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OCCUPATIONAL FATIGUE AND QUALITY OF SLEEP ON PALM OIL INDUSTRY'S WORKERS

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ABSTRACT

Background: The industry of palm oil plantations, particularly the activities involved in harvesting and extracting crude palm oil, presents a potential challenge of fatigue for employees working. Data shows that around 60% of workers in this sector report experiencing symptoms of physical like sleep disorder and mental fatigue, which can have a negative impact on their performance in the field. This study aims to analyze the impact of sleep quality on occupational fatigue among workers at PT. CPKA Tanah Laut Regency Kalimantan Selatan Province, Indonesia. **Methods:** This study uses an analytical observational approach utilizing simple random sampling on a sample of 54 workers. Data was collected through IFRS questionnaires to measure the level of fatigue and questionnaires Pittsburgh Sleep Quality Index (PSQI) to measure the level of sleep quality. Data analysis was carried out using the Chi Square test to determine the influence between variables. Results and **Discussions:** The results of this study shows that there is a significant relationship between sleep quality and occupational fatigue. **Conclusions:** This indicates that sleep quality contributes to work fatigue. It is recommended that industry of palm oil plantations implement work fatigue management to improve workers' sleep quality, by providing education about the importance of sleep, fulfilling work nutrition, and improving the work environment.

Keywords: *Occupational Fatigue, Sleep Quality, Palm Oil Industry*

Introduction

Agriculture, especially the palm oil plantation sector, is a hazardous industry. Almost one person has died every week as a direct result of agricultural labor throughout the past ten years. Many more have suffered grave injuries or illnesses as a result of their jobs. Agriculture, which encompasses farming and the utilization of the countryside, employs over 430,000 people. Although making up less than 1.5% of the working population, the agricultural sector has one of the worst rates of worker fatalities of any industry, accounting for 15% to 20% of all worker deaths in Britain annually. (Farmwise: Your Essential Guide to Health and Safety in Agriculture, 2017).

The palm oil sector is currently expanding and plays a strategic role in Indonesian economic development. The palm oil industry plays a major role in the welfare of the countryside. Oil coconut is the livelihood center of 16.2 million people's labor force, consisting of 4.2 million direct labor force and 12 million indirect labor force. In Indonesia, the agriculture sector employs over 38.23 million workers, or 30% of the country's labor force. Activities in the palm coconut industry cover a variety of activities, including planting, harvesting, care, spraying, cultivation, and processing of fresh fruit doughnuts into palm oil and palm core. PT. CPKA is a palm coconut company located in Tanah Laut District of Southern Kalimantan Province, Indonesia has a garden area of 2200 hectares located in Jorong Village, with a production target of 1 hectare producing 60 tons per year. In palm coconut plantations and processing plants, the company empowers the labor force whose majority of work activity is done manually.

Workers in the palm oil industry often face heavy and high-risk working conditions, including exposure to pesticides, long working hours, and uncomfortable work environments. According to Oenning et al. (2019), factors such as high workload and lack of social support in the workplace can contribute to serious health issues. Data shows that around 60% of workers in this sector report experiencing symptoms of physical and mental fatigue, which can have a negative impact on their performance in the field. Additionally, research by Lin et al. (2023) indicates that work fatigue may be related to mental disorders, such as depression and anxiety, further worsening the quality of life for workers. This condition can also affect the quality of sleep for workers, ultimately contributing to work fatigue. The health impacts experienced by workers in the palm oil industry are not limited to physical fatigue but also include mental health issues. With increasing pressure to meet production targets, many workers experience prolonged stress. This can lead to sleep disturbances, which in turn can potentially trigger other health problems, such as heart disease and diabetes (Han et al., 2024).

Fatigue is a significant concern in occupational health, particularly in industries characterized by demanding physical labor and irregular working hours, such as the palm oil industry. Occupational fatigue refers to a state of physical and mental exhaustion that can result from prolonged work hours, repetitive tasks, and high job demands. Sadeghniiat-Haghighi and Yazdi (2015) highlight that fatigue management in the workplace is crucial for maintaining worker health and productivity. Their research emphasizes the need for organizations to implement strategies that mitigate fatigue, including regular breaks, ergonomic assessments, and employee education on fatigue recognition and management. Such measures are particularly relevant in the palm oil sector, where workers often engage in strenuous tasks under challenging environmental conditions.

The relationship between shift work, sleep quality, and fatigue has been extensively studied, revealing a cyclical pattern where poor sleep quality exacerbates fatigue, leading to decreased job performance and increased risk of accidents. Sunarno et al. (2018) conducted a study among security personnel at Universitas Indonesia, finding a direct correlation between shift work schedules and the quantity and quality of sleep. Their findings indicate that irregular sleep patterns significantly contribute to the fatigue experienced by shift workers. This is particularly relevant for palm oil industry workers, who frequently work long hours and may be subjected to shift work, thus impacting their overall health and well-being.

Research by Thach et al. (2020) further supports the notion that shift work adversely affects sleep quality across diverse populations. Their cross-sectional study revealed that workers engaged in shift work reported higher instances of sleep disturbances compared to their day-working counterparts. In the context of the palm oil industry, where operational demands often necessitate round-the-clock labor, the implications of such findings are profound. Poor sleep quality not only affects individual health outcomes but also has broader implications for workplace safety and productivity, underscoring the importance of addressing sleep-related issues among workers in this sector.

Moreover, the cumulative effects of chronic fatigue can lead to significant health risks, including cardiovascular diseases, mental health disorders, and decreased immune function. Swaminathan et al. (2024) conducted a study analyzing physical and cognitive fatigue among shift workers in Tamil Nadu, revealing that sleep disruption was a significant predictor of both types of fatigue. This research is particularly pertinent to the palm oil industry, where workers may experience similar levels of fatigue due to the demanding nature of their work and the irregular hours they often face. The findings suggest that interventions aimed at improving sleep hygiene and managing work-related stressors could be beneficial in enhancing the overall health of these workers.

Finally, the implications of occupational fatigue extend beyond individual health; they can impact organizational performance and economic outcomes. A study by Wardani et al. (2015) highlighted that fatigue among production workers at a manufacturing facility was linked to decreased productivity and increased absenteeism. This finding resonates within the palm oil industry, where the economic viability of operations can be directly influenced by the health and productivity of the workforce. Addressing occupational fatigue through effective management strategies not only benefits the workers but also enhances organizational performance, making it a critical area for further research and intervention.

In conclusion, the literature indicates a strong connection between occupational fatigue, sleep quality, and the overall health of workers in demanding industries such as palm oil. Effective fatigue management strategies that consider the unique challenges faced by these workers are essential for fostering a healthier workforce and improving productivity. Future research should continue to explore the multifaceted nature of fatigue and its implications within the palm oil sector, paving the way for evidence-based interventions that can enhance worker well-being and operational efficiency.

Studies show that workers experiencing sleep problems tend to have lower levels of productivity and are more vulnerable to workplace accidents. Therefore, it is important to have a deeper understanding of the factors affecting sleep quality and work fatigue among palm oil industry workers. Quality of sleep is an important aspect that affects health and work performance in industries that demand physical and mental exertion, such as palm oil plantations. According to research by Kusmawan (2024), there is a significant relationship between work fatigue levels and poor sleep quality among workers. Workers experiencing high fatigue levels tend to report difficulties sleeping and frequent awakenings at night. This can create a negative cycle where lack of sleep leads to increased fatigue, which further disrupts sleep quality. Statistics show that workers in the palm oil industry have shorter sleep durations compared to workers in other sectors, with an average sleep duration ranging from 5 to 6 hours per night, far below the recommended 7 to 9 hours for adults (Gentil et al., 2020). This lack of sleep not only impacts physical health but also affects the cognitive and emotional performance of workers. A study shows that workers sleeping less than 6 hours per night have a higher risk of workplace accidents and task errors (Lin et al., 2023).

Considering the important role of workers in maintaining production sustainability in this sector, understanding the factors affecting their health, especially related to sleep quality and work fatigue, becomes increasingly relevant. Work fatigue not only impacts productivity decline but also increases the risk of workplace accidents and more serious health problems, especially in the palm oil plantation industry. However, to date, research on factors contributing to work fatigue in this specific context is still limited. One factor strongly suspected to have an impact is sleep quality, which is often overlooked in discussions about occupational health. Palm oil plantation workers often experience sleep disturbances due to inadequate working conditions, such as exposure to extreme temperatures, limited facilities, and unpredictable work schedules (Syadzwina et al., 2018). However, the direct correlation between sleep quality and work fatigue in this sector has not been deeply researched. This lack of clarity suggests the need for more focused research to identify and measure how sleep quality affects work fatigue, in order to provide a strong basis for more effective interventions in improving the well-being of workers in this industry. This study aims to comprehensively examine the influence of sleep quality on the level of work fatigue among workers in the palm oil plantation industry. Given the heavy and challenging working conditions in this sector, this research is expected to provide deeper empirical insights into how poor sleep quality can worsen work fatigue, which in turn can affect productivity, safety, and well-being of workers.

Method

This research applies an analytical survey design with a cross-sectional approach to analyze the relationship between sleep quality and work fatigue among workers in the palm oil plantation industry. The selection of this design is based on its ability to collect data at one point in time, allowing the evaluation of the correlation between the independent variable (sleep quality) and the dependent variable (work fatigue). The population studied includes all workers at PT. CPKA, both those working in the plantation area and in the processing plant. Samples were taken using stratified random sampling techniques, aiming to ensure a proportional representation of workers in various work units. Considering the response rate and variation in the population, the sample size was set at 54 workers, consisting of workers in the plantation and in the processing plant. The research procedure began with obtaining permission from the management of PT. CPKA and approval from the research ethics committee. Subsequently, data was collected by distributing questionnaires directly to respondents at their workplaces. Before filling out the questionnaire, respondents were provided with an explanation of the research objectives and the assurance of data confidentiality. The questionnaire-filling process was conducted under the researcher's supervision to ensure the completeness and accuracy of the collected data. Data was collected using two main instruments. To measure work fatigue variables, this research used a questionnaire from the International Fatigue Research Committee (IFRC), which has been validated for assessing fatigue levels in various worker populations. This questionnaire includes a number of items that describe the physical and mental aspects of fatigue. Meanwhile,

to measure sleep quality, the Pittsburgh Sleep Quality Index (PSQI) was used, which is a standard measurement tool commonly used in sleep quality research. The PSQI consists of 19 items evaluating various dimensions of sleep quality, including sleep duration, sleep disturbances, and sleep medication use. Both instruments have undergone validation processes and shown consistent results in previous studies (Buysse et al., 1989; Horne & Reid, 1985). The collected data was analyzed using descriptive and inferential statistical methods. To test the relationship between sleep quality and work fatigue, Chi Square statistical tests were conducted.

Result

PT Citra Putra Kebun Asri, commonly known as PT CPKA, is a company engaged in the palm oil plantation and palm oil industry (PKS) business, with its main plantation located in Jorong Village, Jorong District, Tanah Laut Regency. The following is the frequency distribution of respondent characteristics, along with univariate and bivariate analysis:

Table 1. Distribution of Respondents' Frequency Based on Age, Gender, Work Division and Shift Work at PT. CPKA

Characteristics	f	%
Age		
Young	44	81,4
Old	10	22,7
Sex		
Man	47	87
Woman	7	13
Division		
Administration	8	14,8
Laboratorium	6	11,1
Processing	30	55,6
Maintenance	6	11,1
Pulp	4	7,4
Shift Work		
Non Shift	14	25,9
Shift	40	74,1

Source: Primary Data

From Table 1 above, it can be seen that the number of young respondents is higher than that of older respondents. In addition, the number of male respondents is also higher than female respondents. The respondents are spread across several divisions, including administration, laboratory, production process, maintenance, and pulp. They are also divided into two categories, namely shift workers (74.1%) and non-shift workers (25.9%).

Table 2. Univariate Analysis Quality of Sleep and Occupational Fatigue of Workers at PT. CPKA

Variabel	f	%
Quality of Sleep		
Good	48	88,9
Bad	6	11,1
Occupational Fatigue		
Low	27	50,0
Moderate	27	50,0
High	0	0
Total	**54**	**100,0**

Source: Primary Data

From table 2, research on sleep quality shows that 88,9 % of respondents have normal sleep latency, meaning they can fall asleep in less than 30 minutes. This figure reflects that one eight of the population studied is able to reach the sleep phase relatively quickly, which is often associated with good mental and physical health. On the other hand, 11,1% of respondents require more than 30 minutes to fall asleep, which can be an indicator of sleep quality issues. overall sleep quality.

Table 3. Bivariate Analysis The Relationship Between Sleep Quality and Occupational Fatigue at PT. CPKA

Quality of Sleep	Occupational Fatigue						*p-value* (Fisher Exact Test)
	Low		Moderate		Total		
	n	%	n	%	n	%	
Good	27	56,3	21	43,7	48	100	**0,023**
Bad	0	0	6	100	6	100	
Total	27	50	27	50	54	100	

Source: Primary Data

Based on the bivariate analysis conducted from table 3, it can be seen that respondents who experience poor sleep quality tend to experience moderate levels of work fatigue, compared to those who experience mild fatigue. This study shows that poor sleep quality can contribute to increased work fatigue, which is a significant issue among employees, especially in the oil palm plantation industry, as seen in PT. CPKA. The chi-square test results show a p-value of 0.023, indicating a significant relationship between sleep quality and work fatigue among workers.

Discussion

Regarding sleep quality and work fatigue, this study on PT. CPKA shows that the majority of respondents have good sleep quality and insignificant levels of fatigue. This study shows that the majority of respondents have good sleep quality and insignificant levels of fatigue. However, the survey results also indicate that many respondents often complain of symptoms such as dizziness, pressure in the head, overall physical fatigue, excessive drowsiness during work hours, difficulty in concentrating, stiffness in the legs when moving, instability when standing, the desire to lie down while working, and fatigue when speaking.

Further research shows that factors such as stress, anxiety, and poor sleep habits can contribute to the length of time needed to fall asleep. Additionally, some respondents also reported experiencing sleep disturbances, such as frequent waking up in the middle of the night due to the need to use the toilet. This indicates that not only the length of time to fall asleep needs to be considered, but also Sleep disturbances experienced by some respondents, such as difficulty breathing comfortably, feeling cold, and experiencing nightmares, can significantly impact their quality of life. Difficulty breathing during sleep, for example, is often associated with medical conditions such as sleep apnea, which can cause someone to suddenly wake up at night. Excessive feelings of cold can disrupt sleep comfort and cause someone to wake up more frequently. Nightmares, on the other hand, can be an indication of untreated emotional stress and can affect a person's mood and productivity during the day. Therefore, it is important to understand the various factors that affect sleep quality and seek appropriate solutions, such as cognitive behavioral therapy or lifestyle changes, to improve overall sleep quality. Thus, greater attention to these sleep problems is expected to enhance the quality of life for many individuals experiencing sleep difficulties.

This finding is very important because it shows that sleep problems can affect the overall productivity and well-being of employees. Furthermore, the relationship between sleep quality and work fatigue can be explained through several interconnected factors. Poor sleep quality is often caused by work stress, environmental pressures, and lack of social support in the workplace. This can lead to disturbances in the sleep cycle, which in turn affects an individual's ability to function optimally during work hours. Further analysis shows that employees who do not get enough sleep have difficulty concentrating, making decisions, and interacting with colleagues, all of which contribute to increased work fatigue. Therefore, it is important for management at PT. CPKA to consider interventions that can improve the quality of employees' sleep, such as stress management programs, sleep awareness training, and improving the work environment. Thus, efforts to improve sleep quality will not only contribute to individual well-being but also increase productivity and efficiency in the workplace overall.

Occupational Fatique

Occupational fatigue is a significant concern in the palm oil industry, where workers are often subjected to long hours of physically demanding tasks. According to Kanajmi et al. (n.d.), fatigue feelings among palm oil fruit bunch harvest workers is closely linked to both age and work experience. Their study highlights that older workers with extensive experience reported higher levels of fatigue, indicating a potential accumulation of physical strain over time. This aligns with findings from Kjellstrom et al. (2016), who emphasize that prolonged exposure to high temperatures and strenuous labor can exacerbate fatigue, particularly in tropical climates where palm oil plantations are prevalent.

Statistical data from the International Labour Organization (ILO) indicates that agricultural workers, including those in the palm oil sector, are at a higher risk of experiencing occupational fatigue due to the nature of their work (ILO, 2020). The prevalence of fatigue among these workers can lead to decreased productivity and increased risk of accidents. For instance, a case study conducted in Indonesia revealed that nearly 60% of palm oil workers reported experiencing significant fatigue, which adversely affected their work efficiency (Wardani et al., 2015). This statistic underscores the urgent need for interventions to mitigate fatigue in this labor-intensive industry.

The psychological aspects of occupational fatigue cannot be overlooked. Lin et al. (2023) found a strong correlation between job fatigue and mental health disorders among workers in various sectors. In the context of palm oil workers, mental fatigue may compound the physical exhaustion experienced, leading to a cyclical pattern of decreased performance and increased fatigue. This is particularly concerning given that many palm oil workers operate heavy machinery, where fatigue can lead to serious safety hazards. In addition to physical and mental fatigue, the work environment also plays a crucial role. Factors such as inadequate rest breaks, poor ergonomic practices, and high work demands contribute to the overall fatigue experienced by palm oil workers (Mansyur et al., 2020). Implementing better workplace practices, such as regular breaks and ergonomic assessments, could help alleviate some of the fatigue experienced by these workers.

Sleep Quality

The quality of sleep among palm oil workers is intricately linked to their occupational fatigue levels. Research indicates that workers in physically demanding jobs often experience disrupted sleep patterns, which can exacerbate feelings of fatigue (Kusmawan, 2024). A study focusing on Indonesian tugboat crews found that long working hours and poor sleep quality were significant determinants of fatigue, suggesting that similar trends may exist among palm oil workers (Mansyur et al., 2020). Poor sleep quality experienced by workers is also an issue that needs to be addressed. Research shows that workers who experience work fatigue tend to have sleep problems, which can affect their concentration and performance at work (Syamila & Ma'rufi, 2024).

Statistical analysis reveals that approximately 70% of palm oil workers report inadequate sleep quality, which is significantly higher than the general population's average of 30% (Pebriana et al., 2024). This disparity highlights the toll that demanding work schedules and physical labor take on the sleep patterns of these workers. Furthermore, the cumulative effect of sleep deprivation can lead to chronic health issues, including cardiovascular diseases and mental health disorders, as noted in various studies (Li et al., 2020; O'Connor et al., 2024).

The nature of shift work in the palm oil industry further complicates the sleep quality of workers. Shift workers often struggle with circadian rhythm disruptions, leading to difficulties in falling asleep and maintaining sleep (Thach et al., 2020). This is particularly relevant in palm oil plantations, where workers may be required to work night shifts during peak harvesting seasons. The lack of a consistent sleep schedule can result in significant sleep debt, which compounds the effects of occupational fatigue.

Environmental factors such as noise and inadequate sleeping conditions in workers' accommodations can further deteriorate sleep quality. A qualitative study by Mortazavi et al. (2024) emphasizes the importance of a conducive sleeping environment for improving sleep quality among workers. In the palm oil industry, addressing these environmental factors is crucial for enhancing the overall well-being of workers.

Conclusion

Data shows that the sleep quality of PT. CPKA workers is good at 88.9%, and work fatigue is balanced at light and moderate levels at 50%. The statistical analysis results indicate a significant relationship between sleep quality and work fatigue among PT. CPKA workers, meaning that the better the workers' sleep quality, the more their bodies remain alert, reducing the risk of experiencing heavy and moderate work fatigue. From a theoretical perspective, this research enhances the understanding of the relationship between work fatigue and sleep quality, particularly in the context of labor-intensive industries such as palm oil. The findings of this study provide valuable insights for companies in managing their human resources. Companies need to consider implementing stress management programs and more flexible work policies to reduce fatigue among workers. Overall, this research highlights the importance of attention to the mental and physical health of workers in the palm oil industry. By addressing work fatigue and improving sleep quality, companies can not only enhance employee well-being but also boost their productivity and job satisfaction. Therefore, proactive steps to create a healthier work environment must be a priority for all stakeholders in this industry. It is also recommended that industry of palm oil plantation implement work fatigue management to improve workers' sleep quality, by providing education about the importance of sleep, fulfilling work nutrition and improving the work environment.

Conflict Of Interest

This research has been conducted without any conflicts of interest from any parties involved. All authors declare that there are no financial or non-financial relationships that could influence the outcomes of this study. The research is funded by an independent source that did not participate in the data collection or analysis processes. The authors are committed to maintaining scientific integrity and transparency in all aspects of this research.

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participation is invaluable and provides deep insights into the impact of occupational fatigue and sleep quality in the context of the palm oil industry. Additionally, we appreciate the contributions of fellow researchers and academics who have provided valuable input during the research process. The references used in this research include various relevant and up-to-date sources, including scientific journals, industry reports, and previous studies discussing fatigue and sleep quality. We hope that the results of this research can make a significant contribution to understanding the challenges faced by workers in the palm oil industry, as well as provide recommendations for improving working conditions and health. With this, we hope that this research can serve as a reference for future research and benefit policymakers, industry practitioners, and academics in efforts to improve the well-being of workers in the palm oil sector.

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