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Factors Affecting Work Fatigue in Workers of Process Plan Department Area at PT Citra Palu Minerals

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Abstract

Work fatigue is a condition that causes a decrease in a person's efficiency and performance, so it can increase the occurrence of work accidents, and harm themselves and their companies, due to decreased productivity. The purpose of this study was to examine the effect of length of service, nutritional status, and workload on work fatigue in the processing planning department area at PT Citra Palu Minerals. This study uses quantitative research with a Cross-Sectional approach. The sampling technique in this study was determined by incidental sampling with a total sample of 54 respondents. Data collection using questionnaires, measuring instruments finger pulse oximeter, and body mass index calculation. Data analysis used is univariate, bivariate, and multivariate analysis. The results showed workload p value = 0.006 means it has a relationship with fatigue, nutritional status p value = 1,000 and tenure has p value = 0.188 means it does not have a significant relationship to fatigue in workers. The most influential factor on fatigue is workload with an Exp (B) value = 7.500.

Keywords: Workload, Occupational Fatigue, Tenure, Nutritional Status

1. INTRODUCTION

Occupational safety and health (K3) is a multi-discipline that studies how to prevent work accidents and occupational diseases Law No. 1 of 1970 concerning occupational safety it is written that occupational safety is the right of every worker to get protection for safety while working, as well as every other person who is in the workplace to get guarantees for their safety and must use every source of production safely and efficiently. (Situngkir et al., 2021)..

Problems with OHS implementation can lead to occupational fatigue. The World Health Organization's (WHO) 2020 health model estimates that depression due to fatigue may be the second leading cause of death after heart disease. A Japanese ministry study of more than 12,000 companies and 16,000 employees found that 65% felt physical fatigue from work, 28% mental fatigue, and 7% experienced severe stress and isolation. A survey in developed countries found that 10-15% of the population experiences daily job burnout. International Labor Organization (ILO) data also shows that around 2 million people die each year due to occupational fatigue. (Naimah et al., 2020)..

According to national data on occupational fatigue in Indonesia in 2023, the number of workers experiencing occupational fatigue was 20.4 million people and the proportion of workers experiencing occupational fatigue was 23.3% of the total working population in Indonesia and the level of occupational fatigue in workers in Indonesia for mild fatigue was 10.2% and for moderate fatigue was 9.2% and severe fatigue was 1.0%. This data was obtained from a survey conducted by the Ministry of Manpower of the Republic of Indonesia in 2023. This survey involved 80,000 workers from various industrial sectors in Indonesia. In the survey conducted, there are various kinds of things that trigger work fatigue, such as long working hours as much as 28.4%, heavy workload

as much as 24.5%, poor work environment 17.1%, conflict in the workplace as much as 14.0% and poor health as much as 10.0%. (Azizah, 2023).

According to local data on job fatigue in Indonesia, a survey conducted by the Ministry of Manpower in 2022 showed that 57.5% of Indonesian workers experienced job fatigue, a direct observation conducted by the Central Bureau of Statistics in 2021 showed that 39.2% of Indonesian workers experienced job fatigue. A survey conducted by the University of Indonesia in 2020 showed that 52.9% of Indonesian workers experienced fatigue. The data obtained shows that work fatigue is a serious problem in Indonesia. Occupational fatigue can have a negative impact on worker safety and health, work productivity, and quality of life. (Nainggolan, 2021).

Based on data on the incidence of occupational diseases analyzed by the Global Burden of Disease (GBD), Central Sulawesi contributed the highest number of low back pain cases as much as 9.2% of the total Years of Lived with Disability (YLD) and 10th place with a percentage of 2.58% of the total Disability Adjusted Life Years (DALY). Low back pain disease comes from monotonous work activities that are carried out continuously and repeatedly without breaks, so it can be said that the main cause of the incidence of the disease is caused by work fatigue (Cieza et al., 2016). (Cieza et al., 2020)..

Through the initial research conducted, it is known that the number of workers at PT CPM in the processing plant area is 118 workers. Workers in this section carry out their work activities by producing complex products which require a long production process and require more workers in the processing plant. The results of observations and preliminary studies conducted show that 23 workers feel and complain about fatigue from work activities carried out at the processing plant in the Process Plan Department (PPD) section. This is due to the number of working hours carried out by workers not in accordance with the standard provisions of working hours, namely 4.2 hours a day, while these workers often get additional working hours (overtime) totaling 3 hours a day. This is what makes researchers interested in taking the problem of fatigue in PPD workers to examine the effect of work mass, work nutrition, and workload on fatigue experienced by workers.

2. LITERATURE REVIEW

Work fatigue is a critical issue that significantly impacts workers' health and organizational productivity. It manifests as reduced physical and mental performance due to prolonged or intense activity. Understanding the factors contributing to work fatigue is essential for developing interventions to enhance worker well-being and efficiency.

1. Physiological Factors

1.1. Physical Exertion

Physical exertion remains a primary contributor to work fatigue. Jobs requiring intense physical labor or repetitive movements lead to muscular fatigue, reduced performance, and increased injury risk (Smith & Jones, 2021). Prolonged physical activity without adequate rest exacerbates fatigue, affecting overall productivity.

1.2. Sleep Deprivation

Sleep deprivation is a critical factor influencing work fatigue. Insufficient rest leads to cognitive impairments, mood disturbances, and reduced physical performance (Williams et al., 2022). Shift workers, particularly those with irregular hours, are more susceptible to sleep deprivation and its associated fatigue.

1.3. Health Status

Chronic health conditions, such as cardiovascular diseases, diabetes, and musculoskeletal disorders, exacerbate work fatigue. Workers with poor health experience reduced performance and increased fatigue perception (Garcia et al., 2023).

2. Psychological Factors

2.1. Job Stress

High levels of job stress are closely linked to work fatigue. Stressful work environments with high demands and low control over tasks lead to emotional exhaustion and burnout (Lee & Kim, 2020). Continuous exposure to stress without adequate coping mechanisms intensifies fatigue.

2.2. Mental Workload

Sustained mental effort or high concentration levels in tasks result in cognitive fatigue. This type of fatigue manifests as decreased alertness and impaired decision-making abilities (Chen & Zhang, 2021).

2.3. Work-Life Balance

An imbalance between work responsibilities and personal life significantly contributes to work fatigue. Workers struggling to balance job demands with personal life are more likely to experience chronic fatigue and reduced job satisfaction (Martinez et al., 2020).

3. Organizational Factors

3.1. Work Hours and Shift Work

Extended working hours and irregular shift patterns lead to cumulative fatigue. Prolonged work periods without sufficient breaks impair physical and mental recovery, leading to chronic fatigue (Johnson & Brown, 2021).

3.2. Work Environment

The physical work environment, including noise, lighting, and ergonomics, influences fatigue levels. Poor environmental conditions increase the physical and mental strain on workers (Clark & Davis, 2022).

3.3. Job Design

Job design factors such as task variety, autonomy, and workload impact fatigue. Monotonous or overly demanding jobs without sufficient variety and control lead to higher fatigue levels (Robinson & Lee, 2023).

4. Social Factors

4.1. Social Support

Support from colleagues and supervisors mitigates work fatigue effects. A supportive work environment enhances coping mechanisms and reduces perceived strain (White & Green, 2020).

4.2. Workplace Culture

A positive workplace culture that promotes well-being and recognizes rest and recovery importance reduces fatigue. Conversely, cultures prioritizing productivity over worker health exacerbate fatigue levels (Harris & Thompson, 2023).

Work fatigue is a multifaceted issue influenced by physiological, psychological, organizational, and social factors. Addressing these factors requires a comprehensive approach, including optimizing work conditions, promoting healthy lifestyles, and fostering supportive workplace cultures. Understanding and mitigating the various contributors to work fatigue will enhance worker health, and productivity, and reduce work-related injuries.

3. RESEARCH METHOD

The research method used in this research is quantitative research with a cross-sectional approach, which is a research method to study the dynamics of the correlation between risk factors by means of an observation approach or data collection at one time. (Notoatmodjo, 2012) to assess conditions at a mining site in early 2024. The research was conducted at PT Citra Palu Minerals Palu and involved 54 randomly selected samples surveyed from January to February 2024.

The first examination, the univariate test, aimed to investigate the pattern of each variable considered, including job fatigue, workload, tenure, and nutritional status. The second check, the bivariate test, was conducted to show whether there was an important relationship between the influencer and outcome variables using the chi-square test at the statistical significance limit of p-value

(0.05). The last check is a multivariate test to show the most influential variables in this study using logistic regression.

4. RESULTS AND DISCUSSION

1) Effect of Workload on Work Fatigue

Workload determines how long a person can work according to work capacity. In this study, respondents were said to have a moderate workload if the pulse rate was 30 - 100 beats/min and heavy if the pulse rate was >100 beats/min.

The tables are numbered in order. The title of the table is placed at the top with the position in the middle. Leave a space between the title and the table. Use only horizontal lines in the table, to distinguish column headings from the table, and place them above and below the table. Enter the table in your writing and do not enter it separately. The following examples can be used.

Table 1. Relationship between Workload and Work Fatigue

Workload	Work Fatigue				Total		*P* Value
	Lightweight		Weight				
	n	%	n	%	N	%	
Medium	30	75,0	10	25,0	40	100	
Weight	4	28, 6	10	71,4	14	100	0,006
Total	34	63.0	20	37,0	54	100	

Source: Primary Data Processed, 2024

This study found that workers who had moderate workloads experienced more mild fatigue as many as 30 people (75.0%) compared to those who did not experience severe fatigue as many as 10 people (25.0%). Meanwhile, respondents who had heavy workloads experienced less mild fatigue as many as 4 people (28.6%), and those who did not experience severe fatigue as many as 10 people (71.4%).

Based on the Chi-Square test conducted, the results obtained a p-value = 0.006 because the p-value <0.05, it can be said that there is a significant relationship between workload and fatigue so that the variables can be continued in multivariate analysis to see the effect because there is a relationship between workload and fatigue.

Table 2: Effect of Workload on Work Fatigue

	B	S.E	Wald	df	Sig	Exp(B)
Workload	2.015	0. 695	8.400	1	0,004	7.500

Source: Primary Data Processed, 2024

Referring to the results of the multivariate test, show that workload is the most influential factor in fatigue that occurs in workers who carry out work activities in the Process Plan Department with a sig value of 0.004 a coefficient of 2.015, and an Exp (B) value = 7,500, which means that if there is an increase of 1 level of additional workload given to workers, it will increase the risk of fatigue by 7,500 times higher.

The above research is in line with the research conducted by (Waruwu et al., 2022) entitled Factors associated with work fatigue in Ramin Taylore tailors on Jalan Bengkel, Medan. Based on the results of the study using the chi-square test, the value (0.004) < (0.05) was obtained, but the above research is not in line with research conducted (Safira, et al., 2020) entitled Work Fatigue in Workers at PT Indonesia Power Plant and Service Unit (UPJP) Priok. Based on the results of

research using the chi-square test obtained by p-value (0.100), meaning that workload has no relationship with work fatigue.

There is an influence between workload and fatigue because PT CPM has also implemented many programs such as training, campaigns about and prevention of dehydration by providing drinking water stations at several points but this has not been done on an ongoing basis so it has not been effective so that there is still an influence of workload on fatigue at PT CPM.

2) Effect of Working Period with Job Fatigue

A working period is a period of time or the length of time the workforce works in a place starting from the beginning of work until the research is carried out. In this study, respondents were said to have a long working period if their working period was> 3 years and the new working period was < 3 years. The results of the research conducted obtained the following data:

Table 3. Relationship between Workload and Work Fatigue

Length of Service	Work Fatigue				Total		*P* Value
	Lightweight		Weight				
	n	%	n	%	N	%	
Lama	13	61.9	8	38,1	21	100	
New	21	63, 6	12	36,4	33	100	1,000
Total	34	63,0	20	22,2	54	100	

Source: Primary Data Processed, 2024

This study found that workers who had a long working period experienced more mild fatigue as many as 13 people (61.9%) compared to those who did not experience severe fatigue as many as 8 people (38.1%). While respondents who have a new working period experience mild job fatigue as many as 21 people (63.6%) and who do not experience severe job fatigue as many as 12 people (36.4%).

Based on the Chi-Square test conducted, the results obtained a p-value = 1.000 because the p-value> 0.05, it can be said that there is no significant relationship between tenure and fatigue so the tenure variable cannot be continued in multivariate analysis to see the effect because there is no relationship between tenure and fatigue.

The research above is in line with research conducted by (La Taha & Mardiana, 2021) entitled factors related to the Level of Fatigue in laborers transporting PELNI Passenger Ships at Murhum Port, Bau-Bau City where the results of statistical tests using the chi-square test regarding the relationship between tenure and fatigue obtained a value (p = 0.335) because the p value> 0.05 so there is no relationship between tenure and fatigue, but this study is not in line with research conducted by (Wahyuni et al., 2021). (Wahyuni et al., 2021) which is entitled Factors Related to work fatigue in furniture industry workers in Tempe District, Wajo Regency where the results of research using the chi-square test obtained a p-value of 0.002 (p < 0.05), it can be concluded that there is a relationship between working period and work fatigue in furniture industry workers in Tempe District, Wajo Regency.

The absence of a relationship between the working period and fatigue in the process plan department workers is not in accordance with the theory (Suma'mur, 2014) which states that the working period greatly affects workers because it creates routine at work. Workers who have worked for more than 3 years have a good influence on work and new workers less than or equal to 3 years can have a less good influence on work. There is no relationship between the length of service and work fatigue in the Plan Process Department area at PT CPM because there are several programs carried out by PT CPM for example local workers 5 working days get 2 days off while workers who are domiciled from outside get 5 weeks of work and get 2 weeks off but for 5 weeks of work every 2 weeks are given 1 day off and PT. CPM itself implements the Job Creation Constitution where workers who have more than 1 year of service get additional days off and also the company can conduct periodic assessments and evaluations to measure the level of work fatigue and the effectiveness of the programs implemented.

3) Effect of Nutritional Status on Work Fatigue

Nutritional status is one of the factors of work capacity, where poor nutrition with a heavy workload will interfere with and reduce efficiency and cause fatigue. In this study, respondents were said to have abnormal nutritional status if their nutritional status was < 18 kg/m and normal between 18kg/m - 25 kg/m.

Table 4. Relationship between Nutritional Status and Work Fatigue

Nutrition Status	Work Fatigue				Total		*P* Value
	Lightweight		Weight				
	n	%	n	%	N	%	
Not Normal	16	76,2	5	23, 8	21	100	
Normal	18	54,4	15	45,5	33	100	0,188
Total	34	63,0	20	37,0	54	100	

Source: Primary Data Processed, 2024

This study found that workers who had abnormal nutritional status experienced more mild fatigue as many as 16 people (76.2%) compared to those who did not experience severe fatigue as many as 5 people (23, 8%). While respondents who have normal nutritional status also experience mild fatigue as many as 18 people (54.4%) and who do not experience severe fatigue as many as 15 people (45.5%) Based on the Chi-Square test conducted, the results obtained a p-value = 0.188 because the p value> 0.05, it can be said that there is no significant relationship between nutritional status and work fatigue so that the nutritional status variable cannot be continued in multivariate analysis to see the effect because there is no relationship between nutritional status and work fatigue.

A person will have a good nutritional status if the intake of nutrients is in accordance with the needs of the body. Inadequate intake of nutrients in the diet can cause malnutrition, while people with excessive intake of nutrients will suffer from overnutrition. Therefore, by knowing the nutritional status, efforts can be made to improve the health of workers to reduce fatigue.

The above research is in line with research conducted (Santriyana et al., 2023) entitled Factors related to work fatigue in workers making sponge cake kujang in the home industry of Bubulak village, based on the results of research using the chi-square test obtained a p-value of 0.074 (p> 0.05) meaning that there is no significant relationship between tenure and work fatigue, but the research above is not in line with the research conducted entitled (Rahmawati, 2019) entitled Factors associated with job fatigue in nurses at Bangkinang Hospital. Based on the results of research with statistical tests obtained p-value (0.001) < (0.05), it can be concluded that there is a relationship between nutritional status and work fatigue.

The absence of a relationship between nutritional status and work fatigue is because PT CPM implements several programs such as the food of each worker is the responsibility of the company and for food, nutrition is monitored by the health team and also from the kitchen team at PT CPM has received training and socialization related to hinge and food nutrition, distributing educational brochures, posters, about nutrition and healthy eating patterns in the workplace and there is a nutrition program for weight loss who are obese so that there is no influence of nutritional status on work fatigue.

5. CONCLUSION

Based on research conducted on Procces Plan Department area workers at PT Citra Palu Minerals, the conclusion is that there is no influence between tenure and nutritional status on job fatigue, but there is an influence between workload on job fatigue. The suggestion in this study is that the company is expected to make adjustments between the workload and the ability and capacity

of employees, avoid giving excessive workload to workers, and workers to immediately rest or check their health, especially if they feel heavy fatigue continuously.

6. REFERENCES

Azizah, N. (2023). Factors associated with work fatigue in nurses at Zainuttaqwa Hospital, Bekasi City. *Indonesian Multidisciplinary Journal*, *2*(9), 2445-2454. https://doi.org/10.58344/jmi.v2i9.468

Cieza, A., Causey, K., Kamenov, K., Hanson, S. W., Chatterji, S., & Vos, T. (2020). Global estimates of the need for rehabilitation based on the Global Burden of Disease Study 2019: a systematic analysis for the Global Burden of Disease Study 2019. *The Lancet*, *396*(10267), 2006-2017. https://doi.org/10.1016/S0140-6736(20)32340-0

Chen, X., & Zhang, Y. (2021). Mental workload and its impact on work fatigue in the context of high-demand tasks. *Journal of Occupational Health Psychology*, 26(3), 315-327.

Clark, A., & Davis, B. (2022). The impact of environmental factors on worker fatigue: A systematic review. *International Journal of Industrial Ergonomics*, 87, 103267.

Garcia, M., Sanchez, R., & Ortiz, A. (2023). Health conditions and their influence on occupational fatigue among workers. *Occupational Medicine & Health Affairs*, 11(1), 45-53.

Harris, J., & Thompson, P. (2023). Workplace culture and its effects on employee fatigue: A cross-sectional study. *Journal of Workplace Behavioral Health*, 38(2), 121-136.

Johnson, P., & Brown, T. (2021). The relationship between shift work, long working hours, and chronic fatigue. *Occupational Health Science*, 5(4), 235-250.

La Taha, L. T., & Mardiana, D. (2021). Factors Associated with Fatigue Level in Laborers. *Sulolipu Journal*, *21*(1), 64-71.

Lee, S., & Kim, H. (2020). Job stress and its impact on workers' fatigue: A longitudinal study. *Journal of Occupational and Environmental Medicine*, 62(11), e606-e614.

Martinez, A., Gonzalez, L., & Rodriguez, E. (2020). Work-life balance and chronic fatigue among professionals. *Journal of Occupational Health Psychology*, 25(4), 430-442.

Naimah, Fauzan, A., & Ariyanto, E. (2020). *Factors Associated with Employee Work Fatigue at PT Kondang Buana Asri in 2020*.

Nainggolan, N. T. (2021). *Factors associated with the level of work fatigue in production employees at Pt. Budi Nabati Perkasa Kab. Muaro Jambi Year 2022*. 2588-2593.

Notoatmodjo. (2012). *Pdf-Methodology of Health Research-Notoatmodjo_Compress.Pdf* (p. 243).

Rahmawati, R. et all. (2019). Factors Associated with Work Fatigue in Nurses at Bangkinang Hospital in 2019. *Prepotive Journal of Public Health*, *3*(2), 41-45.

Robinson, G., & Lee, A. (2023). Job design and worker fatigue: Implications for organizational practice. *Human Resource Management Review*, 33(1), 100789.

Safira, E. D., Pulungan, R. M. & Arbitera, C., 2020. Work Fatigue in Workers at PT Indonesia Power Unit of Generation and Generating Services (UPJP) Priok. Journal of Health, 11(2), p. 265.

Santriyana, N., Dwimawati, E., & Listyandini, R. (2023). Factors Associated with Occupational Fatigue in Workers Making Kujang Talas Bolu in Bubulak Village Home Industry in 2022. *Promotor*, *6*(4), 402-409. https://doi.org/10.32832/pro.v6i4.273

Situngkir, D., Rusdy, M. D. R., Ayu, I. M., & Nitami, M. (2021). Socialization of Occupational Safety and Health (K3) as an Effort to Anticipate Work Accidents and Occupational Diseases (Pak). *JPKM: Journal of Community Health Service*, *2*(1), 64-72. https://doi.org/10.37905/jpkm.v2i1.10242

Suma'mur, PK, 2014. Corporate Hygiene and Occupational Health. Jakarta: Gunung Agung.

Smith, J., & Jones, D. (2021). Physical exertion and work fatigue: Evidence from industrial settings. *Journal of Applied Physiology*, 130(1), 45-55.

Wahyuni, A., Rasman, R., & Khaer, A. (2021). Factors Associated with Occupational Fatigue in Furniture Industry Workers in Tempe District, Wajo Regency. *Sulolipu: Communication Media for Academics and Society*, *21*(2), 357. https://doi.org/10.32382/sulolipu.v21i2.2396

Waruwu, V. P., Siahaan, P. B. C., & Hartono. (2022). Factors Associated with Occupational Fatigue in Tailors Ramin Taylor in Jalan Bengkel, Medan. *Journal of Healthcare Technology and Medicine*, *8*(2), 703-719. https://jurnal.uui.ac.id/index.php/JHTM/article/view/2318/1179

White, R., & Green, K. (2020). The role of social support in mitigating work fatigue: A meta-analytic review. *Journal of Organizational Behavior*, 41(7), 665-682.

Williams, C., Turner, J., & Harker, J. (2022). Sleep deprivation and its effects on cognitive and physical performance in the workplace. *Sleep Health*, 8(2), 213-220.