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Risk Factors of Work Fatigue among Transport Workers in Kupang Traditional Market, East Nusa Tenggara

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ABSTRACT

Background: Transport workers are jobs that need attention because the work process, they carry out carries health risks such as work fatigue. Work fatigue needs to be considered in all types of work, both formal and informal, because it causes a decrease in process efficiency, work performance and reduced physical strength or endurance which can significantly affect the health of the workforce and reduce work productivity. Work fatigue is caused by various factors, namely individual factors consisting of age, gender, and education. The work factor consists of workload. Environmental factors consist of heat stress. This study aimed to find out the risk factors for work fatigue in transport workers at the Kupang City Traditional Market in 2022.
Subjects and Method: A cross-sectional study was conducted at Kupang City Market from July to August in 2022. A total of 72 subjects were included in this study. The dependent variable is work fatigue. The independent variables are workload and heat stress. Data were obtained using questionnaire and analyzed using the Chi-square test.
Results: Workload (OR= 6.01; 95% CI= 2.09 to 17.28; p= 0.001) and heat stress (OR= 45.0; 95% CI= 5.37 to 376.97; p<0.001) are statistically significant associated with fatigue among transport workers.
Conclusion: Workload and heat stress have a relationship with work fatigue in porters.

Keywords: haulers, workload, heat stress.

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BACKGROUND

Occupational safety and health are a program created by a company to prevent work-related accidents and diseases by analyzing work that has the potential to cause work-related accidents and diseases. The good work productivity is based on work carried out through work methods with working environmental conditions that meet health requirements. When one of the conditions is not met, it can result in health problems such as work fatigue (Suma'mur, 2013).

Work fatigue is part of the common problems that are often encountered in the workforce. Fatigue can significantly affect the health of workers and can reduce pro-

ductivity. The term fatigue usually refers to conditions that are different for each individual, but all of them lead to a loss of efficiency and a decrease in work capacity and endurance (Family, 2021). Fatigue is classified into two types, namely muscle fatigue and general fatigue. In general, fatigue can range from very mild to feeling very tired. Fatigue reduces performance and increases the level of work errors that will likely cause work accidents. The danger of work fatigue can be seen from work factors such as excessive workload, lack of energy, work breaks, work attitudes and individual factors such as age, gender, years of service, which also greatly influence the occurrence of work fatigue (Mahardika, 2017).

Indonesia is one of the largest countries in the world which has the 4th largest workforce in the world with a total of 111.48 million people with a working age population (population over 15 years) of 165.6 million people. This shows that Indonesia has made a major contribution to the world in the field of employment at the international level (Ministry of Health RI, 2013). Occupational health is a field of public health that focuses attention on working people, both those in the formal and informal sectors. Law Number 36 of 2009 concerning health states that occupational health efforts aim to protect workers and enable them to live healthy and free from health problems and the adverse effects caused by work, these occupational health efforts cover work in the formal and informal sectors (Pabala et al., 2021).

Freight workers are self-employed workers who sell services for lifting goods from one place to another according to the wishes of the customer. In general, most of the porter's work using their bodies as a tool to carry goods. Workers only pay attention to income factors to meet their needs without paying attention to health factors that can harm the body and hinder productivity which will arise in the long term. Lifting activities that are not ergonomic can cause harm to health and even accidents for workers. Workers often experience work fatigue due to inappropriate lifting and carrying activities resulting in musculoskeletal complaints (Lintau et al., 2019).

There are usually many transport workers in areas close to economic activities such as markets, ports and other facilities. The market is a place where trading activities take place between sellers and buyers from various districts/districts or regions with the aim of increasing the economy in everyday life. In the city of Kupang there are 4 markets namely the Inpres market (Naikoten), Oebobo market, Oeba market, and Kuanino market.

World Health Organization (WHO) in the health model that was created until 2020 states that psychological disorders in the form of feelings of severe fatigue and lead to depression will become the number two killer disease after heart disease. The results of research conducted by the Ministry of Labor of Japan on 12,000 companies involving around 16,000 workers in the country who were randomly selected showed that 65% of workers complained of physical fatigue due to routine work, 28% complained of mental fatigue and around 7% of workers complained intense stress and feeling left out.

Based on the results of the initial survey conducted, it is known that there are 4 markets in Kupang City that have porters where each market has workers with varying individual characteristics such as age, gender, length of work, and others. Freight workers in the city of Kupang are hard work, because workers carry out activities that require muscle strength which puts a strain on the body. Apart from that, transport workers in a day usually lift and trans-

port loads of more than 40 kg. The working hours of porters vary from person to person, some work 8 hours/day, some work more than 8 hours/day and work an average of 7 days/week. The results of interviews conducted with hauling workers can illustrate that on average workers experience fatigue after carrying out lifting and transporting activities. This study aims to determine the risk factors for work fatigue in transport workers in traditional markets in Kupang City, East Nusa Tenggara.

SUBJECTS AND METHOD

1. Study Design

This research was carried out using a quantitative technique using a cross-sectional design carried out in the Kupang City Market Area and the time of research was from May to August 2022.

2. Population and Sample

The population in this study included all transport workers in the Kupang City Market Area, totaling 72 people. A total of 72 porters in the Kupang City Market Area were selected by total sampling.

3. Study Variables

The dependent variable was work fatigue. The independent variables were workload and heat pressure.

4. Operational Definition of Variables

Work Fatigue is a onditions of decreased efficiency, work performance, and reduced physical strength or endurance to continue the work being done. Data were obtained by interview using a fatigue questionnaire which contained 30 question items.

Workload are the burden received by workers to complete the work. The data is obtained by measuring the pulse and stopwatch.

Heat pressure is a combination of air temperature, air humidity, movement speed and radiation temperature. The combination of these 4 factors is calculated by the production of heat by exposure to sunlight in the workplace. Data obtained by using a thermometer.

5. Study Instruments

The data in this study were obtained from primary data and secondary data. Primary data is obtained directly in the field through observation, measurement and interviews with transport workers. Secondary data in this study were obtained from various existing sources, both from books, the internet and government reports.

6. Data Analysis

Univariate analysis was carried out to describe the characteristics of each research variable, in this case Workload and Heat Pressure, while bivariate analysis was carried out to see the relationship between the independent and dependent variables using the chi-square test.

RESULTS

1. Sample Characteristic

This study shows that the characteristics of respondents based on age are highest in the age group ≥ 30 years, namely 41 respondents (56.9%) while the lowest age of respondents is in the age ≤ 30 years, namely 31 respondents (43.1%). Where all respondents were male, namely 72 respondents (100%). Based on education, it was found that the most were elementary school as many as 27 people (38%) and there were no respondents with a tertiary level of education.

Based on table 2, it shows that respondents with a heavy category of workload were 44 respondents (61.1%), and 28 respondents (38.9%) in the light category. As well as most of the respondents working at the level of heat stress in the category of not meeting the standard, namely as many as 55 respondents (76.4%), while the category fulfilling the standard was 17 respondents (23.6%).

Table 1. Distribution of Transport Labor Workers by Age, Gender and Education.

Sample Characteristics	Category	Total (n)	Percentage (%)
Age	≥ 30 years	41	56.9
	≤ 30 years	31	43.1
Gender	Male	72	100
	Female	0	0
Education	PS	27	38
	JHS	14	19
	SHS	10	14
	Higher Education	0	0
	No formal education	21	29

Table 2. Distribution of Respondents as Transportation Workers in Traditional Markets in Kupang City.

Sample Characteristics	Category	Total (n)	Percentage (%)
Workload	Heavy ≥ 100 (beats/minute)	44	61.1
	Light ≤ 100 (beats/minute)	28	38.9
Heat Pressure	Not Meet the Standard > 29°C	58	80.6
	Meet the standard ≤ 29°C	14	19.4

2. Bivariate Analysis

Table 3. The Relationship between Workload and Heat Pressure with Work Fatigue in Transport Workers at Traditional Markets in Kupang City

Variables	Category	Work Fatigue				OR	CI 95%		p
		Risky		Not risky			Lower Limit	Upper Limit	
		n	%	n	%				
Workload	Heavy	35	48.6	9	12.5	6.01	2.09	17.25	0.001
	Light	11	15.3	17	23.6				
Heat Pressure	NMS	45	62.5	13	18.1	45.0	5.37	376.97	<0.001
	MS	1	1.4	13	18.1				

Note: NMS= Not Meet the Standard; MS= Meet the Standard

Table 3 showed the results of the bivariate analysis using the chi-square test, workers with a heavy workload have a risk of experiencing work fatigue 6.01 times compared to workers with a light workload (OR= 6.01; 95% CI= 2.09 to 17.28; p= 0.001). Workers with a workload that is under heat stress. Those who do not meet the standards have a risk of experiencing work fatigue by 45.0 times compared to workers who are under heat stress meeting the standards (OR = 45.0; 95% CI = 5.37 to 376.97; p < 0.001), and both are statistically significant.

DISCUSSION

1. The relationship between workload and work fatigue among porters.

Workload is one of the supporting factors for work fatigue so that the workload received both physically and mentally must be in accordance with the physical and mental abilities of the worker. A workforce has its own abilities in relation to workload. Maybe some of them are more suitable for physical, or mental, or social loads. But as a general equation, they are only able to carry a

load at a certain weight. There are even loads that a person feels are optimal. This is the purpose of placing the right worker on the right job. The exact degree of a placement includes suitability, experience, skills, motivation and so on (Reppi et al., 2019).

The results showed that there was a relationship between workload and work fatigue in porters, out of 72 respondents, 35 respondents (48.6%) had a relatively heavy workload and were at risk of experiencing work fatigue and 9 respondents (12.5%) who were not at risk), while 11 respondents (15.3%) were classified as mild and at risk of experiencing work fatigue and 17 respondents (23.6%) were not at risk of experiencing work fatigue.

This has been proven from the results of research that haul workers who are classified as heavy and light workloads have the same potential to experience work fatigue but, in this study, found that those who are more dominant at risk of experiencing work fatigue are workers who are classified as heavy workloads, because they are influenced by age factor and are also required to carry out strenuous physical activity continuously.

Transport workers who work at the market every day carry out the work of lifting heavy goods such as sacks containing rice, vegetables, fruit and so on. The transport workers use their bodies as a means of transportation such as lifting, carrying and carrying heavy sacks and pushing carts with heavy loads. Some workers with heavy lifting loads tend to complain of feeling tired. Freight workers also work under exposure to the sun so that when lifting heavy loads, workers experience fatigue, both physical and mental fatigue.

Physical workload involves muscle work or affects the body's physiological function. The higher the physical workload can reduce the strength and speed of muscle contractions which indicates weaker muscle work. This decrease in muscle work can cause work fatigue. Complaints experienced by transport workers can be caused by the weight of the load that exceeds the limit where the abdominal muscles contract statically to hold the load. In an atmosphere of working with static muscles, blood flow decreases somewhat, so that lactic acid accumulates and causes muscle fatigue. Work fatigue experienced by workers will affect the productivity of the haul workers themselves, because workers have to lose working days and will ultimately affect the level of income.

Fatigue in porters at traditional markets can be prevented by exercising regularly. Exercise can be done before doing work or during breaks. Exercise can improve the body's organs and blood circulation to run smoothly so that it can make haul workers fresh and enthusiastic in doing their work so that the fatigue experienced when lifting weights is reduced. In addition to regular exercise, the fulfillment of nutrition in workers must be fulfilled by eating nutritious food every day. Nutrition is one of the factors causing fatigue. A worker with good nutritional status will have better work capacity and endurance, and vice versa.

The results of this study are in line with the results of research (Andiani et al., 2018) concerning the relationship between age and workload on work fatigue in loading and unloading workers at the port of Samudera Bitung, the results of which workload has a relationship with work fatigue. These results are also in line with research from (Lumintang et al., 2017) concerning the relationship between age and workload with work fatigue in workshop mechanics in Kiawa village, North Kawangkoan District, Minahasa Regency, stating that there is a relationship between workload and work fatigue.

2. The relationship between heat stress and work fatigue among porters.

Heat stress is a combination of air temperature, air humidity, movement speed and radiation temperature, the combination of the four factors is calculated by production by exposure to sunlight in the workplace. The human body temperature is maintained almost constant as a result of a balance including the heat of the sun which is produced in the body as a result of metabolism and heat exchange between the body and the environment. Heat stress from excessive sunlight can also cause functional changes in human organs and can cause fatigue and drowsiness, reduce stability and cause workers to experience fatigue at work thereby reducing work efficiency (Suma'mur, 2009).

The measurement results showed that of the 72 respondents, the category of heat stress that did not meet the standards and was at risk of experiencing work fatigue was 45 respondents (62.5%) and those who were not at risk were 13 respondents (18.1%), while the category of heat stress that met the standards and was at risk of experiencing fatigue 1 respondent (1.4%) at work and 13 respondents (18.1%) who are not at risk of experiencing work fatigue.

The results of the study show that there is a relationship between heat stress and work fatigue in porters, where heat stress measurements are carried out 3 times/day, namely in the morning, afternoon, and also in the evening so that the heat stress received by workers varies depending on working time. as well as where workers work.

Based on the measurement results, the average worker is exposed to more sunlight during the day and evening, namely 29-34^{0}C and is included in the category of heat stress that does not meet the standards. This means that the higher the heat stress received by workers, the higher the fatigue complaints experienced by these workers. The measurement results show that the heat stress received by workers exceeds the NAV of Heat Pressure, which is 29°C according to Regulation of the Minister of Manpower and Transmigration No. Per.13/MEN/X/2011 of 2011 (Permenaker No 13, 2011).

The results of observations when conducting research, many workers do not use PPE such as long sleeves, head coverings (hats) and also there are often some workers who wear clothes that cannot reflect heat such as black clothes and result in the heat received by workers getting higher. Thus, causing workers to experience fatigue more easily. As a result of high ambient temperature, body temperature will rise. This will cause the hypothalamus to stimulate the sweat glands so that the body will sweat. Sweat contains various sodium chloride salts. The release of sodium chloride salt with sweat will reduce its levels in the body, thereby inhibiting the transportation of glucose as an energy source. This will cause a decrease in muscle contraction so that the body experiences fatigue. Hot work climate in the work environment can cause various health problems. This is because a hot working climate can affect the physical and mental condition of workers which will ultimately have an impact on worker productivity.

This research is in line with research conducted by (Fardela, 2018) to assess fatigue in electric arc smelting workers and continuous casting workers in Taiwanese steel factories, the results of WBGT measurements in this area were around 30.0°C-33.2°C. This study also showed that workers exposed to hot environments tended to burn out, and their fatigue symptoms increased with the level of heat exposure. In

addition, research conducted by (Nur'Aida H, 2004) also showed a significant relationship between heat stress and work fatigue in the finishing workforce at PT Sari Warna Asli III Karanganyar.

The conclusions in this study include, (1) There is a relationship between workload and work fatigue in porters at the Kupang City Traditional Market. (2) There is a relationship between heat stress and work fatigue among porters at the Kupang City Traditional Market. Suggestions for Transport Labor Workers, it is hoped that transport workers pay attention to work risk factors such as doing work according to the ability of the workers, and workers can stretch their muscles and also when working in hot environment workers are expected to use PPE such as long sleeves, head cover (hat) in order to minimize the incidence of work fatigue.

Suggestions for other researchers, it is hoped that it can become a reference for other researchers in developing similar research and this research can be used as a basis for further research so that it can benefit everyone by adding other variables such as work productivity, work stress, nutritional status and others. Suggestions for Related Agencies, it is hoped that related agencies such as the Kupang regional company office, the health office, and the health center will pay more attention to porters in carrying out their work.

AUTHOR CONTRIBUTION

Yufliyati Yuliana Lona as the lead researcher. Anderias Umbu Roga and Eryc Z. Haba Bunga helped direct and guide the first researchers in data analysis and preparation of publication manuscripts.

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This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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