Conference Paper

Study of Shift Work, Quantity and Quality of Sleep with the Occurrence of Fatigue at Universitas Indonesia Security, 2017

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Abstract

Shift work is one solution to increasing productivity. However, it can have several impacts, one of which is the disruption of the circadian rhythm, causing a decrease in the quality and quantity of workers and consequent fatigue. This study aims to establish the correlation between shift work, the quantity and quality of sleep, and the occurrence of fatigue. It is a cross-sectional study, conducted on security at Universitas Indonesia from May to June 2017, with 150 respondents. The instruments of the study were Industrial Fatigue Research Committee (IFRC) and PittsburghSleep Quality Index (PSQI) questionnaires, as well as an objective measurement of the quantity and quality of sleep through the actigraph (fitbit blaze) tool. The results show that 76 people, or 50.7 percent of repsondents, suffered from severe fatigue, while 74 (49.3%) had mild fatigue. The quality and quantity of sleep cannot directly affect the occurrence of fatigue, but in the literature there is a relationship between the variables. This study found no correlation between 2:1 and 4:2 working shift with regard to the occurrence of fatigue due to lack of sleep or its quality.

Keywords: shift work, quantity and quality of sleep, tiredness, sleep hygiene, industrial fatigue research committee, the Pittsburgh sleep quality index

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1. Introduction

White & Keith [1] define shift work as work schedules outside the period of 08:00–16:00. Pigors & Myers [2] state that it is an alternative to extended working hours when production output needs to be improved. The U.S. Department of Labor's Labor Statistics Bureau reports that percentage of shift workers in the hotel industry is 38.3 percent, in mining 31.9 percent and in transportation and services 27.9 percent. J. Carpentier [3] reports that 50–60 percent of night shift workers, whether working in shift rotation or permanent shifts, experience sleep disturbance, and that 60–70 percent

of shift workers complain of sleep disturbances, hard to sleep either in long or short duration. Rosa & Colligan [4] suggest that digestive problems such as stomach ulcers, abdominal pain and loss of appetite are more common in night shift workers than non-shift workers because of their type of eating disorder, so night shift workers are more likely to have a worse diet.

Currently, Universitas Indonesia (UI) has a work unit that handles Health, Safety and Environment aspects. For the security aspect, UI has Pembinaan Lingkungan Kampus (PLK) which is a Sub Directorate of the Directorate General and Facilities UI. Based on UI crime figures, in 2013 there were 17 cases of motorcycle theft, 20 of car theft, one case of office equipment theft, 9 cases of theft from mosques, three cases of deprivation of valuables, two cases of immorality and the discovery of one corpse. This meant that security always needed to be ready to quickly respond when handling cases at UI. Therefore, they must remain in optimal condition and avoid fatigue due to shift work and poor sleep quality and quantity.

2. Methods

The study uses a cross sectional design that aims to give a description of the factors and the relationship between risk of fatigue, sleep quantity and quality and sleep hygiene on fatigue in the shift system. The research was conducted on campus security officers at the University of Indonesia during the period May to June 2017. The sample number was 150. Table 1 shows the distribution of the sample, based on the recommendations of the PLK UI.

Table 1: Samples distribution.

Faculty	Samples
PLK UI	50
FISIP	30
FKM	10
RIK	15
Farmasi	5
FIK	10
Vokasi	10
FT	5
FEB	10
FPSI	5

The instruments of this research are the Industrial Fatigue Research Committee (IFRC) Questionnaire to establish the subjective fatigue felt by respondents. The Sleep Quality Index (PSQI) questionnaire distinguishes between good sleep and poor sleep by examination of seven components: sleep latency, sleep duration, sleep quality, efficiency of sleeping habits, sleep disturbances, use of sleeping pills and daytime body dysfunction. An actigraph tool (Fitbit Blaze) where this was used for at least 7 days and maximum of 14 days to record the sleeping and waking time of 10 security officers.

3. Results

3.1. Fatigue level distribution

The results from the 150 samples show that 76 people, or 50.7 percent, had severe fatigue conditions, while 74, 49.3 percent, had mild conditions.

Level of Fatigue	Workers	(%)
Severe	76	50.7
Mild	74	49.3
Total	150	100.0

3.2. Shift work distribution

Most of the sample, 109 workers, or 72.7 percent, worked in shifts, while 41, or 27.3 percent, were non-shift workers.

Age	Workers	(%)
Shift	109	72.7
Non-shift	41	27.3
Total	150	100.0

3.3. Work duration distribution

Based on the responses in the questionnaires related to working duration, 28 people (18.7%) had a working time of $\leq$ 8 hours, while 122 (81.3%) had one of > 8 hours.

Work Duration	Workers	(%)
≤ 8 Hours	28	18.7
> 8 Hours	122	81.3
Total	150	100.0

3.4. Work type distribution

In the results related to type of work, 137 people (91.3%) had monotonous work, while 13 (8.7%) had a dynamic type of work.

Work Type	Workers	(%)
Monotony	137	91,3
Dynamic	13	8,7
Total	150	100.0

3.5. Quality of sleep distribution

A total of 128 people (85.3%) had poor sleep quality, while 22 (14.7%) had good sleep quality.

Sleep Quality	Workers	(%)
Poor	128	85.3
Good	22	14.7
Total	150	100.0

3.6. Quantity of sleep distribution

121 people (80.7%) had a poor quantity of sleep, while 29 (19.3%) had a good quantity.

Sleep Quantity	Workers	(%)
Poor	121	80,7
Good	29	19,3
Total	150	100.0

3.7. Quality of sleep in shift work 2:1 and 4:2 system

The research using the FITBIT tool on 10 respondents was conducted in two faculties, namely FISIP and FKM, because these have different shift systems, with a composition in FISIP of 2:1 working shift and in FKM of 4:2 working shift system.

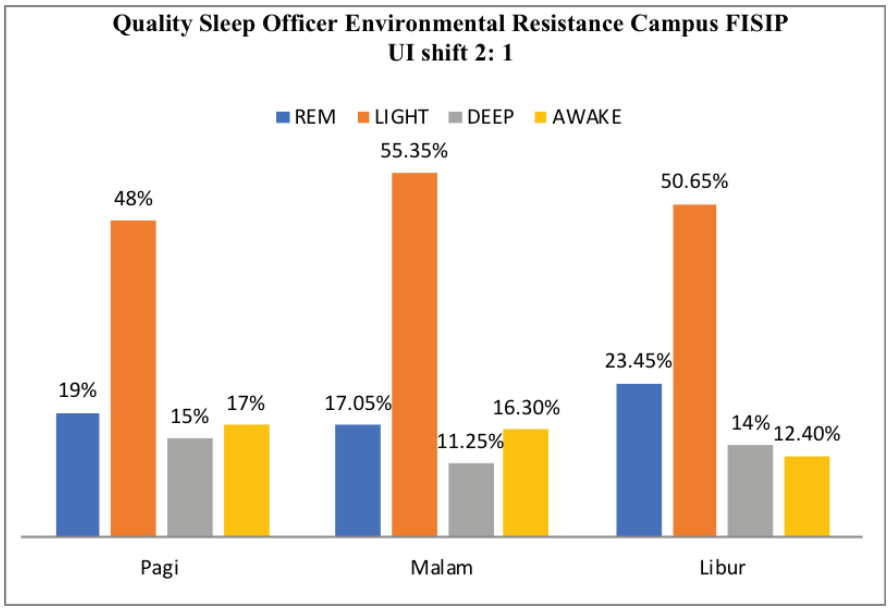

Figure 1: Sleep quality of FISIP campus security, UI..

The research using FITBIT tool on 10 respondents was done in 2 faculty that is FISIP and FKM because FISIP and FKM have different shift system with composition of FISIP 2:1 working shift

From the sleep quality Figure 2 between the 2:1 and 4:2 shifts, there was no significant difference between the amounts of sleep fulfillment at each stage of sleep. If viewed from the actigraph tool, the sleep quality of UI campus environmental security officers is good, but does not reach the maximum value of REM 15–25 percent, Light 40–60 percent, Deep 12–23 percent and Awake 5–20 percent.

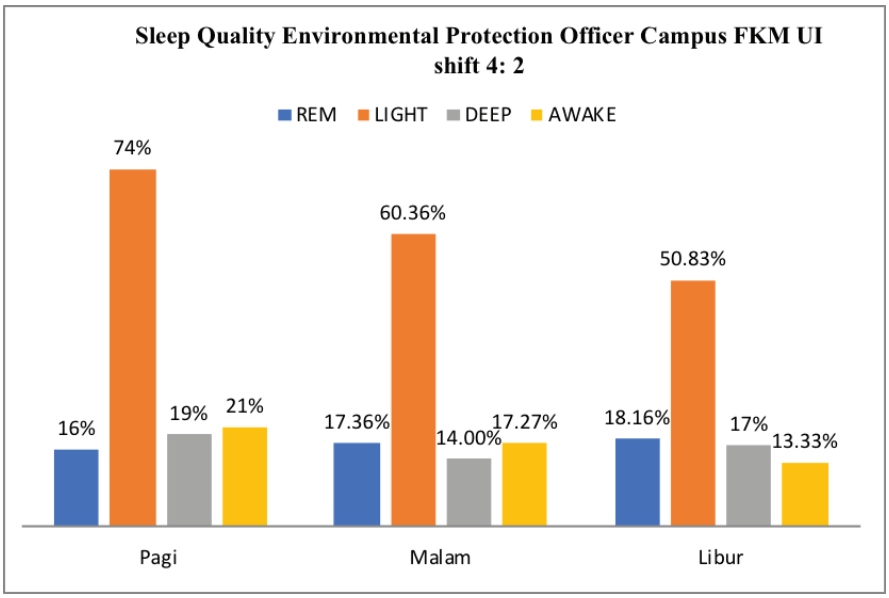

Figure 2: Sleep quality of FISIP campus security, UI.

3.8. Relationship between fatigue and quality/quantity of sleep

Table 2: Relationship between sleep quality with occurrence of fatigue.

Variable	Severe Fatigue N (%)	Light Fatigue N (%)	Total N = 150	OR (95% CI)	*p*-value
Sleep Quality				1,032 (0.418 – 2.550)	1.000
Poor	65 (50.8)	63 (49.2)	128 (100)		
Good	11 (50.0)	11 (50.0)	22 (100)		

From the 128 workers who had poor sleep quality, 65 (50.8%) had severe fatigue, while from the 22 who had good sleep quality, 11 (50%) suffered from severe fatigue. The result of the analysis of the relationship between work fatigue and sleep quality of the UI campus environmental security officers showed a *p*-value of 0.564 (< 0.05). It can be concluded that there is no significant relationship between fatigue and sleep quality. With OR = 1.032, this means that respondents who had poor sleep quality 1 fold greater of experiencing severe fatigue than the respondents who had good sleep quality. This can be seen in the following Table 2.

Out of the 121 workers with poor sleep quantity, 62 (51.2%) suffered from severe fatigue, whereas out of the 29 with good sleep quantity, 14 people (48.3%) had severe fatigue. The results from the analysis of the relationship between work fatigue and sleep quantity of the UI campus environmental security officers show a *p*-value of 0.468 (< 0.05). It can thus be concluded that there is no significant relationship

Table 3: Relationship between sleep quality with occurrence of fatigue.

Variable	Severe Fatigue N(%)	Light Fatigue N(%)	Total N = 150	OR (95% CI)	*p*-value
Sleep Quantity				1,126 (0.500 – 2.553)	0.468
Poor	62 (51.2)	59 (48.8)	121 (100)		
Good	14 (48.3)	15 (51.7)	29 (100)		

between fatigue and sleep quantity. The OR value of 1.126, means that respondents who had bad sleep quantity were 1 fold greater of experiencing severe fatigue than the with respondents who slept longer.

4. Discussion

Work fatigue reflects the body's response to the activities performed, and the environment exposure received during work or the decline in work capacity is characterized by fatigue, lethargy, and a tired sensation. The circumstances experienced by the campus environment security officers working shifts were either exhaustion due to the weakening effect of activities, attenuation of work motivation or physical fatigue, in this study measured by the International Fatigue Research Committee of the Japanese Association of Industrial Health (IFRC). This questionnaire can measure the level of subjective tiredness and contains 30 questions. This study measures the work fatigue of 150 respondents to establish the fatigue complaints of the UI campus security officers. The results show that out of the 150 UI campus security officers, 76, or 50.7 percent, had severe fatigue, while 74, 49.3 percent, had mild fatigue. Hobbs et al. [5] explain that fatigue cannot be eliminated, but that the risk factors associated with it can be managed through cooperation between companies and workers. A more comprehensive method for managing occupational fatigue risk is the Fatigue Risk Management System (FRMS). This consists of many important layer defenses to monitor and manage the risks posed by fatigue for occupational safety. It is specifically designed to combat the risks associated with work fatigue and was first proposed by Dawson and McCulloch [6]. It includes a series of defense layers that can be established at four points in combination with potential trajectories. Identifying and preventing accidents related to fatigue can be found at each of these points.

4.1. Relationships between fatigue with work shift

From the statistical test results, there was no significant relationship between work shift with work fatigue with *p*-value 0.395, Maurits and Widodo [7] stated that work shift has the following effect: (1) negative to physical, mental and social health; (2) disturbing homeostatic psychophysiology such as circadian rhythms, bedtime and eating; (3) reducing work ability, and increasing errors and accidents; (4) impedes social and family relationships; and (5) risk factors for the digestive tract, nervous system, heart and blood vessels. Implementation of shift work system has consequences that need to be realized by each agency, because the application of work shift can be exposed to various health risks with circadian cycle changes that can develop into sleep disorders and work fatigue.

4.2. Relationship between fatigue and quality/quantity of sleep

Shift work disturbs the circadian rhythm, leading to the main sleep disturbance disorder which causes sleep deprivation and fatigue [7]. One of the causes of fatigue is sleep disturbance. Budnick et al.'s study of 29 workers with changes in work behavior reported that almost 84 percent had fallen asleep during work and almost 50 percent had had accidents or made mistakes due to low alertness and fatigue. This was due to circadian rhythm disturbance and lack of sleep.

5. Conclusion

The results show that 76 respondents, or 50.7 percent, had severe fatigue conditions, while 74 (49.3%) had mild symptoms of fatigue. The quality and quantity of sleep does not directly affect the occurrence of fatigue, but in the literature there is a relationship between these variables. This study found no correlation between shift work 2:1 and 4:2 with regard to the occurrence of fatigue due to poor sleep quantity or quality.

6. Recommendation

Fatigue management training, with the aim of teaching workers what factors affect body fitness at work and which can cause fatigue. Workers are expected to maintain fitness by practicing healthy behavior such as exercising and not smoking to prevent fatigue at work. Material given, that is definition of fatigue impact that can be caused,

symptoms of fatigue, factors that can cause and how to prevent the occurrence of fatigue. Publications should be created on fatigue and distributed in each work unit, such as posters or leaflets. The physical work environment should be assessed, such as noise and temperature levels, and other physical environmental factors that may cause fatigue. Workers on night shifts should have the chance to replace their lost sleep hours before returning to work. Finally, there should be a 24-hours break between shifts to prepare for work on a new day or on the next night's shift.

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