ORIGINAL ARTICLE

Association between Sleep Quantity and Quality with Occupational Stress among Truck Driver

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ABSTRACT

Introduction: Occupational stress is a condition in which one or several factors in the workplace interact with workers, therefore it causes disturbance of the equilibrium both physiological and psychological matter. For a driver, occupational stress will impact on the declining performance that may threaten the safety while driving. Consequently, occupational stress becomes one of the most processes which is being related to harmful behavior to drivers that may affect the risk of accidents. This study aims to analyze the correlation between quantity and quality of sleep with occupational stress on truckload drivers. **Methods:** This study uses a cross-sectional method. Data instruments are utilizing a questionnaire and few additional instruments (e.g. cocoro meter, fitbit, sphygmomanometer, and oximetry) to measure the relationship between quantity and quality of sleep to occupational stress as its supporting data. The data obtained were statistically analyzed using the chi-square test and different mean test. **Results:** 27 respondents (60%) experiencing occupational stress at a mild level and 18 respondents (40%) experiencing occupational stress at a moderate level. **Conclusion:** In addition, from the results of the analysis, it was found that there is a correlation between quantity and quality of sleep with occupational stress on truckload drivers.

Keywords: Sleep, Stress, Occupational Stress, Driver

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INTRODUCTION

Occupational safety and health problems in the transportation sector are quite diverse, including the high rate of accidents, physical hazards, acts of violence, as well as hazardous work situations and exposure to hazardous materials (1). In addition, Workers in the transport sector are also prone to any disturbances related to their work, such as occupational stress, fatigue, sleep deprivation, kidney problems, obesity, and substance abuse (1–3).

Professional drivers become one of the highest risk groups of work that can cause stress in the workplace, especially when working long hours, high workload intensity, night-time shift, spending a long time on the road, and lack of rest before doing driving assignments (4). The increase of work demand along with high focus can result in sleep deprivation, which becomes an external factor for stress (5).

Sleep deprivation, including lack of sleep time and bad sleep quality, is a crucial factor in both traffic and workplace accidents (6,7). Previous research found that that high work stress is related to higher risks regarding sleep deprivation (8,9). Worsening quality and quantity of sleep leads to lower control, added with the excessive workload and minimum social support, triggers work stress (8).

Occupational stress is defined as the pressure that exists on a worker. In addition to that, occupational stress is negatively related to performance. In other words, the higher the stress, the lower its performance (10). The factors related to work that can create occupational stress are task demands both in the form of excessive workload and tasks that are more stressful, such as tight and routine work, lack of role of workers, lack of support from coworkers and physical conditions that are either unpleasant or dangerous (11).

In the long term, individuals who cannot endure occupational stress so that they are no longer able to work optimally, become lazy and neglected of their responsibilities. This can have a general impact on organizational and personal for individuals, namely mutations, demotion and even fired. For a driver, occupational stress will have an impact on decreasing performance so that it can threaten safety while driving (13,14).

The results of previous studies indicate that sleep quality in professional drivers is in the poor category. This relates

to long working hours, work shifts, and job satisfaction (15,16). Other studies suggest that the driver's work stress is related to fatigue indicators (3). But in some previous studies about the quantity and quality of sleep using only a measuring instrument in the form of a questionnaire. In Indonesia, not many studies related to the quantity and quality of sleep in cargo truck drivers are associated with occupational stress. Likewise with the objective measuring instrument used. Whereas in this study, in addition to using questionnaires, researchers used fitbit to examine the quantity and quality of sleep and use cocoro meter to assess the level of stress in the driver. The aim study is to investigate the association between sleep quantity and quality with occupational stress on the truck driver.

MATERIALS AND METHODS

This study uses a cross-sectional approach. The sample in this study was all truckload drivers in Jakarta with a total of 45 respondents. Data were obtained using questionnaires and interviews. In addition, data collection was carried out using several measuring instruments, such as cocoro meter (measuring occupational stress), fitbit (measuring quantity and quality of sleep), sphygmomanometer (measuring blood pressure), and oximetry (measuring oxygen levels), as supporting data. Measurement of blood pressure, pulse and oxygen levels is carried out before and after the driver works, for 21 working days.

Occupational stress is measured using a questionnaire and cocoro meter. Occupational stress questionnaires are used to assess stress levels by adapting from the research conducted by Nugrahani, with the Alpha Cronbach value of 0,861 (17). The objective measurement of work stress is conducted using cocoro meter. Cocoro meter is a tool to determine individual stress levels by analyzing the content of the amylase enzyme in saliva. The higher stress an individual feel, the higher their amylase count.

This examination is done by placing the tip of the sensor chip into the mouth for about 10-30 seconds then the chip is inserted into the tool for analysis. At the time of the study, respondents were expected not to eat, drink alcohol, coffee or soft drinks, smoke and do physical activity at least one hour before measurements were taken. They were also expected to not have health problems both physically and mentally, to avoid the influence of drug use (18–20). Then the results of the examination will be displayed on the monitor screen. The results of the cocoro meter measurements were divided into four categories based on alpha-amylase, namely 0-30 KU/L (no stress/normal), 31-45 KU/L (mild stress), 46-40 KU/L (moderate stress), and ≥61 KU/L (severe stress).

The quantity and quality of sleep in the driver are measured using a questionnaire, a sleep log filled in by the driver and an actigraph device called fitbit. This device is used to calculate sleep duration and stages of sleep (awake, REM, light sleep, and deep sleep) from the driver. Fitbit was used for 21 days for 13 drivers. Fitbit can automatically measure sleep time, restlessness and awake during sleep, so this tool can help understand the condition every night of its users. Fitbit is also a wireless physical activity tracking device that meets the standards of validity and reliability so that it can be used to monitor physical activity objectively (21).

Assessment of sleep quality was also conducted using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. PSQI is an assessment method in the form of a questionnaire that is used to assess the quality and sleep disturbance of adults in the past 1 month. In the PSQI questionnaire, there were 7 components used as assessment parameters. The seven components include sleep quality, sleep latency, sleep duration, sleep habits, sleep disturbances, use of sleeping pills (excessive), and dysfunction during the day.

All gathered data is analyzed using the SPSS program. The analysis is conducted by observing the frequency distribution of each variable. In addition, data analysis also uses the chi-square test to determine the correlation between the quantity and quality of sleep with occupational stress and using different mean statistical tests to determine whether there is a difference in cocoro meter, blood pressure, pulse, and oxygen levels, before and after the driver works. This research has been approved by The Ethical Commitee of Research and Community Development, Faculty of Public Health Universitas Indonesia No. 190/UN2.F10/PPM.00.02/2018.

RESULTS

The most respondents in this study were ≤35 years old (51.1%), the last level was secondary education (80%), married status (95.6%), and the working period was ≤1 year (60%) (Table I). The average work time of respondents is 14,6 hours with an average distance of 319,87 km. It can be seen that respondents worked >8 hours with good rest time (53,3%), monotonous work (40%), with a distance of ≤320 km (60%), bad work environment (95,6%), and most experience mild work fatigue (60%) (Table I). Most of the respondents received support from colleagues (91.1%) and family support (97.8%).

The results of sleep quantity measurement based on sleep log filling showed that 26 respondents (57,8%) had enough sleep quantity. In addition, it is known that the average sleep quantity of respondents is 6,47 hours, with the shortest sleep duration of 3 hours and the longest sleep duration of 9 hours. While the results of the measurement of sleep quality based on the PSQI questionnaire, it was found that 24 respondents (53,3%)

Table I: Frequency Distribution of Individual Factors, Work Factors, and Psychosocial Factors

Variable	Parameter	Frequency (f)	Percentage (%)
Individual Factor			
Age	a. ≤35 years	23	51,1
	b. >35 years	22	48,9
Education Level	a. Primary	9	20
	b. Secondary	36	80
Marriage Status	a. Single	2	4,4
	b. Married	43	95,6
Work Period	a. ≤1 year	27	60
	b. >1 year	18	40
Work Factor			
Working Hours	a. ≤8 hours	1	2,2
	b. >8 hours	44	97,8
Recess Time	a. Good	24	53,3
	b. Not good	21	46,7
Monotonous Tasks	a. Dynamic	27	60
	b. Monotonous	18	40
Mileage	a. ≤320 km	27	60
	b. >320 km	18	40
Work Environment	a. Good	2	4,4
	b. Not good	43	95,6
Work Fatigue	a. Mild	27	60
	b. Moderate	18	40
Psychosocial Factor			
Colleague Support	a. Supportive	41	91,1
	b. Not supportive	4	8,9
Family Support	a. Supportive	44	97,8
	b. Not supportive	1	2,2
Total		**45**	**100**

had good sleep quality (Table II).

A total of 27 respondents (60%) experienced mild occupational stress. The results of the occupational stress of the driver from filling out the questionnaire can be seen in the Table III. Based on the Table IV, there are differences in blood pressure (systole), pulse, and oxygen levels before and after work ($p < 0.05$). From the results of the cocorometer, there are differences in occupational stress before and after work when measuring the first and third days. But on the second day measurements, there was no difference in stress levels. In addition, it can be seen that the average stress level of the driver's work before and after work has increased. In the first and second measurements, before working the average stress level of the driver is in the normal category (0-30 KU/L), after working into the medium category (46-60 KU/L). In the third measurement, there was also an increase in stress levels, from normal to mild

Table II: Frequency Distribution of Quantity and Quality of Sleep Based on the PSQI Questionnaire

Variable	Parameter	Frequency (f)	Percentage (%)
Quantity of Sleep	a. Enough	26	57,8
	b. Less	19	42,2
Quality of Sleep	a. Good	24	53,3
	b. Poor	21	46,7
Total		**45**	**100**

Table III. Distribution of Occupational Stress on Truckload Drivers

Occupational Stress	Frequency (f)	Percentage (%)
a. Mild	27	60
b. Moderate	18	40
Total	**45**	**100**

Table IV: Distribution of Blood Pressure, Pulse, Oxygen Levels, and Cocoro Meter

Variable	Treatment	Mean ± SD	Min	Max	ρ value
Sistole	Before	128,3 ± 14,52	109,2	167,2	0,013
	After	125,7 ± 14,52	108,7	163,7	
Diastole	Before	85,3 ± 8,29	72,4	99,8	0,070
	After	83,8 ± 8,67	69	99	
Pulse	Before	83,2 ± 7,27	72,7	97,3	0,027
	After	79,8 ± 5,58	68,6	90,8	
Oxygen Levels	Before	97,3 ± 0,60	96,1	98,4	0,019
	After	97,1 ± 0,47	96,1	97,8	
Cocorometer	Before (Measurement 1)	29,9 ± 33,69	3	130	0,011
	After (Measurement 1)	49,5 ± 42,27	3	148	
	Before (Measurement 2)	21,9 ± 39,85	1	148	0,071
	After (Measurement 2)	50,54 ± 48,46	3	162	
	Before (Measurement 3)	15,2 ± 18,04	2	70	0,004
	After (Measurement 3)	45,2 ± 30,79	2	92	

(31-45 KU/L) (Table IV). There is a correlation between quantity and quality of sleep with occupational stress ($p < 0.05$) (Table V).

Table V: Chi-Square Analysis of Quantity and Sleep Quality with Occupational Stress

Variable	OR (95% CI)	p-*value*
Quantity of Sleep	5,714 (1,551-21,058)	0,007
Quality of Sleep	6,175 (1,647-23,148)	0,005

DISCUSSION

Based on the results of the study, it was found that 27 respondents (60%) experienced mild stress conditions, then 18 respondents (40%) experienced moderate stress. From the results of the cocorometer, there are differences in occupational stress before and after work when measuring the first and third days. But on the second day, there was no difference in stress levels. The chi-square analysis shows that there is a correlation between quantity and quality of sleep with occupational stress on truckload drivers. Drivers become one of the occupational groups with the highest level of risk that can cause stress in the workplace. The driver's stress vulnerability can occur due to the demands of work that exceeds the ability. The main intrinsic source of professional driver stress varies according to the type of vehicle being driven and the nature of the job (22).

Occupational stress conditions experienced by the driver, because some drivers who have not received a holiday from their work. Plus, the driver stayed away from his family, so in addition to thinking about the job, the driver also thought of family members outside the city. According to respondents, they often feel stressed when distributing fuel to gas stations in "unfortunate" conditions, namely where gas stations have requested fuel orders but when shipping turns out the fuel in the gas station is still quite a lot so the driver has to wait long enough for the tank to be ready to be filled. This is an

occupational stress trigger for the driver in accordance with the conditions in the field.

For a driver, occupational stress will have an impact on decreasing performance so that it can threaten safety while driving. The impact of occupational stress on the driver can put the driver at a higher risk of deviant behavior when driving and the involvement of accidents in driving conditions becomes riskier (13,14). This is reinforced by a statement from the Northern Territory Government Australia, that work stress affects drivers. Especially if coupled with the problem at home and at work, the driver can be five times more at risk of being involved in an accident (23).

The results of the study also found that there were differences in blood pressure (systole), pulse, and oxygen levels before and after the driver worked (Table 4). However, there was a decline after finishing work. This is not in accordance with research from Elliott & Lal, that there is an increase in blood pressure after work. Increased blood pressure is seen as one of the mechanisms underlying job stress (24). However, the results have not been fully consistent, because changes in blood pressure can be caused by several factors, such as age, gender, BMI, medication, and activities carried out (25,26). On the other hand, high job stress repeatedly is always associated with an increased risk for cardiovascular disease. This relationship is largely derived from the effects of blood pressure and pulse due to repeated autonomic nervous system reactivity in work-related stress (27).

From the results of the cocoro meter, there are differences in occupational stress before and after work when measuring the first and third days (Table 4). This can happen because on the first day of measurement, some drivers previously had to time off. Whereas on the second day of measurement there is no difference in stress levels because in the middle of work, the driver begins to feel high pressure from work, feeling tired due to long distance, lack of rest time, and job demands that exceed the ability. Differences in the level of stress experienced by the driver can also occur because of the different coping abilities of the drivers. A person with good coping skills can overcome the existing stressors so as not to influence the physical, emotional, and behavioral conditions.

Based on statistical tests, obtained results that there is a significant relationship between the quantity of sleep and occupational stress on truckload drivers (Table 5). Strengthened by statements from Dahlgren and Akerstedt, that increased levels of drowsiness are related to work stress (5,28). High work demands can interfere with sleep, so immediate recovery is needed to do the next job. Lack of sleep causes a lower level of control, coupled with the excessive workload and lack of social support, this is what triggers occupational stress.

Lack of sleep and various other factors including workload, continuous duration of work, poor social and environmental factors can affect the risk of errors and accidents. In addition, psychological and emotional stress is also associated with short amounts of sleep. Although not directly part of the operational environment, the situation at home (for example, the presence of newborns, hobbies, social support, the opportunity to get away from work, dark and quiet bedrooms) can affect getting enough sleep, and with thus modulating the level of fatigue. Low sleep efficiency and a number of other factors that cause occupational stress and result in fatigue. This can ultimately affect a person's cognitive impairment, in the form of inability to make clear decisions, poor concentration, short attention span, and mental obstacles (29,30).

In addition, the results of the study of the quantity of sleep between filling the sleep log and the use of fitbit have different results. Based on the sleep log, it is found that most respondents have sufficient quantity of sleep. While based on the use of fitbit, the average quantity of sleep for respondents is 3 hours 17,85 minutes. In adulthood, the average number of nights sleep duration is 7 hours (31,32). So, it can be said that the sleep quantity of respondents based on fitbit is in the less category. This difference can be caused because in filling in the sleep log the respondent is unable to remember sleep properly. It's different from using fitbit, measuring sleep quantity more objectively.

In the variable of sleep quality, the results obtained that there was a significant relationship between the quality of sleep with occupational stress on truckload driver. This is in line with the research of Sickel, et al., that sleep quality affects physical and psychological health (33). Strengthened by research from Duan, et al., that sleep quality affects work stress (34). Workers with low sleep quality can easily feel dissatisfaction and other negative feelings. With the increase in workload and individual stress, sleep problems become increasingly serious.

The results showed that the proportion of REM sleep stage in this study was included in the less category. The lack of a proportion of REM sleep can cause nervousness, dizziness, lack of focus, and can cause memory problems. In addition, if REM sleep is disrupted one night, the body cannot follow the development of the next normal sleep cycle when sleeping (35,36).

Based on the interview, the poor quality of sleep on respondents was due to the condition of the respondent's residence which disturbed the comfort of sleeping. Drivers say that when they are asleep, they often wake up because of the heat and noise around the rented area. Then added with a call from the office while sleeping, the respondent was asked to make a delivery. Delivery schedules are not necessarily due to differences in time requests from consumers which results in the respondent

having to always be ready to receive delivery calls, even when sleeping. Strengthened by experimental studies in humans and animals, that stress experienced during the day results in sleep disturbances, including a longer transition into REM sleep (37).

With a long driving trip that reaches >8 hours, the distance reaches >300 km, then coupled with damaged road conditions, holes, many steep slopes and inclines, sharp turns and dangerous blind spots, this makes the driver need time to rest good and enough. A good rest time is one of them with the rest area. This is consistent with research, that driving for hours and over long distances can result in a stress response (38). In addition, stressful conditions while driving can be exacerbated by road conditions, such as traffic congestion, vehicle conditions (noise, temperature, vibration), lack of job security, sleep problems, learning routes, even difficulties in meeting family because of the long distance and working hours. Mohanty & Gupta, stated that the increase in mileage and road density has significantly increased the risk of accidents (39).

CONCLUSION

In conclusions, the study showed that truck driver experienced mild and moderate stress conditions and was associated with sleep quantity and quality.

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