



## Fatigue in Loading and Unloading Workers at the Port

Viranda Nedine Putri Watulinggas, Mona Lestari<sup>✉</sup>, Novrikasari, Desheila Andarini, Anita Camelia

Study Program of Public Health Sciences, Faculty of Public Health, Sriwijaya University, Indonesia

### Article Info

*Article History:*  
Submitted January 2020  
Accepted April 2020  
Published July 2020

*Keywords:*  
Work fatigue, ports, loading and unloading worker

**DOI**  
<https://doi.org/10.15294/kemas.v16i1.22946>

### Abstract

The port has a fairly dense loading/unloading activity according to the total flow of goods it manages. In addition to high work activities, environment factors such as noise and work climate can also affect the occurrence of work fatigue. Therefore, this study aims to determine factors associated with work fatigue in loading/unloading workers at the port. This study uses cross sectional study design with simple random sampling. Data analysis used the Paired Sample T-Test and Chi-Square test. The results showed that there was a difference of fatigue before and after work and as many as 71.2% of workers experienced moderate fatigue. It is known that age (p-value = 0,000), breakfast habits (p-value = 0,000), and years of service (p-value = 0,000) have a significant correlation with work fatigue, while nutritional status (p-value = 0.203), workload (p-value = 0.140), hot work climate (p-value = 0.362), and noise (p-value = 0.880) have no correlation with work fatigue. It was concluded that age, breakfast habits and work duration were related to work fatigue in loading/unloading labor. Therefore, workers are advised to be used to have breakfast with the right menu and time and workers should wear hats while working to reduce sun exposure.

### Introduction

According to research conducted by the National Safety Council, as many as 13% of work accidents are caused by work fatigue experienced by workers. 1 Still in this study, from 2,010 adults working in America, it was found that as many as 16% of workers had experienced work accidents at least once as a result of fatigue (National Safety Council, 2017). While the number of work accidents in Indonesia in 2018 reached 173,105 accidents, this case has increased where in the previous year there were reported as many as 123,041 cases of work accidents that occurred (Tri, 2019). The number of accidents that occur in the workplace, 60% are caused by work fatigue (Maurits, 2010).

The loading and unloading activity is one of the activities that can be found at the port.

Loading and Unloading Workers (TKBM) are required to carry out their work in accordance with predetermined targets. Thus, in addition to strenuous physical activity, high workloads and supported by environmental factors such as noise and hot work climate, causing loading and unloading workers to experience work fatigue. The results of research by Saragih, et. al, it is known that loading and unloading activities, especially in the stevedoring section, have the highest risk of causing fatigue and work accidents at the port (Saragih, Mahyuni, & Lubis, 2015). The results of research by Kurniawan, et. al, it is known that work fatigue is one of the causes of work accidents (Kurniawan, Kurniawan, & Ekawati, 2018).

The results of research conducted at Pekanbaru Port show that fatigue due to heavy workloads affects minor work accidents that

<sup>✉</sup> Correspondence Address:  
Public Health Sciences, Faculty of Public Health, Sriwijaya University, Indonesia  
Email: mona\_lestari@unsri.ac.id

often occur, from crushed hands or toes to being injured by the goods they transport, but workers never report this to the foreman or the Manpower and Transmigration Office. Putri, (2018). Work fatigue is an effect of accumulated exposure to risk factors in the workplace, such as work environment, intensity and duration of physical work, as well as individual factors, both age or nutritional status (Tarwaka, HA, Bakri, & Sudiajeng, 2004).

Boom Baru Port is one of the ports in Palembang City, South Sumatra. This port has become one of the economic arteries for domestic and international trade in South Sumatra, especially Palembang City. Based on data from the International Port Corporation's Annual Report in 2015, Boom Baru Port is one of the ports that achieved the target in the total flow of visits for general goods and bulk goods managed by the port. Realization of container flow in 2015 was 135,156 TEUs and 123,367 boxes. So from these data, it can be concluded that the loading and unloading activities at the Boom Baru Port are quite high (International Port Corporation, 2015).

The Loading and Unloading Workers (TKBM) of Boom Baru Port work with a wholesale system where in this system workers are required to be able to complete their work quickly and efficiently so that they can achieve predetermined targets. This is directly proportional to the workload received by these workers. In addition, loading and unloading activities are carried out in an open location so that workers are exposed to direct sunlight. From the description of the problems above, it is necessary to analyze the factors related to work fatigue in loading and unloading workers at the Boom Baru Port, Palembang. This study aims to determine the factors associated with work fatigue in these workers.

#### Method

This type of research used in this research is a quantitative study with a Cross

Sectional Study design. The population of this research is all loading and unloading workers at the Boom Baru Port, Palembang. From the sample calculation, the sample in this study was 66 workers. Sampling was carried out using simple random sampling technique with inclusion criteria, namely actively working for the last 1 week and working in the wrapped cargo stevedoring section and the exclusion criteria, namely workers in the wrapped cargo stevedoring section who do not carry out goods carrying activities.

The measurement of work fatigue was carried out before and after work using the Industrial Fatigue Research Committee (IFRC) questionnaire. Direct measurements were made to determine the hot working climate and noise intensity. The measurement of the hot working climate is carried out using a Heat Stress Monitor and noise measurements are carried out using a Sound Level Meter. Measurements were carried out 3 times at 8 points for 8 hours of work. For data analysis, the measurement of work fatigue was carried out using the Paired Sample T-Test and bivariate analysis using the Chi-Square test.

#### Result and Discussion

The Unloading Workers Cooperative (TKBM) in Palembang is a cooperative whose job is to manage welfare, supervise and regulate the loading and unloading workforce work schedule at the port which was formed since November 4, 1986 after the Yayasan Usaha Karya (YUKA) was dissolved. With a vision to be a cooperative provider of loading and unloading workers (TKBM) at ports that are professional, quality, effective, efficient and modern in serving and supporting loading and unloading activities and port progress.

Measurement of work fatigue in loading and unloading workers at the Boom Baru Port in Palembang is carried out before and after work. This aims to determine the differences in work fatigue of workers before and after work.

**Table 1.** Differences in the Level of Fatigue at Work Before and After Work

Work Fatigue	Mean	Correlation	95% CI	Df	Sig
Fatigue Before				65	
Fatigue After	-1,288	0,994	-1,592 - 0,984	( $t_{table} = 1,997$ )	0,000

By using the Paired Sample T-Test, it is known that the average fatigue of work before work is 1,288 lower than that of after work. With 95% CI (-1.592 to 0.984) and  $t_{count} = 0.000 < t_{table} = 1.997$ , it can be concluded that there is a difference between work fatigue before work and fatigue after work. Fatigue is a protective mechanism carried out by the body system so that the body is protected from further damage, resulting in recovery after resting (Tarwaka, HA, Bakri, & Sudiajeng, 2004). The results showed that there were differences in work fatigue before and after work. The results of this study are in line with Rochmah's research which states that there is a difference in the level of work fatigue before and after working with the average fatigue of work before work which is 2.317 lower than that after work (Rochmah, 2011).

The univariate results showed that workers who experienced moderate fatigue were more (42.4%) than workers who experienced low fatigue. There are (66.7%) workers with the old age category. The average age of workers in this study was 42 years, with the youngest being 27 years old and the oldest being 53 years old. The nutritional status of workers is dominated by normal nutritional status (75.8%), the majority of workers have a habit of having enough breakfast (66.7%). More workers are with long work period (63.6%) than workers with new work period. As many as (97.0%) workers have a heavy workload, there are (24.2%) workers exposed to a high work climate and as many (40.9%) workers are exposed to high noise.

From the bivariate analysis, it can be seen that there are 3 (three) variables related to work

Table 2. Frequency Distribution of Factors Associated with Work Fatigue

Variable	n=66	%
Work Fatigue		
Moderate	47	71.2%
Light	19	28.8%
Ages		
Old (>40 years old)	44	66.7%
Young ( $\leq$ 40 years old)	22	33.3%
Nutritional status		
Abnormal	16	24.2%
Normal	50	75.8%
Having Breakfast habits		
Enough	44	66.7%
Good	22	33.3%
Work Period		
Long (>10 years)	54	81.8%
New ( $\leq$ 10 years)	12	18.2%
Workload		
Very heavy	2	3.0%
Heavy	64	97.0%
Hot Working Climate		
High	16	24.2%
Low	50	75.8%
Noise		
High	27	40.9%
Low	39	59.1%

Source: Primary data, 2018

fatigue, including age with p-value = 0.000 (95% CI = 1,260-3,536), breakfast habits with p-value = 0,000 (95% CI = 1,938 -9,100), and years of service with p-value = 0,000 (95% CI = 1,560-66,979). In addition, there are 4 (four) variables that are not related to work fatigue, including nutritional status with p-value = 0.203, workload with p-value = 1,000, hot work climate with p-value = 0.362 and noise with p-value. = 0.880. The results showed that workers with old age had a 2,111 times greater risk of experiencing moderate work fatigue, workers with a fairly moderate risk of having breakfast habits were 4,200 times more likely to experience moderate work fatigue, and workers with long working tenure had a 10,222 times greater risk of experiencing moderate work fatigue.

The results of the measurement of work fatigue show that there are 42.4% more workers who experience moderate work fatigue than those who experience mild fatigue. Based on the Chi-Square test, it is known that there is a relationship between age and work fatigue. Older age was 2.111 times more likely to experience moderate work fatigue (95% CI = 1,260-3,536). According to Mulyadi & Nurwinda, a person's age has a relationship with physical capacity where when a person is 40 years old, physical strength will decrease by 20% and sensory-motor skills decrease by 60% (Mulyadi & P, 2018). In line with Amalia & Widajati's research, which states that there is a relationship between age and work fatigue with a p-value = 0.030 (Amalia & Widajati, 2019).

The increasing age of a person will result

Table 3. Factors Associated with Work Fatigue

Variable	Work Fatigue				P value	PR (95% CI)
	Moderate		Low			
	N	%	N	%		
Ages						
Old (>40 years old)	38	86.4	6	13.6	0,000	2,111 (1,260-3,536)
Young (≤40 years old)	9	40.9	13	59.1		
Nutritional status						
Abnormal	9	56.2	7	43.8	0,203	0,740 (0,468-1,172)
Normal	38	76.0	12	24.0		
Having Breakfast habits						
Enough	42	95.5	2	4.5	0,000	4,200 (1,938-9,100)
Good	5	22.7	17	77.3		
Work period						
long (>10 years old)	46	85.2	8	14.8	0,000	10,222 (1,560-66,979)
new (≤10 years old)	1	8.3	11	91.7		
Workload						
Very heavy	2	100	0	0	1,000	1,422 (1,213-1,668)
Heavy	45	70.3	19	29.7		
Hot Working Climate						
High	13	81.2	3	18.8	0,362	1,195 (0,883-1,617)
Low	34	68.0	16	32.0		
Noisy						
High	20	74.1	7	25.9	0,880	1,070 (0,788-1,453)
Low	27	69.2	12	30.8		

Source: Primary data, 2018

in gradual damage to the physiological and chircandian systems so that muscle strength decreases and results in the accumulation of lactic acid in the muscles. The accumulation of lactic acid can cause muscle pain and increase a person's heart rate (Budiman, Husaini, & Arifin, 2016). The existence of a relationship between age and work fatigue in loading and unloading workers at the Port of Boom Baru Palembang is influenced by the dominance of long working tenure among workers with old age. If an activity is carried out continuously or for years it can cause disturbances in the body. Physical stress at a certain time can result in decreased and reduced muscle performance which will eventually cause fatigue to occur more quickly (Prastuti & Martiana, 2016).

From the results of Fisher's Exact test, it is known that there is no relationship between nutritional status and work fatigue. This is in line with Putro & Hariyono's research, which states that there is no relationship between nutritional status and work fatigue with p-value = 0.813 (Putro & Hariyono, 2017). According to Gurusinga et.al., the absence of a relationship between nutritional status and work fatigue is influenced by the fulfillment of nutrients and calories in the worker's body every day, so that workers do not experience work fatigue (Gurusinga, Camelia, & Purba, 2015). If the body gets enough nutrients and is used efficiently, an optimal nutritional status will be achieved which allows physical growth, brain development, workability and general health at the highest possible level (Pranoto, Hardjanto, & Suwadji, 2014).

Nutritional status is related to the consumption of a worker, if the nutritional status of the worker is not normal, it will interfere with the worker's activities due to a decrease in work power and a slowdown in movement (Sari & Muniroh, 2017). The absence of a relationship between nutritional status and work fatigue in loading and unloading workers at Boom Baru Port, Palembang can be influenced by the dominance of workers with normal nutritional status. A person with good nutritional status will store more energy reserves and last relatively longer, therefore the higher the nutritional status of a person, the lower the level of fatigue that is felt (Anggraini,

Purba, & Sitorus, 2013).

The results showed that there was a relationship between breakfast habits and work fatigue. Breakfast habits are quite at risk 4,200 times greater for experiencing moderate work fatigue. This result is in line with the research of Sartono, et. al which states that there is a relationship between having breakfast habits and work fatigue with p-value = 0.016 (Sartono, Martaferry, & Winaresmi, 2016). According to Deyulmar et. al. There is a relationship between having breakfast habits and work fatigue due to the fact that many workers rarely have breakfast, workers tend to eat only when the hunger arises, which is above 09.00 am. Meanwhile, workers who eat breakfast do it before 07.00, so that fatigue can be felt faster (Deyulmar, Suroto, & Wahyuni, 2018). As in the research of Yogisutanti et.al. which say that breakfast is an activity that is very important for initial energy when starting an activity, especially activities related to physical and psychological activities (Yogisutanti, Kusnanto, Setyawati, & Otsuka, 2013).

The lack of breakfast habits can cause workers to experience hypoglycemia or glucose levels below normal so that workers will quickly experience weakness and fatigue (Sartono, Martaferry, & Winaresmi, 2016). From observations, it is known that workers tend to consume coffee frequently in the morning, drinking coffee in the morning will cause drowsiness, this is because the caffeine content in coffee can increase the hormone cortisol in the body. The hormone cortisol can trigger excessive anxiety so that the body will feel tired quickly because a lot of energy is drained to overcome the anxiety (Akbar, Kalsum, & Mahyuni, 2015).

From the results of Fisher's Exact test, it is known that there is a relationship between tenure and work fatigue. Long working tenure 10,222 times greater risk of experiencing moderate work fatigue. In line with Paulina & Salbiah's research which states that there is a relationship between work period and work fatigue with p-value = 0.043, this is because the impact of work fatigue experienced by workers is accumulative, the longer the working period the higher a worker is at risk of experiencing fatigue (Paulina & Salbiah,

2016). Fatigue can arise because workers carry out their duties repeatedly every day, causing boredom and boredom in workers (Astuti, Ekawati, & Wahyuni, 2017). According to Prastuti & Martiana, if an activity is carried out continuously or for years it can cause disturbances in the body (Prastuti & Martiana, 2016).

Physical stress at a certain time can result in decreased and reduced muscle performance which in turn causes fatigue to occur more rapidly. The working period is an external part of the workload, in jobs with heavy or excessive workloads it will cause muscle contraction that exceeds the body's capacity so that this can accelerate the occurrence of work fatigue (Tarwaka, HA, Bakri, & Sudiajeng, 2004). The relationship between work period and work fatigue in the loading and unloading workers at the Boom Baru Port in Palembang can be caused by accumulated feelings of boredom for years experienced by workers. From the observations it is known that workers with a long working period are more than those with a new work period.

From the results of this study it is known that there is no relationship between workload and work fatigue. In line with Ningsih & Nilamsari's research, which states that there is no relationship between workload and fatigue with  $p\text{-value} = 0.901$ , this is because the weight and low workload of workers can be influenced by work environment factors (Ningsih & Nilamsari, 2018). A good work environment will create a sense of comfort for workers, so that the workload of workers can be slightly reduced by this psychological influence. Asriyani et. al. states that a worker has his own ability to adapt to the workload he has, some of which are more suitable for mental, physical and social workloads (Asriyani, Karimuna, & Jufri, 2017). The absence of a relationship between workload and work fatigue can be caused by workers having sufficient rest time after each loading and unloading activity.

Working with high environmental temperatures will cause sweating, if it occurs excessively it will cause the body to lack fluids which results in obstruction of glucose transportation in the body (Juliana, Camelia, & Rahmiwati, 2018). Based on the Fisher's Exact

test, it is known that there is no relationship between hot work climate and work fatigue. In line with the research of Starizky et. al. which states that there is no relationship between hot work climate and work fatigue, this is because the worker's body has adapted to the environmental temperature, plus the type of clothing used is not the same so that the ability of the clothes to dissipate heat for each worker is different (Starizky, Ekawati, & Jayanti, 2016). According to Adi et. al., the human body has the ability to adapt well, one of which is adaptation to environmental temperatures (Adi, Suwondo, & Lestyanto, 2013). If a worker is accustomed to being exposed to high environmental temperatures, the slower the body responds to fatigue. The absence of a relationship between the hot working climate and work fatigue of the loading and unloading workers at the Boom Baru Port in Palembang can be caused by workers being accustomed to being exposed to these temperatures.

The results of the research that have been done show that there is no relationship between noise and work fatigue. In line with Andriani's research which states that there is no relationship between noise and work fatigue with  $p\text{-value} = 0.31$ , this is because the type of noise experienced by workers is the type of implant noise, which means that the noise is not constant and occurs in a short time (Andriani, 2016). Workers who are accustomed to working in noisy places will experience their body adjustments or adapt themselves to loud sounds so that the body will gradually get used to it and cause a decrease in the body's response to noise. There is no relationship between noise and work fatigue in this study because the noise in that place is still below the applicable threshold value. The absence of a relationship between noise and work fatigue in this study can be caused because the type of noise in the Boom Baru Port of Palembang is a type of impulse noise (not constant and occurs briefly) and the measurement results show that the noise level at Boom Baru Port Palembang is still at the safe level is below TLV 85 dBA.

### **Conclusion**

The results showed that there was a difference between work fatigue before and after work with an average of 1,288 work

fatigue before working than after work fatigue. From the results of the bivariate analysis, it is known that there is a relationship between age (p-value = 0.000; PR = 2.11), breakfast habits (p-value = 0.000; PR = 4.20), and years of service (p-value = 0.000; PR = 10. , 22) with work fatigue on loading and unloading workers at the Boom Baru Port, Palembang. Based on the research results, it is better if PT. X as the port manager controls noise coming from cranes by performing routine maintenance on machines and providing or adding lubricants to moving machines to reduce noise due to friction. The Palembang TKBM Cooperative is recommended to be able to carry out health promotions regarding work nutrition, especially the importance of having breakfast before work. In addition to health promotion regarding work nutrition, it is also advisable to carry out health promotion regarding work fatigue, workers are advised to get used to having breakfast before work at 07.00-08.00 in the morning so that the energy reserves in the body can last a little longer. The breakfast menu that workers should consume is foods high in fiber, simple carbohydrates and low in fat with a carbohydrate composition of 60-68%, 12% protein, 20-25% fat, and 10-15% fiber. Workers should also be able to wear a hat that adequately covers the head area but does not obstruct the view while working to avoid direct sunlight.

#### References

- Adi, D.P., Suwondo, A., & Lestyanto, D., 2013. The Relationship Between Work Climate, Nutritional Intake Before Work and Workload to Work Fatigue Levels in Morning Shift Workers in the Packing Section of PT. X Kendal Regency. *Journal of Public Health*, 2(2), pp.1-11.
- Akbar, M.B., Kalsum., & Mahyuni, E.L., 2015. Differences in the Level of Work Fatigue Based on Breakfast Habits in JNE Delivery Courier Workers in Medan City in 2015. *Journal of the Environment and Occupational Health*, 4(2), pp.1-7.
- Amalia, I., & Widajati, N., 2019. Factors Associated with Fatigue at Work in the Unit of Rolling Iron PT. X. *Journal of Health Science and Prevention*, 3(1), pp.16-24.
- Andriani, K.W., 2016. Relationship between Age, Noise and Air Temperature with Individual Subjective Fatigue at PT. X Jakarta. *The Indonesian Journal of Occupational Safety and Health*, 5(2), pp.112-120.
- Anggraini, N., Purba, I.G., & Sitorus, R.J., 2013. Work Fatigue in Workshop Workers of AUTO 2000, Plaju Branch, Palembang, 2011. *Journal of Public Health Sciences*, 4(2), pp.125-130.
- Asriyani, N., Karimuna, S.R., & Jufri, N.N., 2017. Factors Related to Work Fatigue in Workers in PT. Kalla Kakao Industri. *Scientific Journal of Unsyiah Public Health Students*, 2(6), pp.1-10.
- Astuti, F.W., Ekawati., & Wahyuni, I., 2017. Relationship between Individual Factors, Workload and Work Shifts with Work Fatigue at Nurses at Regional Mental Hospital (RSJD) Dr. Amino Gondohutomo Semarang. *Journal of Public Health*, 5(5), pp.163-172.
- Budiman, A., Husaini, H., & Arifin, S., 2016. Relationship between Age and Workload Index with Worker Fatigue at PT. Karias Tabing Kencana. *Journal of Periodic Health*, 1(2), pp.121-129.
- Deyulmar, B.A., Suroto., & Wahyuni, I., 2018. Analysis of Factors Associated with Work Fatigue in Opak Cracker Maker Workers in Ngadikerso Village, Semarang Regency. *Journal of Public Health*, 6(4), pp.278-285.
- Gurusinga, D., Camelia, A., & Purba, I.G., 2015. Analysis of Factors Associated with Work Fatigue on Sugar Factory Operators at PT. PN VII Cinta Manis in 2013. *Journal of Public Health Sciences*, 6(2), pp.83-91.
- International Port Corporation., 2015. *Annual Report 2015: Advancing Excellence Through Performance*. International Port Corporation.
- Juliana, M., Camelia, A., & Rahmiwati, A., 2018. Analysis of Work Fatigue Risk Factors of Production Employees PT. Arwana Keramik, Plc. *Journal of Public Health Sciences*, 9(1), pp.53-63.
- Kurniawan, Y., Kurniawan, B., & Ekawati., 2018. The Relationship between Knowledge, Fatigue, Physical Workload, Work Posture, and Attitude of Using PPE with Occupational Accidents (Study on Manual Lifting Activities at the Fertilizer Packing Unit of Tanjung Emas Port Semarang). *Journal of Public Health*, 6(4), pp.393-401.
- Maurits, L.S., 2010. *Glimpse of Work Fatigue*. Yogyakarta: Amara Books.
- Mulyadi, & P, N., 2018. Analysis of the Causes of Worker Fatigue in PT. Top Saba Mandiri Food Makassar. *Jurnal Sulolipu: Communication Media of Academics and Society*, 18(1).
- National Safety Council., 2017. *Fatigue in Safety-Critical Industries: Impact, Risks and*

- Recommendations. National Safety Council.
- Ningsih, S.N., & Nilamsari, N., 2018. Factors Related to Locomotive DIPO Worker Fatigue PT. Kereta Api Indonesia (Persero). *Journal of Industrial Hygiene and Occupational Health*, 3(1), pp.69-82.
- Paulina, & Salbiah., 2016. Factors Related to Worker fatigue in PT. Kalimantan Steel. *Journal of Health Vocational*, II(2), pp.165-172.
- Pranoto, B., Hardjanto., & Suwadji., 2014. *The Relationship between Nutritional Status and Work Fatigue in the Weaving Section of Workers in PT. Iskandar Indah Printing Textile Surakarta*. Study Program of Public Health, Faculty of Health Sciences of University of Muhammadiyah Surakarta.
- Prastuti, T.N., & Martiana, T., 2016. Analysis of Individual Characteristics with Complaints of Work Fatigue in Taxi Drivers in Rungkut Surabaya. *The Indonesian Journal of Public Health*, 11(1), pp.64-74.
- Prastuti, T.N., & Martiana, T., 2016. Relationship between Individual Factors, Workload and Work Shifts with Work Fatigue at Nurses at Regional Mental Hospital (RSJD) Dr. Amino Gondohutomo Semarang. *The Indonesian Journal of Public Health*, 11(1), pp.64-74.
- Putri, R., 2018. Factors Related to Work Ability at TKBM at Pekanbaru Port in 2015. *Collaborative Medical Journal*, 1(1), pp.49-59.
- Putro, A.N., & Hariyono, W., 2017. *Workload, Nutritional Status and Feelings of Work Fatigue in Pottery Industry Workers*.
- Rochmah, M., 2011. *The Difference of Work Fatigue Before and After Exposure to Heat Pressure in Workers in the Patchwork Milling Section in the Mattress Industry X Sukoharjo*.
- Saragih, W.L., Mahyuni, E.L., & Lubis, A.M., 2015. Assessment of Work Accident Risk of Loading and Unloading Workers at Teluk Nibung Port, Tanjung Balai Asahan in 2015. *Journal of Occupational Health and Environment*, 4(2).
- Sari, A.R., & Muniroh, L., 2017. The Relationship between Adequacy of Energy Intake and Nutritional Status with the Workforce Fatigue Level of Production Workers (Study in PT. Multi Aneka Pangan Nusantara Surabaya). *Amerta Nutrition*, 1(4), pp.275-281.
- Sartono., Martaferry., & Winaresmi., 2016. Relationship between Internal Factors and External Factors Employees with Work Fatigue in Laundry Garment Employees in the Production Section of CV. Sinergie Laundry Jakarta Barat. *Articles of Public Health*, 1(1), pp.64-72.
- Starizky, O., Ekawati., & Jayanti, S., 2016. Relationship between Workload and Work Climate with Work Fatigue in Land Measurement Workers Using Theodolite Tool. *Journal of Public Health*, 4(3), pp.549-556.
- Tarwaka, H.A., Bakri, S., & Sudiajeng, L., 2004. *Ergonomics for Safety, Health and Productivity*.
- Tri., 2019. *BPJS of Employment*.
- Yogisutanti, G., Kusnanto, H., Setyawati, L., & Otsuka, Y., 2013. Morning Habits, Long Sleep and Fatigue at Lecturers. *Public Health - Journal of Public Health* 9(1), pp.53-57.