musculoskeletal system that cause symptoms such as pain due to damage to nerves, and blood vessels in various body locations such as neck, shoulders, wrists, hips, knees, and heel(5). MSDs can cause a number of conditions, including pain, numbness, tingling, stiff joints, difficulty moving, and sometimes paralysis(6). MSDs disorders usually occur due to excessive muscle contractions due to too heavy workload coupled with a long duration.

MSDs disorders usually occur due to excessive muscle contractions due to too heavy workload coupled with a long duration. At the age of 30 years degeneration occurs in the form of tissue damage, tissue replacement with scar tissue, fluid thinning. This results in decreased bone and muscle stability. The older a person is, the greater the risk of experiencing a decrease in bone elasticity, which triggers the onset of MSDs symptoms (7)

The recommended consumption of water in adults is around 8 glasses per day or equivalent to 2 liters Ministry of Health, 2018 By consuming water as recommended can cleanse toxins in the body, improve digestion, maintain blood circulation, balance body temperature, and maintain the humidity of body organs so that it can be concluded by drinking water as recommended can maximize the work of organs in the body (8).

Concrete production workers work every day by going through various production processes including from making concrete dough, reinforcement preparation, mold preparation, casting, stressing, concrete compaction, product production to stacking products in stock yards. Even though it has used sophisticated technology, there are still many things that cannot be separated from manual human labor which is done with awkward postures such as squatting, bending over and lifting excess weights.

Based on preliminary data collection on concrete production workers, 5 workers showed workers complained of fatigue and pain while working and improved after rest which was a symptom of stage I MSDs, while the part complained of was allocated pain in the shoulders and waist. Therefore, researchers are interested in knowing the relationship between age, water consumption and work posture with musculoskeletal complaints in concrete production workers at Pt. Wijaya Karya Beton Tbk, Pasuruan.

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## 2. Material and methods

This type of research is a quantitative type research with an analytical observational design. The study was conducted by collecting data on independent variables and dependent variables collected at the same time at a certain period or time. This research was conducted in the production section, especially line 1 and repetition at PT Wijaya Karya Beton Tbk. (WIKABETON) Pasuruan. The process of taking samples uses a total sampling technique with a total of 35 workers. Free variable data collection using questionnaire instruments for age and water consumption and Rapid Entire Body Assessment (REBA) worksheets for work posture. Meanwhile, variable data were tied to complaints of Musculoskeletal Disorders (MSDs) using the Nordic body map (NBM) questionnaire instrument. The analysis used in this study is univariate analysis to describe each variable. The test used in this study was bivariate analysis using the Spearman test.

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## 3. Results and discussion

### 3.1. The Relationship between Age with Complaints of Musculoskeletal Disorders

Based on the results of the study, it can be seen that workers aged < 35 years who experienced mild Musculoskeletal Disorders (MSDs) complaints of 25.7% or as many as 9 workers, moderate levels of 17.1% or as many as 6 workers and high levels of 2.9% or as many as 1 worker. While the group of workers aged ≥ 35 years who experienced mild Musculoskeletal Disorders (MSDs) complaints of 14.3% or as many as 5 workers, moderate levels of 20.0% or as many as 7 workers and high levels of 20.0% or as many as 7 workers.

**Table 1** Distribution of Complaints of Musculoskeletal Disorders by Age

Age	Complaints of Musculoskeletal						Total	
	Light		Keep		Heavy		n	%
	n	%	n	%	1	%		
< 35 years	9	25.7	6	17.1	7	2.9	16	45.7
≥ 35 years	5	14.3	7	20.0	8	20.0	19	54.3
Total	14	40.0	13	37.1	8	22.9	35	100

Source: Primary Data, 2023

**Table 2** Complaints of Musculoskeletal Disorders by Age

		Age	Complaints of Musculoskeletal
Age	Correlation coefficient	1.000	0.383
	<i>p-value</i>	35	0.023
	N		35
Complaints of Musculoskeletal	Correlation coefficient	0.383	1.000
	<i>p-value</i>	0.023	
	N	35	35

Source: Primary Data, 2023

Based on the results of the study, it shows that there is a relationship between age and complaints of Musculoskeletal Disorders (MSDs) in line I production workers and repetition at PT Wijaya Karya Beton Tbk. (WIKABETON) Pasuruan. This is known from the results of the spearman correlation test which obtained a significance of 0.023 so that statistically it shows that there is a significant relationship between age and complaints of Musculoskeletal Disorders (MSDs). The correlation between age variables and complaints of Musculoskeletal Disorders (MSDs) is low with a value of  $r = 0.383$ .

Skeletal muscle complaints are usually experienced by someone at the working age of 24-65 years, usually the first complaint is experienced at the age of 35 years and the level of complaints will increase with age. So that the results of this study are in accordance with existing theories where as we get older complaints of Musculoskeletal Disorders (MSDs) increase. With increasing age, there will be degeneration in the form of tissue damage, replacement of tissue into scar tissue, reduction of tissue so that it causes stability in bones and muscles to be reduced where it can trigger Musculoskeletal Disorders (MSDs) complaints(9).

This research is in line with research Rahman conducted on informal concrete sector workers where the results showed a significant relationship between age and complaints of Musculoskeletal Disorders (MSDs)(10). In addition, this study is also in line with research conducted on plywood manufacturing workers where the results show there is an influence between age and musculoskeletal complaints in UD repair workers. Tunas Subur Pacitan in 2021(11).

In contrast to the results of research conducted Dyana on fish lifting workers at the Mina Karya Karangasem Trade Business, where no significant relationship was found between age and complaints of Musculoskeletal Disorders (MSDs)(12).

### 3.2. The Relationship between Water Consumption with Complaints of Musculoskeletal Disorders

**Table 3** Distribution of Complaints of Musculoskeletal Disorders by Water Consumption

Water Consumption	Complaints of Musculoskeletal Disorders						Total	
	Light		Keep		Heavy		n	%
	n	%	n	%	n	%		
< 2 l/day	0	0	6	17.1	7	20.0	13	37.1
≥ 2 l/day	14	40.0	7	20.0	1	2.9	22	62.9
Total	14	40.0	13	37.1	8	22.9	35	100

Source: Primary Data, 2023

Based on the results of the study, it shows that workers whose water consumption is < 2 l / day and experience complaints of mild Musculoskeletal Disorders (MSDs) none, moderate levels of 17.1% or as many as 6 workers and at high levels of 20.0% or as many as 7 workers. While the group of workers whose water consumption ≥ 2 l / day and experienced complaints of mild Musculoskeletal Disorders (MSDs) of 40.0% or as many as 14 workers, moderate levels of 20.0% or as many as 7 workers and high levels of 2.9% or as many as 1 worker.

**Table 4** The Relationship between Work Consumption and Complaints of Musculoskeletal Disorders

		Work Consumption	Complaints of Musculoskeletal Disorders
Work Consumption	Correlation coefficient	1.000	-0.705
	<i>p-value</i>		0.000
	N	35	35
Complaints of Musculoskeletal Disorders	Correlation coefficient	-0.705	1.000
	<i>p-value</i>	0.000	
	N	35	35

Source; Primary Data 2023

Based on the results of the study, it shows that there is a relationship between water consumption and complaints of Musculoskeletal Disorders (MSDs) in line I production workers and repetition at PT Wijaya Karya Beton Tbk. (WIKABeton) Pasuruan. This is known from the results of the spearman correlation test which obtained a significance of <0.05 so that statistically it shows that there is a significant relationship between water consumption and complaints of Musculoskeletal Disorders (MSDs). The correlation between variable water consumption and complaints of Musculoskeletal Disorders (MSDs) is strong with a value of  $r = -0.705$ .

This can be interpreted that the relationship between water consumption and complaints of Musculoskeletal Disorders (MSDs) is strong. Where the more water consumption, complaints of Musculoskeletal Disorders (MSDs) are getting less and vice versa. It is shown that 40.0% who consume water ≥ 2 l / day only experience mild Musculoskeletal Disorders (MSDs).

The results of this study are in line with research conducted Rini dan Triastuti conducted on convection factory workers where the results showed a relationship between water consumption and complaints of Musculoskeletal Disorders (MSDs)(13). In accordance with the theory, the adequacy of water consumption in workers during work will affect the increase in energy that will be produced when working, because when a person has entered the age of 30 years there will be adverse changes that can damage the network, namely tissue replacement that makes the tissue not strong and fluid reduction. which can trigger the occurrence of musculoskeletal disorders in individuals(14).

### 3.3. The Relationship between Working Posture with Complaints of Musculoskeletal Disorders

**Table 5** Distribution of Complaints of Musculoskeletal Disorders by Working Posture

Working Posture	Complaints of Musculoskeletal Disorders						Total	
	Light		Keep		Heavy		n	%
	n	%	n	%	n	%		
Very low risk	3	8.6	4	11.4	0	0	7	20.0
Low risk	3	8.6	4	11.4	2	5.8	9	25.7
Medium risk	8	22.8	4	11.4	4	11.4	16	45.7
High risk	0	0	1	2.9	2	5.8	3	8.6
Total	14	40.0	13	37.1	8	35	35	100

Source: Primary Data, 2023

Based on the results of the study, it shows that workers who have a work posture with a very low risk and experience complaints of mild Musculoskeletal Disorders (MSDs) of 8.6% or as many as 3 workers, moderate levels of 11.4% or as many as 4 workers and high levels of none. Workers who have a work posture with low risk and experience mild Musculoskeletal Disorders (MSDs) complaints of 2 by 8.6% or as many as 3 workers, medium levels by 11.4% or as many as 4 workers and high levels by 5.8% or as many as 2 workers. Workers who have a work posture with moderate risk and experience mild Musculoskeletal Disorders (MSDs) complaints of 22.8% or 8 workers, moderate levels of 11.4% or as many as 4 workers and high levels of 11.4% or as many as 4 workers. While the group of workers who have a work posture with high risk and experience complaints of mild Musculoskeletal Disorders (MSDs) does not exist, moderate levels of 2.9% or as many as 1 worker and high levels of 5.8% or as many as 2 workers.

**Table 6** Complaints of Musculoskeletal Disorders by Working Posture

		Working Posture	Complaints of Musculoskeletal Disorders
Working Posture	Correlation coefficient	1.000	-0.189
	<i>p-value</i>		0.277
	<i>N</i>	35	35
Complaints of Musculoskeletal Disorders	Correlation coefficient	-0.189	1.000
	<i>p-value</i>	0.277	
	<i>N</i>	35	35

Source: Primary Data, 2023

Based on the results of the study, it shows that there is no relationship between work posture and complaints of Musculoskeletal Disorders (MSDs) in line I production workers and repetition at PT Wijaya Karya Beton Tbk. (WIKABeton) Pasuruan. This is known from the results of the spearman correlation test which obtained a significance of 0.277 so that statistically it shows that there is no significant relationship between work posture and complaints of Musculoskeletal Disorders (MSDs) because the significance value is  $>0.05$ .

The results of this study are in line with research conducted Engka on fishermen in Borgo Satu Village, Belang District, where the results of the analysis showed that there was no significant or insignificant relationship between work posture and musculoskeletal complaints(15). In contrast to the results of research conducted on manual handling workers of rolling mill parts, the results of the analysis showed a very strong relationship between work posture and complaints of MSDs. The worse the work posture, the greater the musculoskeletal complaints(16).

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#### 4. Conclusion

There is a relationship between age variables, and water consumption with complaints of Musculoskeletal Disorders (MSDs) in line 1 production workers and repetition of PT Wijaya Karya Beton Tbk. (WIKA Beton). While there was no relationship between work posture and complaints of Musculoskeletal Disorders (MSDs) in line 1 production workers and repetition of PT Wijaya Karya Beton Tbk. (WIKA Beton).

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#### Compliance with ethical standards

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##### *Disclosure of Conflict of interest*

No potential conflict of interest was reported by the authors.

##### *Statement of Informed Consent*

Informed consent was obtained from all individual participants included in the study.

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