

# The Relationship between Work Shifts and Work Environment with Nurse Fatigue in the Emergency Department

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## ABSTRACT

**Introduction:** Work fatigue is one of the common health problems faced by nurses. Work shifts and work environment are factors that cause work fatigue for nurses. Nurse fatigue can cause work accidents and decreased work productivity. It was reported that 47% of employees experienced decreased productivity, and 32% of employees experienced injuries and near misses due to work fatigue. This research aimed to figure out whether and to what extent work shifts and work environment were correlated with nurse fatigue at the emergency department of Surabaya Haji General Hospital. **Method:** This analytic observational study employed a cross-sectional approach with work fatigue as the dependent variable and work shifts and work environment as independent variables. This research used the Spearman's correlation test with 30 emergency department nurses at Surabaya Haji General Hospital as the samples. The instruments used in this research were work environment questionnaires and work fatigue questionnaires from IFRC. **Results:** The results showed that work shift had a very weak relationship with work fatigue. At the same time, there was a moderate relationship between work environment and work fatigue. **Conclusion:** The work fatigue among emergency department nurses at the Surabaya Haji General Hospital observed had a very weak relationship with work shifts and a moderate relationship with their work environment.

**Keywords:** nurse, secure work, work environment, work fatigue, work shift

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## INTRODUCTION

The Indonesian Labor Law No. 13 of 2003 defines a worker as an individual who performs a specific work to produce goods and or to provide services, from which personal or community needs are met (Ministry of Manpower, 2003). Every worker doing work must feel work fatigue. Fatigue is a term used to describe a mental or physical state that can decrease a person's ability to complete necessary tasks in safe and effective manners (Workplace Health and Safety Queensland, 2020). According to Susanti and Amelia, (2019), work fatigue can cause a decrease in performance for workers such as being slow to react and difficult to make decisions and take actions. Moreover, work fatigue can also cause workers to make errors. Human errors can cause work related accidents (Adhikari, 2015).

A survey conducted by the National Safety Council reported that 47% of employees were reported to have low productivity due to work

fatigue, 50% of employees ever fell asleep while on duty, 57% of employees showed nursing absenteeism, and 32% of them experienced collisions because of work fatigue (National Safety Council, 2018). In addition, a survey conducted by the National Safety Council on 2,010 workers in America reported that 71% of construction industry workers, 73% of manufacturing industry workers, 66% of transportation industry workers, and 64% of utility industry workers felt tired while working, causing them to experience a decrease in work productivity. Furthermore, there were 45% of construction industry workers, 44% of manufacturing industry workers, 45% of transportation industry workers, and 41% of utility industry workers felt tired while working, causing them to experience safety incidents in the workplace (National Safety Council, 2018).

Work fatigue occurs due to internal and external factors. The internal factors are factors that come from inside the workers (Soedirman and Suma'mur, 2014). A work shift is one of the causes of work fatigue that come from outside the workers, commonly called as external factors. A work shift is a system of rotating workers in a company to do a job (Ratih, Mulyatini, and Suhendi, 2020).

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Generally, work shifts consist of morning shifts and night shifts. The National Safety Council claims that night-shift staff tend to have less time to rest and sleep, thus having a higher risk of work fatigue. Sleep time is supposed to be at night, but workers can only sleep in the morning due to night shifts. Sleeping in the morning is opposed to the body's natural sleep time, which can cause workers to have sleep difficulty and lack of sleep. According to a National Safety Council survey, it was reported that 59% of night-shift workers had a short sleep duration of less than 7 hours compared to morning-shift workers (National Safety Council, 2018).

The work environment can also cause workers to feel tired. The work environment is physical and non-physical circumstances in the workplace that can influence employee productivity (Susita, Muslimah, and Waspodo, 2017). According to Romadhoni, Asmony, and Suryatni (2015), the work environment can affect the conditions of workers at work because a bad work environment can cause workers to have fatigue, high emotional tension, and low motivation, while a good work environment causes workers to have high motivation and low emotional tension.

Nursing is a type of work that often deals with work fatigue due to work shifts and work environment. According to a survey by Kronos (2018), there were 98% of nurses who described their work as physically and mentally demanding. Also, there were 93% of the nurses who reported that at the end of typical days, they were mentally and/or physically tired. Research by Febriandini, Ma'arufi, and Hartanti (2016) revealed that 67% of 46 nurses had work fatigue.

Nurse fatigue is a condition that cannot be ignored and must be anticipated immediately because it can affect the working performance of nurses. Nurses who feel tired will negatively affect their productivity and performance. Nurses' low performance can jeopardize the patient's well-being condition because nurses' performance determines the success rate of the patient's medical treatment. Based on a survey by Kronos (2018), it was reported that 11% of nurses said they had made mistakes at work because they were too tired.

The Surabaya Haji General Hospital is one of the hospitals in Surabaya that accepts patient referrals. These patient referrals consist of patients with the National Health Insurance, patients with certificates of poverty in Surabaya, and patients with other health insurance partners. The acceptance of these patient referrals makes the Surabaya

Haji General Hospital have many patient visits. According to hospital admission statistics from January to October 2019, 29,544 patients visited the Emergency department of the Surabaya Haji General Hospital. The innumerable patient visits in the hospital can precipitate an uncomfortable work environment because patients restrict the nurses' mobility. These uncomfortable work environment conditions will have an impact on work-related fatigue for nurses. According to Haghghi and Yazdi (2015), there are three causes of work fatigue, one of which is environmental load. Environmental load is one of the causes of work fatigue in addition to physical load and mental load. Environmental load is a workload that comes from the environment.

The Surabaya Haji General Hospital is a health service institution that provides various kinds of health services for 24 hours. Health services for 24 hours have an impact on workers because they also have to work for 24 hours to provide health services. However, according to Law No. 13 of 2003, the working time limit is only 7-8 hours/day, so it is necessary to implement work shifts. Work shifts aims to limit workers' working time without reducing the number of health services provided. Thus, the work shifts make health services available for 24 hours and workers can work without exceeding the working time limit, which is 7-8 hours / day. Emergency department nurses at the Surabaya Haji General Hospital are required to provide 24-hour health services. To be able to provide 24-hour health services, the emergency department nurses at Surabaya Haji General Hospital implement a work shift system. Work shifts at the Surabaya Haji General Hospital consist of morning shifts, evening shifts, and night shifts. In each work shift, workers will have 7-8 hours of working time. The National Safety Council (2018) stated that work shifts are one of the causes of work fatigue. Haghghi and Yazdi (2015) also stated that workers' fatigue is usually found among shift workers because shift workers usually do not have normal circadian rhythms. In many cases, these workers do not adjust their phase shifts to entirely adapt to working conditions that require day sleep and night work. For this reason, they are less alert during working time, experience fatigue, and, eventually, have poor performance.

Based on the previous description, it can be seen that emergency department nurses at Surabaya Haji General Hospital are at risk of work fatigue caused by work shifts and work environment. Therefore, the researchers are intrigued to examine whether or not

work shifts and work environment affect fatigue on nurses at the hospital emergency department.

**METHODS**

This analytic observational research employed a cross-sectional design and took place at the Surabaya Haji General Hospital from January to February 2020. The research population was 30 nurses employed at the hospital’s emergency department. These nurses made up the research samples.

This study was set out to figure out whether and to what extent work shifts, work environment, and fatigue at the workplace were related. There were two variables in this research, namely independent and dependent variables. Work shifts and work environment were the independent variables of this study, while work fatigue was the dependent variable.

The research instruments were work environment questionnaires and work fatigue questionnaires from the Industrial Fatigue Research Committee (IFRC). Work environment questionnaires were used to measure nurses' perceptions of work environment conditions. Moreover, work fatigue questionnaires from IFRC were used to measure subjective nurses' work fatigue. Univariate and bivariate were types of data analysis of the research, and the Spearman’s correlation test were used as the complement. The level of confidence used in this research was 95%.

This research has been granted ethical clearance by the Research Ethics Committee of the Public Health Faculty, Universitas Airlangga (No. 03/EA/KEPK/2019). Moreover, all respondents in this research have also signed informed consent.

**RESULTS**

**General Overview of Respondents**

Based on the descriptive statistics of the respondents, the 30 emergency department nurses observed consisted of 19 males and 11 females. In addition, it was also found that most of the emergency department nurses at Surabaya Haji General Hospital were under or equal 30 years old (43.3%) and most of them had been working there for less than or equal to 5 years (43.3%). Table 1 presents the general overview of the demographic characteristics of the respondents.

**Work Shifts**

Table 2 divides the emergency department nurses at Surabaya Haji General Hospital according to their work shifts (in number and percentage). 11 nurses worked in the morning shifts (36.7%), 11 nurses worked in the evening shifts (36.7%), and 8 nurses worked in the night shifts (26.7%). These results indicate that when the research was carried out, most nurses worked in the morning and evening shifts.

**Work Environment**

Table 3 is the frequency distribution of the emergency department nurses' perceptions about the work environment. 12 nurses felt that the work environment could affect their work insignificantly or in the low category (40%), and 18 nurses felt that it could affect their work comparatively or in the moderate category (60%). These results indicate that most emergency department nurses felt that the work environment could affect their work in the moderate category.

**Table 1.** The Frequency Distribution of Emergency Department Nurses’ Characteristics at Surabaya Haji General Hospital in 2020

Characteristics	n	%
<b>Gender</b>		
Female	11	36.7
Male	19	63.3
<b>Age</b>		
≤ 30 years old	13	43.3
31 – 40 years old	10	33.3
41 – 50 years old	7	23.3
<b>Work Period</b>		
≤ 5 years	13	43.3
6 – 10 years	7	23.3
> 10 years	10	33.3

**Table 2.** The Frequency Distribution of Emergency Department Nurses’ Work Shifts at Surabaya Haji General Hospital in 2020

Work Shift	n	%
Morning	11	36.7
Evening	11	36.7
Night	8	26.7
<b>Total</b>	30	100

**Work Fatigue**

Table 4 is the frequency distribution of the emergency department nurses' work fatigue. 7 nurses had low fatigue levels (23.3%), 21 nurses had moderate fatigue levels (70%), 1 nurse had high fatigue levels (3.3%) and 1 nurse had very high fatigue levels (3.3%). These results indicate that most emergency department nurses experienced moderate work fatigue levels.

**Table 3.** The Frequency Distribution of Emergency Department Nurses' Perception of Work Environment Condition at Surabaya Haji General Hospital in 2020

Work Environment	n	%
Low	12	40
Moderate	18	60
<b>Total</b>	<b>30</b>	<b>100</b>

**Table 4.** The Frequency Distribution of Emergency Department Nurses' Work Fatigue at Surabaya Haji General Hospital in 2020

Work Fatigue	n	%
Low	7	23.3
Moderate	21	70
High	1	3.3
Very High	1	3.3
<b>Total</b>	<b>30</b>	<b>100</b>

**The Relationship between Work Shifts and Work Fatigue**

The Spearman's correlation test of work shifts and work fatigue yielded a coefficient of -0.144, suggesting a very weak relationship between the two. Moreover, in Table 5, it can be seen that 21 emergency department nurses suffered from fatigue in the moderate category which consisted of 10 nurses working in the morning shifts (90.9%), 7 nurses working in the evening shifts (63.6%), and 4 nurses working in the night shifts (50%). These results indicate that most emergency department nurses who had moderate fatigue were those who worked in the morning shifts.

**The Relationship between Work Environment and Work Fatigue**

The Spearman's correlation test showed a positive correlation of 0.558 between work environment and work fatigue, which implies a moderate relationship between the two aspects. As shown in Table 6, nurses with moderate work fatigue comprised of 4 nurses who felt that the work environment could affect the work process in the low category (33.3%) and 17 nurses who felt that the work environment could affect the work process in the moderate category (94.4%). These results indicate that most emergency department nurses with moderate work fatigue were those who felt that their work environment moderately affected the work process.

**Table 5.** The Spearman's Correlation Test Results between the Work Shifts and Work Fatigue of the Emergency Department Nurses at Surabaya Haji General Hospital in 2020

Work Shift	Work Fatigue								Correlation
	Low		Moderate		High		Very High		
	n	%	n	%	n	%	n	%	
Morning	1	9.1	10	90.9	0	0	0	0	-0.144
Evening	3	27.3	7	63.6	1	9.1	0	0	
Night	3	37.5	4	50	0	0	1	12.5	
<b>Total</b>	<b>7</b>	<b>23.3</b>	<b>21</b>	<b>70</b>	<b>1</b>	<b>3.3</b>	<b>1</b>	<b>3.3</b>	

**Table 6.** The Spearman's Correlation Test Results between the Work Environment and Work Fatigue of the Emergency Department Nurses at Surabaya Haji General Hospital in 2020

Work Environment	Work Fatigue								Correlation
	Low		Moderate		High		Very High		
	n	%	n	%	n	%	n	%	
Low	7	58.3	4	33.3	1	8.3	0	0	0.558
Moderate	0	0	17	94.4	0	0	1	5.6	
<b>Total</b>	<b>7</b>	<b>23.3</b>	<b>21</b>	<b>70</b>	<b>1</b>	<b>3.3</b>	<b>1</b>	<b>3.3</b>	

## DISCUSSION

### General Overview of the Respondents

The emergency department nurses at Surabaya Haji General Hospital consisted of female and male nurses. There were 19 male nurses (63.3%) and 11 female nurses (36.7%). According to Humairoh and Putra (2020) there was a significant relationship between gender and fatigue. Oksandi and Karbito (2020) stated that males had a 3.04 times greater chance of having fatigue than females. Otherwise, Tarwaka and Bakri (2004) stated that females had a greater chance of having fatigue than males. The reason females tire more easily than males is because females only have 2/3 physical strength of males' physical strength. In addition, females have a maximum oxygen volume of 15-30% lower than males. This condition occurs because females have higher body fat levels and lower hemoglobin levels than males. Based on some of the previous findings stated, it can be seen that there were different statements regarding gender and work fatigue. However, it still can be concluded that there was a relationship between gender and fatigue.

Moreover, it can be seen that most of the emergency department nurses at Surabaya Haji General Hospital were aged  $\leq 30$  years old (43.3%). In general, this age can be classified as productive age and that is the reason why most of emergency department nurses at Surabaya Haji General Hospital just had moderate work fatigue, not high or very high work fatigue. Someone who has older age will experience more changes and a decrease in physiological function than someone who has younger age (Rahmawati and Tualeka, 2019). According to Setiawan (2016), the age group of 26-35 years old is in the peak of human physical development, so at that age, they can have high productivity, especially in jobs that require good physicality. Thus, it can be concluded that increasing age can make a person feel tired quickly because of a decrease in physiological function, and this is a something that can reduce the level of performance and productivity.

The emergency department nurses at Surabaya Haji General Hospital consisted of nurses who had been working there for  $\leq 5$  years, 6-10 years and  $> 10$  years. There were 13 nurses (43.3%) who had worked for  $\leq 5$  years, 7 nurses (23.3%) who had

worked for 6-10 years and 10 nurses (33.3%) who had worked for  $> 10$  years. It was found that most of the emergency department nurses at Surabaya Haji General Hospital had a working period  $\leq 5$  years. According to Maulina and Syafitri (2019), working period can affect performance both positively and negatively. The positive effect of the longer working period is that workers will be more professional and understand more how to handle their work. Meanwhile, the negative effect of the longer working period is the workers will have long exposure in the workplace, which can cause work-related diseases or the workers will feel bored because they do the same job for a long time. Research by Setiawan, Fauzan and Norfai (2020) stated there were 74 workers with a working period of more than 3 years, 49 workers (66.2%) of whom had mild fatigue and 25 workers of whom (33.85%) had moderate fatigue. The reason is that workers with a working period of more than 3 years already understand the conditions of their work, so it makes it easier for workers to do their jobs, which also reduces their work fatigue.

### Work shifts

A work shift is a way of an organization to manage working hours when operating hours exceed 8 hours or even cover a total of 24 hours by rotating several groups of workers (Perez *et al.*, 2019). Therefore, work shifts can enable an organization to extend their operating hours, even up to 24 hours without exceeding the workers' daily working time limit, which is 7-8 hours per day.

Work shifts consist of the morning shifts, day shifts, and night shifts. Every organization has a different work shift system. According to the International Labour Organization (2019), the work shift system includes fixed shift and rotating shift systems. Certain groups of workers who always work in the same shift get what is called a fixed shift. Meanwhile, the rotating shift will schedule varying working times over time, which lets a worker work from morning to evening shifts, from evening shifts to night shifts, or from night shifts to morning shifts.

Based on the results of this research, emergency department nurses at Surabaya Haji General Hospital implemented a rotating shift system consisting of morning, evening, and night shifts. Morning and evening shifts had 11 nurses on duty, and only 8 nurses worked the night shift.

## Work Environment

The work environment can be defined as a place where people work. Work environment conditions are one of the most important components that determine the level of performance of employees in an organization. According to Sharma, Dhar, and Tyagi (2016), the conditions of the work environment have an important role in determining the level of worker motivation, productivity, and performance. Workers who work in an unhealthy and uncomfortable work environment can suffer from health problems, such as work-related diseases that cause workers to have low levels of performance, while workers who work in peaceful and cooperative work environments have high levels of performance (Hafeez *et al.*, 2019). Thus, the work environment has both positive and negative effect on workers (Duru and Shimawua, 2017).

Based on the results of this research, most of the emergency department nurses at Surabaya Haji General Hospital felt that the work environment could affect their work in the moderate category because they felt that their work environment was unsupportive and uncomfortable, which disrupted their work. That disturbed feeling can lead to decreased performance.

## Work Fatigue

Work fatigue is the state of physical, mental, and emotional exhaustion and affliction which can lessen one's working performance in the middle of and towards the end of the duty (Frone and Tidwell, 2015). According to Ningsih and Nilamsari (2018), fatigue is a condition experienced by a person after doing activities. A person who experiences fatigue usually has several symptoms, such as low levels of activity, motivation, and physical condition. The low level of activity is characterized by several conditions in which someone feels heaviness in the head and legs, feels tired, yawns frequently, feels confused, feels sleepy, feels burdened in the eyes, and has no balance in standing. The low level of motivation is characterized by feeling difficult to think and concentrate, feeling tired when speaking, feeling nervous, being forgetful, being not confident, feeling anxious, being unable to control attitudes, and not being able to do a good job. Moreover, the low level of physical condition is characterized by headache, stiff shoulders, back pain, heavy breathing, thirst, dizziness, and unhealthy condition.

Numerous factors may cause nursing staff to experience heavy workloads, for instance, a shortage of workers, unsystematic shift schedules, overtime work, and circadian adjustments for night shift workers (Steege and Rainbow, 2017). The heavy demands and workloads have the potential to cause work fatigue. Therefore, work fatigue poses a substantial risk for nurses working in hospitals, which eventually leads to poor outcomes, e.g., reduced mental acuity, impaired workplace performance, and errors (Canadian Centre for Occupational Health and Safety, 2017). This research found that 21 of the 30 nurses observed experienced moderate work fatigue while the rest indicated low fatigue. Thus, it can be concluded that most of the emergency department nurses at Surabaya Haji General Hospital experienced moderate work fatigue.

## The Relationship between Work Shift and Work Fatigue

The results of the Spearman's correlation test between the work shifts and work fatigue of the Emergency Department nurses at Surabaya Haji General Hospital indicated a very weak relationship. Between the three work shifts, the morning shifts had greater work fatigue for nurses. There were 90.9% nurses who worked in the morning shift and had moderate work fatigue. This result is different from research by Nuraini (2018) which showed that night shifts resulted in greater work fatigue for nurses. Night shift nurses' work fatigue is caused by a lack of sleep due to disruption of the body's circadian rhythm. Humans normally get to sleep at night and work in the morning. Otherwise, night shift nurses who work in the night shifts and take a rest in the morning will be more likely to encounter health problems, such as the disruption of the body's circadian rhythm which can cause nurse fatigue. In addition, sleep deprivation in nurses who work night shifts is also caused by the duration of working hours. Night shift nurses will have a longer work duration than morning shift nurses. Thus, it can be seen that night shift nurses had a greater risk of work fatigue than morning shift nurses.

Most Emergency department nurses at Surabaya Haji General Hospital suffered from work fatigue when working the morning shift more than working in the night shifts. It is because they have more activities to do in the morning. Research by Mallapiang, Alam, and Suyuti (2016) stated that

morning shift nurses felt tired because they had many activities to do before doing their job as a nurse in the morning. Furthermore, according to Heryana, Mahadewi, and Buwana (2020), morning-shift nurses had more activities than night-shift ones, as evident from the work-sampling comparative research of the two. The results of the work sampling research showed that the proportion of morning shift nurses' activities was 89.3%, while the proportion of night shift nurses' activities was only 65.8%. This means that morning shift nurses had more activities than night shift nurses. Nursing activities consist of direct and indirect nursing activities. Direct nursing activities include hecting, communicating with patients, measuring vital signs, taking nebulizer actions, performing injections, performing wound care, changing bandages, performing electrocardiogram (ECG) actions, giving oral medication, handing over and accepting patients, and promoting healthy behaviors. Meanwhile, indirect nursing activities include preparing to change work shifts, documenting medical records, preparing medical devices and medical materials, coordinating with other health workers, receiving office calls, tidying up medicine cabinets, discussing with doctors, inputting data reports, preparing medicine, and going to the laboratory (Heryana, Mahadewi, and Buwana, 2020).

### **The Relationship between Work Environment and Work Fatigue**

In addition to work shifts, the work environment is another factor affecting the success rate of a work process. For instance, an uncomfortable work environment can result in employee fatigue and reduced performance. According to Dewi (2018), work fatigue is caused by non-standard working conditions which will cause a feeling of discomfort. According to Suma'mur (2009), measuring workers' perceptions about work environment conditions is the right method to determine which work environment that can affect work fatigue. Workers who are uncomfortable with their work environment feel more tired than workers who feel otherwise.

The research results on Emergency department nurses at Surabaya Haji General Hospital revealed that there was a moderate relationship between work environment and work fatigue. There were 94.4% nurses who felt that the work environment could affect the work process in the moderate category and also had work fatigue in the moderate category. This fatigue was suffered by nurses who

felt that their work environment was unsupportive and uncomfortable, which disrupted their work. That disturbed feeling could lead to decreased performance and work fatigue. Research by Abiseno and Salami (2017) and Dewi (2018) also showed that most workers with heavy work fatigue were workers who felt uncomfortable with working conditions at work. Meanwhile, workers who felt comfortable with their working conditions only had low or moderate work fatigue.

### **CONCLUSION**

The results of research on the emergency department nurses at Surabaya Haji General Hospital revealed that work fatigue experienced by most nurses was caused by work shifts and work environment. According to the results of the Spearman's correlation test, the correlation coefficient between work shifts and work fatigue was -0.144, implying a very weak relationship between work fatigue and work shifts. Furthermore, the Spearman's correlation test between work environment and work fatigue yielded a coefficient of 0.558, signifying a moderate relationship between the two variables.

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