

Factors Associated with Work Fatigue among Public Gas Station Operators in Kupang, East Nusa Tenggara

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ABSTRACT

Background: Public Gas Station (SPBU) is a public infrastructure to provide the fuel needs of the wider community. The high demand for fuel in Indonesia leads to demanding activities and potentially causes work fatigue to the workforce, especially operators. The study aims to analyze the correlation between working period, noise, workload, and work fatigue among the operators of the Public Gas Station in Kupang, East Nusa Tenggara.

Subjects and Method: A cross-sectional study was conducted in Kupang, East Nusa Tenggara from October- November 2022. A total of 68 subjects consisted of 30 operators of 16 hours Public Gas Station; 38 operators of 24 hours Public Gas Station. The dependent variable was work fatigue. The independent variables were working period, noise, and workload. The data were collected using a questionnaire and analyzed using Spearman Correlation (ρ).

Results: Working period indicated a strong negative correlation with work fatigue, and was statistically significant ($r = -0.74$; $p < 0.001$). Noise revealed a weak negative correlation with work fatigue at gas station operators ($r = -0.25$; $p = 0.837$), while workloads showed a strong positive correlation with work fatigue at gas station operators, and the result was statistically significant ($r = 0.850$; $p < 0.001$).

Conclusion: Working period, noise, and workload have a correlation with work fatigue among public gas station operators.

Keywords: work fatigue, working period, noise, workload.

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BACKGROUND

Public Gas Stations are the spearhead of fuel distribution and marketing and are situated in the midst of the community. The role of public gas stations is very important and strategic in supporting the wheels of the national economy because it concerns

the interests of the wider community. In line with economic and national development, the number of public gas stations continues to grow and the distribution is getting expansive throughout Indonesia. In 2018 the number of gas stations almost reached 7000 units throughout Indonesia

(Directorate General of Mineral and Coal of Republic Indonesia, 2018).

In addition to this strategic role, activities at public gas stations as well as other oil and gas activities, also contain a high risk of work accidents. During the 2016-2018 period, there were around 120 accidents or fires in public gas station environments that resulted in losses not only for the owner but also for the wider community. For this reason, safety aspects should receive high priority, for consumers, gas station managers, and the wider community. The intended health protection efforts are Occupational Safety and Health which is currently a priority for employers to achieve optimal health with the frequency of attendance and preventable disease, disability, and work accidents that leads to increased company productivity (Aprilliani et al., 2022).

One of the factors that cause work accidents is work fatigue. Byrd and Moore (1986) state that work fatigue can decrease work productivity. Work fatigue will reduce performance and increase the level of work errors that can lead to industrial accidents (Nurmianto, 2005). Based on the data from the International Labor Organization (2013) work fatigue factor is responsible for two million workers who become victims due to work accidents every year, it is discovered that 18.828 (32.8%) out of 58.118 people suffer from fatigue and it affects work productivity (Amanda, 2018).

Work fatigue is a decreased body endurance and power to do work (Suma'mur, 2009). More than 65% of workers in Indonesia come to the company's polyclinic with an ailment of work fatigue (Lating et al., 2021). The term "fatigue" usually refers to a different condition for each individual, but it all boils down to the loss of efficiency and decreased working capacity and endurance. Various factors that cause work fati-

gue include the intensity and duration of physical and mental work, monotony, work climate, lighting, noise, responsibility, anxiety, conflicts, ailments, and nutrition (Tarwaka, 2004). Work fatigue can lead to decreased work motivation, low performance, low quality and work productivity, numerous mistakes at work, generating work stress, work-related diseases, injuries, and accidents due to work. Based on the risks of work fatigue described above, it is necessary to take precautions, treatment, and recovery measures to overcome these risks.

East Nusa Tenggara Province is one of the provinces in Indonesia. Based on data from the Central Statistics Agency of East Nusa Tenggara Province, in 2020 a total of 929.354 vehicles were recorded in East Nusa Tenggara province with the most vehicles in Kupang City, reaching 253.808 (passenger cars, buses, trucks, and motorcycles). A total of 16 public gas stations in Kupang City operate at 06.00-22.00 WITA, however, there are also public gas stations that operate for 24 hours. Shift 1 operates at 06.00-14.00 WITA, shift 2 operates at 14.00-22.00 WITA, and shift 3 operates at 22.00-06.00 WITA.

Based on a preliminary survey on March 12, 2022, through direct interviews with 10 operators of public gas stations in Oeba and Pulau Indah, 9 out of 10 operators suffered from work fatigue. The causes of the work fatigue they suffered were more likely to occur among new operators with short working periods and still in the adaptation period, a fairly high workload during working hours, and interrupted rest due to the keep-coming vehicles.

The impact of work fatigue on public gas station operators was that it could reduce work productivity which was indicated by the symptoms they experienced, including disrupted concentration while working, dizziness, and desire to lie down

caused by various fatigue factors. Based on the problem of work fatigue that occurs among public gas station operators, researchers were interested in conducting a study to analyze factors correlated with work fatigue among public gas station operators in Kupang, East Nusa Tenggara.

SUBJECTS AND METHOD

1. Study Design

It was an analytical observational study using a cross-sectional approach. The study was conducted in all 16-Hour and 24-Hour Public Gas Stations in Kupang City, East Nusa Tenggara in October-November 2022.

2. Population and Sample

The population in this study was all gas station operators with a total of 222 operators. Whereas the samples in this study were 68 people, including 30 people at 16-hour gas stations and 38 people at 24-hour gas stations, using a proportional random sampling technique.

3. Study Variables

The dependent variable was work fatigue. The independent variables were working period, noise, and workload.

4. Operational Definition of Variables

Work fatigue was a symptom of weakening activities, motivation, and physique among public gas station operators in Kupang City, East Nusa Tenggara. The measuring instrument used for the work fatigue variable was the IFRC (International Fatigue Research).

Working period was the number of years the operator works at the Public Gas Station in Kupang City. The measuring instrument used for the working period variable was the IFRC (International Fatigue Research) questionnaire.

Noise was the intensity of noise in the environment of the Public Gas Station in Kupang City. The measuring instrument

used in this noise variable was a sound level meter.

Workload was the pulse while the operator of the Public Refueling Station in Kupang City was working. The measuring instrument used for workload variables was a pulse oximeter.

5. Study Instruments

The data in this study were obtained from primary data and secondary data. Primary data were obtained from direct interviews using the IFRC questionnaire to determine the level of work fatigue and working period, also pulse measurements using a pulse oximeter to obtain workload data. Secondary data were obtained from the Director General of Oil and Gas of the Republic of Indonesia concerning the list of fuel distributors.

6. Data Analysis

The analysis of this study was conducted in univariate and bivariate with the Spearman Rank statistical test using the SPSS program version 26.0.

7. Research Ethics

The study obtained ethical clearance from the Health Service Ethics Commission, Faculty of Public Health, Universitas Nusa Cendana No. 2022351-KEPK.

RESULTS

1. Sample Characteristic

Based on table 1. it is discovered using the IFRC questionnaire, that the level of work fatigue mostly experienced by operators was severe work fatigue with a percentage of 36.67% among 16-hour gas station operators and 39.47% among 24-Hour gas station operators in Kupang City. Meanwhile, the percentage of respondents who experienced mild work fatigue was 26.67% among 16-hour gas station operators and 26.32% among 24-hour gas station operators in Kupang City.

18 (60%) out of 30 operators of 16-Hour Gas Station were new employees with short working periods and 12 were old employees with long working periods. Meanwhile, 24 operators of the 24-hour gas stations (63.16%) were new employees with short working periods and 14 people were old employees (36.84%) with long working periods. All respondents at 16-Hour and

24-Hour gas station operators, work in an environment with eligible noise of <85dBA.

The majority workload level was heavy workload with a percentage of 39.71% among 16-Hour gas station operators and 50% among 24-Hour gas station operators. Meanwhile, the percentage of light workload was 32.35% among 16-hour gas station operators and 30% among 24-hour gas station operators in Kupang City.

Table 1. Respondents’ distribution based on work fatigue among Public Gas Station operators in Kupang City.

Characteristics	Categories	16-Hour Public Gas Station		24-Hour Public Gas Station	
		n	%	n	%
Work fatigue of 16-Hour Public Gas Station	Mild	8	33.33	10	26.32
	Moderate	10	26.67	11	28.95
	Severe	11	36.67	15	39.47
	Extremely Severe	1	3.33	2	5.26
Working Period	Long	12	40	14	36.84
	Short	18	60	24	63.16
Noise	Eligible	30	100	38	100
	Non-Eligible	0	0	0	0
Workload	Light	10	32.35	9	30.0
	Moderate	8	26.47	11	36.67
	Heavy	11	39.71	15	50.0
	Very Heavy	1	1.47	3	10.0

2. Bivariate Analysis

Table 2. Correlation between Working Period, Noise, Workload, and Work Fatigue

Variable	Mild Fatigue		Moderate Fatigue		Severe Fatigue		Extremely Severe Fatigue		r	p
	n	%	n	%	n	%	n	%		
Working Period										
Old	18	26.5	6	8.8	2	2.9	0	0	-0.74	<0.001
New	0	0	15	22.1	24	35.3	3	4.4		
Noise										
Eligible	18	26.5	21	30.9	26	38.2	3	4.4	-0.25	0.837
Non-Eligible	0	0	0	0	0	0	0	0		
Workload										
Light	17	25	2	2.9	0	0	0	0	0.850	<0.001
Moderate	1	1.5	18	26.5	0	0	0	0		
Heavy	0	0	0	0	24	35.3	2	2.9		
Very Heavy	0	0	1	1.5	2	2.9	1.5	0		

Based on table 2, it was elaborated that there was a negative and strong correlation between working period and work fatigue among public gas station operators. Subjects with long working periods reduced extremely severe fatigue level, and the result was statistically significant ($r = -0.74$; $p < 0.001$). There was a negative and weak correlation between noise and work fatigue among public gas station operators. Subjects experiencing eligible noise reduced extremely severe fatigue level, however, the result was not statistically significant ($r = -0.25$; $p = 0.837$). And furthermore, it was elaborated that there was a positive and strong correlation between workload and work fatigue among gas station operators. Subjects with very heavy workloads increased extremely severe fatigue level, and the result was statistically significant ($r = 0.850$; $p < 0.001$).

DISCUSSION

1. The Correlation between Working Period and Work Fatigue

The working period is the accumulation of the length of time a worker has worked in a certain place (Tarwaka, 2010). The longer the working period, the higher the level of adaptation. This is due to the emergence of a feeling of accustomed when a person is working in a certain job longer, so this has an impact on the body's immune system toward the endured fatigue. One with a longer working period consequently will have more experience compared to someone with a shorter working period. Workers with a long period of work obviously will be familiar with their work so that it will not generate work fatigue for themselves (Setyawati, 2010).

The result showed that there was a correlation between working period and work fatigue, where operators with a working period of ≤ 5 years experienced the most

ailments of severe work fatigue with a percentage of 35.3%. This study is in line with a study conducted by Sakti (2020) and Magvira, et al (2022) which state that there is a correlation between working period and work fatigue. It is because someone with a long working period is more experienced and able to work efficiently. They can manage the amount of energy used because they are accustomed to the job. In addition, they have figured out the best or most comfortable work position for themselves, so that they can maintain their productivity. This is estimated to prevent or reduce the occurrence of work fatigue (Mulyana et al., 2006).

Based on the interviews using the IFRC questionnaire, the most commonly encountered complaints of fatigue symptoms during working among operators with a new working period were headaches, thirst, and heavy legs while working, and likely to forget to give the change to customers. The physical and motivational attenuation indicated by the operators may impact on operator's decreased concentration at work. Therefore, it is recommended to the managers and or supervisors of the gas stations to pay more attention to the new operators by providing an understanding of working procedures or providing a guidebook of oil and gas industry health and safety (safety password) at the gas station so that he can slowly adjust to his work.

2. The Correlation between Noise and Work Fatigue

Noise (noise pollution) is unwanted sounds or sounds that occur at the wrong place and time (Chandra, 2014). Noise belongs to the physical pollutants that are commonly encountered. The source of noise in the environment may come from the sound of motor vehicles, the sound of industrial machines, and so on (Mulia, 2005). Noise

not exceeding 8 hours a day or 40 hours a week is 85 dB(A) (Ministry of Manpower the Republic of Indonesia, 2011). The main influence of noise on health is the sense of hearing damage. Initially, the effect of noise on hearing is temporary and recovery occurs quickly after the exposure is stopped. However, continuous exposure results in persistent damage to the senses of hearing (Mulia, 2005).

The results of this study showed that there was no correlation between noise and work fatigue. Thus, this study contradicts with a study conducted by Sakti (2020) which showed that there was a correlation between noise and work fatigue. It happened due to the urban conditions in Kupang that is different from the urban condition in Makassar where the number of motor vehicles in Makassar City is much denser than in Kupang City so gas station operators in Kupang City on average work at normal noise exposure is threshold value <85 dB. Exposure to sound obtained tends to be normal because there is no source of high-intensity noise at the workplace and the workplace is also outdoor.

Noise can interfere with the workers' concentration on their work, especially high-pitched sounds, as they can cause psychological reactions and fatigue. In more brain-using jobs, noise is otherwise suppressed as low as possible. However, based on measurements using a noise device, called the Sound Level Meter, vehicular noise in Kupang City does not exceed the predetermined threshold value, so it does not disturb the concentration of the operators on duty (Mulia, 2005).

It made the noise factor at gas stations unrelated to work fatigue experienced by gas station operators in Kupang City. The operators could still work well because they were in a working environment with a safe noise intensity (<85 dBA). However,

operators are advised to use ear plugs to reduce the intensity of high noise that can appear suddenly from the vehicle. In addition, further study is needed to find a correlation between noise and work fatigue among gas station operators in Kupang City.

3. The Correlation between Workload and Work Fatigue

The greater the load, the shorter the working time of a person without being exhausted. The size of the physical workload can be seen from the heart rate. Heart rate can be measured from the pulse in which a heart rate is a volume of pulsation (stroke volume) of arterial blood. The heart pumps a sufficient amount of arterial blood at a certain rate of pulsations per minute for working purposes. When physical activity is increasing, the heart must pump more blood so that the number of pulsations increases. At the beginning of work, the pulse will increase, but after that, it settles down according to the needs and after stopping working, then the pulse slowly returns to normal. After 15 minutes of work, a healthy heart will return to work normally as before. Various factors that affect heart rate include illness, psychic and psychological reactions, and working weather (Hutabarat, 2017).

The results of this study are in line with a study conducted by Sakti (2020) and Lating et al. (2020) which show that there is a significant correlation between workload and work fatigue among gas station operators. This is because the level of the workload conducted by a worker can be used to determine how long a worker can carry out his work activities according to the worker's capability or working capacity. The heavier the workload, the shorter one's working time to work without fatigue and significant physiological disorders or vice versa (Tarwaka et al., 2004).

The human body is designed to be able to carry out daily work activities. The existence of muscle mass that weighs almost more than half the weight of the body, allows humans to be able to move the body and do the work. Working on the one hand has an important meaning for progress and improvement of achievement, thus achieving a productive life is one of the goals of life. On the other hand, working means that the body will receive a load from outside its body. In other words, every worker is a burden to him/herself. The burden can be both a physical burden and a mental burden.

The high workload among gas station operators has an impact on a higher level of fatigue so activities involving physical will also decrease. Therefore, a rhythmic balance is needed in every function of the body between energy intake and energy replacement (work-rest), it is necessary to have a short break for 15 minutes after working for 1.5-2 hours by providing energy intake for the body in the form of food and drinks that can increase the stamina so that work performance and efficiency are maintained (Tarwaka et al., 2004).

AUTHOR CONTRIBUTION

Maria Sahra Keron was the main researcher. Serlie K. A. Littik, Tadeus A. L. Regaletha helped by directing and guiding the main researcher in data analysis and formulating the manuscript for publication.

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CONFLICT OF INTEREST

There is no conflict of interest in this study.

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