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The Relationship Between Stress Levels And Sleep Quality Of Drum Truck Operators At Pt. Malachite International Mining Morowali Regency Central Sulawesi Province

Andi Muh Khaerul Amri[1], Firman[2], Andi Nurhikma Mahdi[3]
[1 2 3] Nursing Science Program, Stikes Karya Kesehatan, Kendari, Indonesia

Author Correspondence
Firman
Nursing Science Program, Stikes Karya Kesehatan, Kendari, Indonesia
BTN Reski 3 Anggoeya
Email: firmansyahidali@gmail.com

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Abstract. *Stress is a physiological and psychological response that can affect a person's health, including sleep quality. Poor sleep quality can reduce concentration, increase fatigue, and impact work safety. This study aims to determine the relationship between stress levels and sleep quality among drum truck operators at PT. Malatchine Internasional Mining in Morowali Regency, Central Sulawesi Province. This study is a quantitative cross-sectional study. The sample consisted of 92 drum truck operators at PT. Malatchine International Mining in Morowali Regency, Central Sulawesi Province. Non-probability sampling of the purposive type was used. Data collection was conducted using questionnaires. The data obtained were processed statistically using a contingency test. From the results of data analysis, it was found that the majority of respondents had a high school education (60.9%). The majority of respondents were married (56.5%). The average length of employment was 1-5 years (47.8%). The average age of respondents was 31-40 years (53%). The results also showed that the highest level of stress was moderate (39.1%) and the highest quality of sleep was poor (69.6%). There is a significant relationship between stress levels and sleep quality among drum truck operators, as determined by Fisher's exact test with a significant value (p-value) of p<0.001. This means that there is a meaningful relationship between stress levels and sleep quality among drum truck operators at PT. Malachite International Mining in Morowali Regency, Central Sulawesi Province. In addition, the contingency coefficient (CC) value of 0.690 indicates a strong relationship between the two variables.*

Introduction

Work stress is a maladaptive physiological and psychological response when job demands exceed an individual's capacity to cope. For night shift workers in the industrial sector, particularly drum truck operators, work stress is influenced by various factors such as irregular working hours that conflict with the body's natural circadian rhythm, social isolation due to differences in working hours, limited exposure to sunlight, and high physical and mental demands in the form of constant vigilance, heavy workloads, and significant occupational safety risks. [1]

Long-term stress is known to contribute to a decline in an individual's health, particularly through sleep disturbances. Chronic psychological stress triggers persistent activation of the autonomic nervous system,

which in turn inhibits the body's ability to reach deep, restorative sleep. This results in restless sleep, frequent awakenings, and prolonged fatigue. [2]

Sleep disturbances caused by unmanaged stress form a pathological cycle, in which sleep deprivation exacerbates stress responses, while increased stress further disrupts sleep quality. This cycle leads to physiological and emotional imbalances, which in the long term can potentially reduce the body's resistance, emotional stability, and an individual's ability to adapt to the demands of work. [3]

Sleep quality is an important component in maintaining physical and mental health, characterized by adequate sleep duration, good sleep continuity, and optimal restorative function. In night shift workers, disturbances in the circadian rhythm that regulates the sleep-wake cycle often trigger various sleep problems, such as insomnia, prolonged sleep latency, and insufficient sleep duration even though rest time is available during the day. [4]

The decline in sleep quality among night shift workers has serious implications for occupational health and safety. This condition is closely related to increased stress, chronic fatigue, mood disorders, anxiety, depression, and decreased concentration and alertness, which can indirectly increase the risk of work errors and accidents. [2]

Working as a heavy equipment operator in the mining industry requires optimal physical and mental readiness. Job responsibilities include operating large machines in high-risk work environments, high precision, continuous vigilance, and the ability to make quick decisions under high pressure. Exposure to work environments such as noise, dust, and extreme physical conditions adds to the workload and has the potential to increase stress and disrupt workers' sleep quality. [6]

In Indonesia, the nickel mining sector, including in Morowali Regency, Central Sulawesi, operates intensively with a 24-hour work system that involves night shift workers. Drum truck operators play a strategic role in the mining operational chain, particularly in the transportation of mining materials. The long working hours and disruption of the circadian rhythm make this group of workers vulnerable to work stress and sleep quality disorders.

Chronic work stress that is not managed effectively can have a significant impact on workers' physical and mental health, including increased blood pressure, immune system disorders, metabolic disorders, emotional exhaustion, and decreased motivation and work productivity. Therefore, institutional intervention is needed in the form of comprehensive stress management and the provision of facilities and work policies that support sleep quality in order to maintain the well-being, safety, and performance of workers in a sustainable manner. [8]

Method

This type of research uses a cross-sectional research design that aims to determine the relationship between stress levels and sleep quality in night shift drum truck operators. Data was collected at one time to obtain an overview of the variables simultaneously. The sampling technique used in this study was random sampling, in which the entire population had an equal chance of being selected as a sample, and the sample consisted of 92 night shift drum truck operators who met the criteria.

Results and Discussion

Respondent Characteristics

Table 1 Distribution of Respondents Based on Latest Education, Marital Status, and Length of Employment

	Distribusi of Responden	(f)	(%)
Highest Level of Education	Junior high school graduate	9	9,8
	High school graduate	56	60,9
	University graduate	27	29,3
	Total	**92**	**100**
Marital Status	Unmarried	35	38,0
	Married	53	56,5
	Divorced/widowed	5	5,4

	Total	**92**	**100**
Employment Period	< 1 year	27	29,3
	1-5 years	44	47,8
	>5 years	21	22,8
	Total	**92**	**100**

Based on their highest level of education, the majority of respondents had completed high school, totaling 56 people (60.9%). Respondents with a college education numbered 27 (29.3%), while those who had completed junior high school numbered 9 (9.8%). This shows that most of the drum truck operators at PT Malachite International Mining have a high school education.

Based on marital status, most respondents were married, totaling 53 people (56.5%). There were 35 unmarried respondents (38.0%), while only 5 respondents (5.4%) were divorced or widowed.

Based on length of employment, nearly half of the respondents had 1-5 years of work experience, namely 44 people (47.8%). Respondents with less than 1 year of employment numbered 27 people (29.3%), while those with more than 5 years of employment numbered 21 people (22.8%).

Univariate Analysis

Table 2 Distribution of Respondents Based on Stress Levels of Drum Truck Operators

Stress Level	(n)	(%)
Normal	12	13,0
Mild	18	19,6
Moderate	36	39,1
Severe	20	21,7
Extremely Severe	6	6,5
Total	**92**	**100**

The table above shows that most respondents experienced moderate stress, with 36 people (39.1%). Meanwhile, 20 respondents (21.7%) experienced severe stress and 18 respondents (19.6%) experienced moderate stress. Only 12 respondents (13.0%) were in the normal category, while 6 respondents (6.5%) experienced very severe stress.

Table 3 Distribution of Respondents Based on the Sleep Quality of Drum Truck Operators

Sleep Quality	Frequency (n)	Percentage (%)
Good	28	30.4
Poor	64	69.6
Total	92	100

Tabel di atas, diketahui bahwa Sebagian besar responden memiliki kualitas tidur buruk, yaitu sebanyak 64 responden (69,6%). Sementara itu, hanya 28 responden (30,4%) yang memiliki kualitas tidur baik.

Bivariat Analysis

Table 4 Analysis of the Relationship Between Stress Levels and Sleep Quality of Drum Truck Operators

Stress Level	Sleep Quality		Total
	Good	Bad	
Normal	12 (100%)	0 (0%)	12
Mild	16 (88,9%)	2 (11,1%)	18
Moderate	0 (0%)	36 (100%)	36
Severe	0 (0%)	20 (100%)	20
Very Severe	0 (%)	6 (100%)	6
Total	**28 (30,4%)**	**64 (69,6%)**	**92**
Statistical test		**Fisher's Exact Test**	**p = 0,000**

The table above shows that of the 92 respondents, most respondents with normal (100%) and mild (88.9%) stress levels had good sleep quality. Conversely, all respondents with moderate (100%), severe (100%), and very severe (100%) stress levels had poor sleep quality. This shows a clear difference between stress levels and the sleep quality of drum truck operators.

Based on the SPSS output results for Fisher's Exact Test, a significant value (Asymp. Sig. 2=sided) of 0.000 was obtained. This value is less than 0.05 ($p < 0.05$), which means that there is a statistically significant relationship between stress levels and the sleep quality of drum truck operators. This indicates a meaningful relationship between stress levels

and sleep quality among drum truck operators at PT. Malachite International Mining in Morowali Regency, Central Sulawesi Province.

The majority of drum truck operators at PT. Malachite International Mining in Morowali Regency experience moderate to severe stress levels. This condition is influenced by high job demands, production target pressures, occupational safety risks, and exposure to noisy, vibrating, and extreme mining environments. Long working hours and shift work systems, particularly night shifts, further increase psychological stress among mining workers. This aligns with transactional stress theory, which states that stress arises when environmental demands exceed an individual's adaptive capacity, and is supported by research showing high stress levels among mining workers due to work risks and rotating work patterns. [2,9]

The results also showed that most drum truck operators had poor sleep quality based on their Pittsburgh Sleep Quality Index (PSQI) scores. Sleep disturbances included insufficient sleep duration, low subjective sleep quality, and daytime alertness disturbances. These conditions are influenced by circadian rhythm disturbances due to shift work, exposure to noise and vibration from heavy equipment, and high physical and mental workloads. These findings are consistent with studies that show that shift workers and heavy vehicle drivers have a high prevalence of sleep disorders and chronic fatigue. [10,12]

Statistical tests show a significant relationship between stress levels and sleep quality among drum truck operators. Operators with moderate to high stress levels tend to have poorer sleep quality than operators with low stress levels. Physiologically, stress increases the secretion of cortisol and adrenaline hormones, which maintain the body's alertness and inhibit the sleep process. Psychologically, stress increases cognitive activity and emotional tension, which worsens sleep disorders. These findings support stress theory and previous research showing that work stress is closely related to sleep quality disorders, especially among shift workers.

Based on these results, work stress is an important factor that needs to be considered in efforts to improve the sleep quality of drum truck operators. Companies are advised to implement stress management strategies through more balanced workloads, optimized shift systems, adequate rest periods, and stress management or counseling programs. These efforts are expected to improve the sleep quality, occupational health, safety, and productivity of operators on an ongoing basis. [13]

Conclusion

Based on the results of research conducted at PT. Malachite International Mining in Morowali Regency, Central Sulawesi Province, on the relationship between stress levels and the sleep quality of drum truck operators, it can be concluded that:

There is a significant relationship between stress levels and the sleep quality of drum truck operators. The higher the stress levels experienced by workers, the poorer their sleep quality. This confirms that work stress is an important factor that has a direct impact on the sleep quality of operators.

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