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MORALITY BEFORE KNOWLEDGE

Factors contributing to work fatigue among nurses at hospital: A study on the impact of work attitudes, shift schedules, and sleep quality

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ABSTRACT

Background: Fatigue is an essential body protection mechanism, preventing further damage and allowing recovery after rest. In work, especially in the hospital environment, fatigue can affect the performance and well-being of medical personnel, including nurses. This study aims to identify and analyze factors associated with work-related fatigue among Dr. Adjidarmo Regional Hospital nurses. The main focus of this study includes the relationship between gender, length of service, work attitude, shift schedule, and sleep quality on the level of fatigue experienced by nurses. **Method:** This study adopted a cross-sectional design targeting a population of 256 nurses who are actively practicing at Dr Adjidarmo Regional Hospital. The study sample consisted of 75 respondents selected using a random sampling method. Data was collected through questionnaire-based interviews that accessed information from secondary and primary sources. The data obtained were analyzed univariate and bivariate to determine the prevalence and significant relationship between the variables studied and work-related fatigue. **Findings:** Univariate analysis revealed that out of 75 respondents, 54.7% reported experiencing moderate work-related fatigue. Demographic distribution showed that 74.7% of respondents were female, 81.3% had worked for five years or more, 50.7% showed risky work attitudes, 29.3% worked night shifts, and 52.0% reported poor sleep quality. The results of the bivariate analysis showed a significant relationship between work attitudes (P-value = 0.000), shift schedules (P-value = 0.002), and sleep quality (P-value = 0.000) with the level of work-related fatigue. **Conclusion:** Based on these findings, it is recommended that shift schedules be distributed evenly during the third shift to reduce nurse fatigue. In addition, stretching exercises and physical activity during work breaks should be encouraged to improve nurses' well-being and reduce fatigue-related problems. This intervention aims to improve nurses' working conditions, which can improve patient care quality and reduce fatigue's negative impact on work performance. **Originality/Novelty:** This study offers new insights into factors contributing to work-related burnout among nurses, focusing on specific variables such as work attitudes, shift schedules, and sleep quality. The study identifies significant correlations that have not been widely explored in the context of a regional hospital in Indonesia. By providing practical recommendations for redistributing shift schedules and promoting stretching exercises, this study contributes to the development of evidence-based intervention strategies to address burnout in the hospital workplace.

KEYWORDS: nurses; shift schedule correlation; work fatigue.

1. Introduction

To identify factors contributing to workplace accidents in hospital settings, one crucial concern is work fatigue. Work fatigue is a condition where an individual's efficiency and

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resilience significantly decline. The term fatigue refers to a state where the body experiences decreased energy levels for activities, leading to reduced work capacity and physical endurance (Juliana, et al. 2018; Silvestri. Et al., 2018; Desta et al., 2018).

According to the World Health Organization (WHO), fatigue ranks as the second leading cause of death after heart disease. Data from the Ministry of Labor in Japan involving 12,000 companies and 16,000 randomly selected workers indicate that fatigue issues are prevalent in workplaces. Approximately 65% of workers experience physical fatigue due to demanding work routines, while 28% suffer from mental fatigue. Fatigue not only affects individual performance but also poses risks to workplace safety by increasing accident rates (Juliana, et al. 2018).

Research also highlights that work fatigue is not only linked to long working hours but also influenced by factors such as heavy workload, environmental noise, and high levels of stress in the workplace. These factors can affect sleep quality and lead to ongoing sleep disturbances, consequently heightening both physical and mental fatigue among workers. Additionally, around 7% of respondents reported experiencing severe stress and feeling marginalized in their work environment (Permatasari, et al. 2017). These findings underscore that fatigue is not merely an individual issue but a significant public health concern, impacting productivity and well-being in the workplace.

Fatigue serves as the body's protective mechanism to prevent further damage, yet prolonged fatigue over extended periods can lead to chronic fatigue. Fatigue symptoms may manifest not only after working late but also during and before work (Tarwaka, 2015; Wang et al., 2019). According to the International Labour Organization (ILO), approximately two million workers suffer work-related accidents and fatalities annually due to fatigue factors. Out of 58,115 samples studied, about 18,828 samples (32.8%) have the potential to experience fatigue (Kartika, 2018).

Similar studies conducted in Indonesia indicate that common symptoms of work fatigue include headaches, shoulder stiffness, and back pain (Juliana, et al. 2018). Moreover, based on data from the Social Security Administration for Manpower, there has been a significant increase in the number of work accidents year by year in Indonesia. In 2017, there were 123,000 recorded cases of work accidents nationwide, reflecting a 20% increase compared to 2016. This highlights significant challenges in maintaining workplace safety and health across various industrial sectors in Indonesia. Work fatigue causing concentration loss during work is estimated to be the primary cause of these accidents (Priono, 2018).

Occupational accidents are a severe problem in the hospital environment due to the complexity and high risk in healthcare units, which often deal with multiple diseases and complex medical conditions. The hospital environment presents a variety of potential hazards, ranging from exposure to hazardous substances and the risk of infection to the potential for physical injury due to the use of medical equipment. The high intensity of work and the demands of providing efficient care often contribute to an increased risk of occupational accidents. Therefore, it is essential for hospitals to implement and ensure comprehensive protective measures to maintain the safety and health of the workforce. These measures include regular safety training, appropriate personal protective equipment (PPE), the implementation of standard operating procedures, and the development and maintenance of ongoing occupational health and safety programs. Effective implementation and monitoring of these measures are essential to creating a safe working environment, which not only reduces the risk of accidents but also contributes to the safety and well-being of medical staff and improves the quality of patient care.

In the context of healthcare delivery in hospitals, nurses play a crucial role in providing patient care. Nurses work continuously, especially in emergency situations, often facing high workloads, long shifts, and significant psychological and organizational responsibilities (Astuti, et al. 2017). Work fatigue can be influenced by various factors such as individual characteristics, the type of job performed, workplace environmental conditions, and psychological factors affecting one's mental state at work (Perwitasari, 2014). Individual factors include variables such as age, length of service, nutritional status,

and gender. Job-related factors encompass the level of workload encountered daily and the monotony level of the job. Meanwhile, environmental factors consider physical environmental conditions such as workplace lighting levels, room temperature, and noise levels that may affect comfort and work productivity. Psychological factors include social interactions in the workplace that can influence stress levels and fatigue experienced by individuals.

In hospital settings, tasks in emergency units (ER), outpatient care, and inpatient care often require additional physical efforts such as moving wheelchairs, lifting beds, and handling other emergency situations. Therefore, these roles require more male nurses compared to female nurses due to the physical stamina typically possessed by male nurses. Research by Feng et al. (2022) in surgical settings has shown a correlation between gender and levels of work fatigue.

Nurses perform repetitive tasks daily, which can lead to fatigue among those who have worked for more than five years compared to those who have worked for shorter periods. Among nurses who have worked for more than five years, some have also entered old age, which can affect their stamina and increase their fatigue risk. Studies by Astuti (2017) on nurses indicate a relationship between length of service and work fatigue.

Work attitudes requiring prolonged body positions during work can cause health complaints, muscle tension, and lactic acid buildup that can lead to fatigue. Comparing static and dynamic muscle work indicates that static muscle work requires more energy, increases heart rate, and requires longer rest periods compared to dynamic muscle work. Findings from research by Kartika (2018) on production employees indicate a significant relationship between work posture adopted and the level of work fatigue experienced by respondents.

Shift work employees often show more signs of health problems than those who work on a fixed schedule. Imbalanced shift work between work and rest time, as well as long work schedules, can result in chronic fatigue. This can reduce alertness, increase delayed reactions, and the risk of drowsiness, as revealed in Nuraini's (2018) study on nurses. Shift work can also affect one's sleep quality, especially night shifts that can disrupt circadian rhythms. Poor sleep quality is a significant contributor to work fatigue. Research by Kartika (2018) on production employees indicates a relationship between sleep quality and work fatigue. The study also concludes that good sleep quality can enhance freshness and individual fitness upon waking.

RSUD Dr Adjidarmo is a government-owned type B hospital located in Lebak Regency, Banten Province, and has a capacity of 404 inpatient beds. In 2017, this hospital served around 113 inpatients per day, 592 outpatients, and 57 ER patients daily (RSUD Dr. Adjidarmo Profile, 2018). An initial survey conducted by the Infection Prevention and Control Unit (IPCN) at RSUD Dr Adjidarmo in 2018 revealed three cases where nurses had accidents due to exposure to used patient needles. These accidents were most likely caused by work fatigue and decreased concentration. Therefore, this study aimed to identify factors contributing to work fatigue among nurses and to disseminate the effectiveness of preventive measures in reducing the risk of work accidents. This study aims to provide evidence-based recommendations to reduce work fatigue and improve safety in the hospital environment.

2. Methods

2.1 Research design

This study is a cross-sectional study conducted at Dr. Adjidarmo Regional Hospital to determine the factors that influence work fatigue in nurses. This study focused on several independent variables, namely gender, work posture, shift schedule, length of work, and sleep quality, all of which can contribute to the level of work fatigue experienced. Gender was studied to determine whether there were differences in fatigue levels based on gender.

Work posture was described to determine whether non-ergonomic work positions were related to fatigue. Shift schedules were studied to determine the effect of night work or irregular shifts on fatigue. Length of work was studied to assess whether long-term work experience was related to fatigue. Sleep quality was studied to determine how sleep disturbances could affect fatigue levels. The dependent variable in this study was work fatigue, which was the main focus to determine the extent to which these independent factors influenced the level of fatigue experienced by nurses..

2.2 Sampling method, data collection procedure, and data analysis

The population in this study consisted of 262 staff nurses distributed across all care units. The sample was selected using accidental sampling, with a total of 75 nurses participating as research subjects. Primary data were collected through interviews using a questionnaire instrument administered to the respondents. Additionally, secondary data were gathered from Dr. Adjidarmo Regional Hospital documents.

The data collected from this study were processed through several important stages to ensure the integrity and accuracy of the analysis results. The first stage is editing, which aims to check and ensure that the collected data is complete and error-free. After the editing process, the next stage is coding, which is when the data is broken down into codes that facilitate further analysis. Furthermore, the data is entered into the database through the data entry process, and the last stage is cleaning, which is cleaning the data from invalid values or outliers that can affect the accuracy of the analysis results.

At the univariate analysis stage, descriptive statistical exploration was carried out to obtain an overview of each variable's frequency distribution and proportion. This analysis includes understanding the essential characteristics of the sample, including the distribution of gender, length of service, work posture, shift schedule, sleep quality, and level of work fatigue. Univariate analysis provides initial insight into data distribution and helps identify basic patterns in the sample.

Furthermore, bivariate analysis was carried out to determine the significant relationship between independent variables such as gender, length of service, work posture, shift schedule, and sleep quality with the dependent variable, namely the level of work fatigue. The Chi-square test was used to measure the level of statistical significance of the relationship between the variables. Results showing a p-value ≤ 0.05 were considered statistically significant, proving a strong correlation between the independent and dependent variables in the context of nurse burnout at Dr Adjidarmo Regional Hospital.

This analysis process provides an in-depth understanding of the factors contributing to nurse burnout and ensures that the research results are validated through an accurate and comprehensive statistical approach. Thus, this study provides a solid basis to recommend more effective interventions and policies in managing and reducing burnout levels in healthcare settings, which can ultimately improve nurse well-being and patient care quality.

3. Results and Discussion

3.1 Result

3.1.1 Univariate analysis

Fatigue refers to a condition where an individual's ability to perform activities diminishes, although this is not the only symptom (Behrens et al., 2023; Hanken et al., 2016). The term of fatigue encompasses different physical and mental states, but both result in reduced work efficiency and decreased physical endurance (Suma'mur, 2009). Based on the univariate analysis documented in Table 1, it is evident that a majority of respondents exhibit various levels of variables related to work fatigue. Specifically, 54.7% of respondents experience moderate levels of work fatigue. The majority of respondents are female, accounting for 74.7%. In particular, 81.3% of respondents have a relatively long length of

service. Risky work postures were observed in 50.7% of respondents, while 36.0% work on day shifts. Additionally, 52.0% of respondents reported having poor sleep quality.

Further research indicates that out of 75 respondents, 41 (54.7%) experienced moderate work fatigue, while 34 (45.3%) experienced low work fatigue. This finding contrasts with Christra's study conducted among nurses in the Emergency Unit and Intensive Care Unit (ICU) at Datoe Binangkang General Hospital, Bolaang Mongondow Regency, where only 7 respondents (17.5%) reported moderate fatigue and 33 respondents (82.5%) reported mild fatigue.

Table 1 Frequency distribution of work fatigue by gender, length of service, work posture, shift work, and sleep quality

Variable	Frequency	%
Work Fatigue		
Moderate Work Fatigue	41	54.7
Low Work Fatigue	34	45.3
Gender		
Female	56	74.7
Male	19	25.3
Tenure		
Long	61	81.3
New	14	18.7
Work Attitude		
Risky	38	50.7
Not Risky	37	49.3
Work Shift		
Morning	26	34.7
Afternoon	27	36
Night	22	29.3
Sleep Quality		
Poor	39	52
Good	36	48
Total	75	100

Analysis of work fatigue variables among nurses at RSUD Dr. Adjidarmo Rangkasbitung Lebak-Banten in 2019 revealed that 50 respondents (66.7%) experienced fatigue throughout their body while working, 43 respondents (57.3%) felt easily forgetful while working, 37 respondents (49.3%) felt drowsy while working, 34 respondents (45.3%) experienced headaches while working, 31 respondents (41.3%) felt heaviness in their legs, and 54 respondents (72%) frequently felt thirsty while working. According to the questionnaire, the most common work fatigue experienced by nurses at RSUD Dr. Adjidarmo was feeling thirsty while working, reported by 54%. Fatigue can impact workplace safety, and high mobility-related fatigue can increase the risk of work-related accidents (Hastuti, 2017). In healthcare settings such as hospitals, there is a heightened risk of work accidents, such as needle stick injuries caused by nurses (Depkes RI, 2008).

3.1.2 Bivariate analysis

Bivariate analysis is an advanced stage of univariate analysis that aims to determine whether there is a relationship between independent and dependent variables. In this study, the independent variables include gender, years of service, work attitude, work shift, and sleep quality. The focus is on examining the relationship of these independent variables with the dependent variable, which is work fatigue among nurses at RSUD Dr. Adjidarmo Rangkasbitung Lebak-Banten in 2019, using the Chi Square test. Work fatigue is categorized into two levels: moderate work fatigue and low work fatigue.

Based on the analysis from Table 2, it is evident that various studied variables correlate with the level of work fatigue among respondents. For instance, concerning gender, out of a total of 56 female respondents, 32 (57.1%) experienced moderate work fatigue. On the

other hand, among 19 male respondents, 10 (52.6%) reported low levels of work fatigue. The variable of work experience also shows a similar pattern. Out of 61 respondents with long work experience, 37 (60.7%) reported moderate work fatigue. In contrast, among 14 respondents with new work experience, 10 (71.4%) reported low levels of work fatigue. The impact of work attitude on work fatigue is also significant. Out of 38 respondents with risky work attitudes, 32 (84.2%) experienced moderate work fatigue. Meanwhile, among 17 respondents with non-risky work attitudes, 28 (75.7%) reported low levels of work fatigue.

Table 2 The relationship between gender, tenure, work attitude, work shifts, and sleep quality with work fatigue

Variable	Work Fatigue				Total	P Value
	Moderate Work Fatigue		Low Work Fatigue			
	N	%	N	%		
Gender						
Female	32	57.1	24	42.9	56	0.636
Male	9	47.4	10	52.6	19	
Tenure						
Long	37	60.7	24	27.7	61	0.060
New	4	28.6	10	71.4	14	
Work Attitude						
Risky	32	84.2	6	15.8	38	0.000
Not Risky	9	24.3	28	75.7	17	
Work Shift						
Night	18	81.8	4	18.2	22	0.002
Afternoon	15	55.6	12	44.4	27	
Morning	8	30.8	18	69.2	26	
Sleep Quality						
Poor	33	84.6	6	25.4	39	0.000
Good	8	22.2	28	77.8	36	
Total	41	54.7	34	45.3	75	

Shift work also demonstrates a notable impact. Among 22 respondents working night shifts, 18 (81.8%) experienced moderate work fatigue. Conversely, out of 26 respondents working morning shifts, 18 (69.2%) reported low levels of work fatigue. The role of sleep quality is crucial in determining work fatigue levels. Out of 39 respondents with poor sleep quality, 33 (84.6%) experienced moderate work fatigue. In contrast, among 36 respondents with good sleep quality, 28 (77.8%) reported low levels of work fatigue. Bivariate analysis using the Chi-square test indicates statistically significant relationships at a 5% significance level ($\alpha = 0.05$) between work attitude (p-value = 0.000), shift work (p-value = 0.002), and sleep quality (p-value = 0.000) with the level of work fatigue among nurses at Dr. Adjidarmo Hospital (p-value < 0.05). However, for gender (p-value = 0.636) and work experience (p-value = 0.060) variables, no statistically significant relationships were found with the level of work fatigue among nurses at Dr. Adjidarmo Hospital (p-value > 0.05).

3.2 Discussion

Fatigue is a protective mechanism of the body designed to prevent further damage, allowing recovery after rest. This process is centrally regulated by the brain, which manages both activation (sympathetic) and inhibition (parasympathetic) systems within the central nervous system. The term 'fatigue' generally refers to varying conditions among individuals, but it typically results in decreased efficiency, reduced work capacity, and diminished body endurance (Tarwaka, 2015). Work Cover NSW (2006) also explains that fatigue can impact an individual's physical, mental, and emotional states, potentially leading to decreased alertness, impaired decision-making abilities, poor judgment, slow body reactions to specific situations, and reduced motor skills (Cunninghmann, 2022).

According to Schuler et al. (1999), occupational fatigue is a type of stress frequently experienced by individuals working in service sectors, healthcare, transportation, law enforcement, and similar fields. It is a complex phenomenon that involves not only physiological and psychological fatigue but is also closely related to decreased physical performance, feelings of exhaustion, diminished motivation, and reduced work productivity (Front & Tidwell, 2015).

According to Grandjean (1991), the causes of fatigue in the industry are highly varied. To maintain health and efficiency, it is essential to manage and mitigate stress effectively. Recovery typically occurs during adequate nighttime sleep, though periods of rest and breaks can also contribute to recuperation (Tarwaka, 2015). Fatigue resulting from static work differs from that caused by dynamic work. In static muscle work, exerting 50% of maximum muscle strength can only be sustained for about one minute, whereas physical work with exertion below 20% can continue for a longer duration. However, static muscle exertion at levels between 15% and 20% can lead to fatigue and discomfort if sustained throughout the day.

3.2.1 Gender

In this study, out of a total of 56 respondents who were female, 32 individuals (57.1%) experienced moderate levels of work fatigue. On the other hand, out of 19 male respondents, 10 individuals (52.6%) experienced lower levels of work fatigue. However, bivariate analysis results indicated that there was no significant correlation between gender and the level of work fatigue among this group of respondents. This finding contrasts with Kartikasari's study (2017), which found a significant relationship between gender and work fatigue levels. Nevertheless, these results align with findings reported by Astuti (2017) .

Physical differences between males and females include different physical abilities, strengths, and muscle work. Biologically, women have smaller body sizes and muscle strengths compared to men, influenced by menstrual cycles, pregnancy, menopause, and their societal role as homemakers (Suma'mur, 2009). In the context of work, physical activities such as pushing wheelchairs, lifting patients, or performing nursing procedures are often more commonly performed by male nurses. This indicates that physiologically, male nurses have larger body sizes and muscle strengths compared to female nurses, enabling them to better handle physical activities and reduce the risk of excessive fatigue.

In this study, male respondents experienced a moderate level of work fatigue at 47.4%. This factor is associated with their risky work attitudes, such as performing infusion procedures or suturing wounds, which require prolonged standing times, especially in the Central Surgery Installation (CSI) with an average standing time of ±115 minutes per day. However, moderate levels of work fatigue were more prevalent among female nurses at 57.1%. This is due to the physical limitations of females who have smaller body sizes and muscle strengths compared to males, leading them to engage in physical activities beyond their tolerable limits.

3.2.2 Work tenure

In this study, out of a total of 61 respondents who have been employed for a long period of time, 37 individuals (60.7%) experienced moderate levels of work fatigue. On the other hand, out of 14 respondents who were new to their jobs, 10 individuals (71.4%) experienced lower levels of work fatigue. However, the bivariate analysis conducted indicated that there is no statistically significant relationship between length of employment and the level of work fatigue among this group of respondents.

These findings differ from those of Astuti (2017), who found a significant correlation between length of employment and work fatigue levels. However, these results are consistent with the findings reported by Mallapiang (2016), which also did not find a significant relationship between length of employment and work fatigue in their study context.

The majority of respondents in this study have spent a significant amount of time in their work environment, with an average length of employment of approximately 9 years. This suggests that they have experienced and adapted to the daily demands of their jobs over a sufficiently long period. With increasing work experience, individuals tend to become more skilled in managing and reducing the impact of work fatigue they may experience, although this does not always imply a direct correlation between length of employment and the level of fatigue they feel.

Most nurses in this study have worked for more than 5 years, which is a substantial period to adapt and adjust to their daily tasks in the work environment. The average length of employment for nurses in this study is 9 years, indicating that they have been in the same working conditions for a considerable amount of time. This analysis suggests that the longer someone works, the better their body's ability to adapt to fatigue. Increasing work experience allows individuals to become more accustomed to the demands of their job, thereby enhancing their resilience to the fatigue they experience.

3.2.3 Work attitude

In this study, out of 38 respondents exhibiting risky work attitudes, 32 respondents (84.2%) experienced moderate levels of work fatigue. On the other hand, out of 17 respondents with non-risky work attitudes, 28 respondents (75.7%) experienced low levels of work fatigue. Bivariate analysis results indicate a significant relationship between work attitude and the level of work fatigue. This finding aligns with research conducted by Chen (2014), which demonstrated that work attitudes influence levels of work fatigue (Chen, et al. 2014).

Manual patient handling is one of the most demanding nursing activities, whether it involves bedside care, walking/standing, or sitting, and it significantly contributes to acute fatigue among nurses. It is crucial for nursing staff to understand the relative contributions of various work activities to their acute fatigue and adopt ergonomic techniques in their daily nursing practices (Chen, et al. 2014).

Maintaining ergonomic body posture during work is not only important for achieving optimal work efficiency and productivity but also for ensuring comfort during work. According to Suma'mur (2009), improper body posture during work can increase the level of work fatigue. For example, standing with correct posture—where the spine is vertical and body weight is evenly distributed between both legs—requires good physical and mental alertness. Although standing is a demanding posture, the energy required for standing is typically 10-15% higher compared to sitting. Prolonged standing for more than 1 hour or sitting for more than 2 hours can lead to significant bodily fatigue (Suma'mur, 2009) (Tarwaka, 2015).

Field research findings revealed that respondents with risky standing work attitudes often experienced moderate levels of work fatigue, with many of them standing for more than 1 hour during work. For instance, nurses in the Central Operating Room (IBS) typically stand for an average of ±115 minutes per day due to lengthy surgical procedures. In the Emergency Room (ER), the average standing time reaches ±157 minutes due to high patient volume and tasks such as infusion, resuscitation, and medication administration without adequate breaks. This lack of muscle relaxation and stretching during work can lead to muscle lactate accumulation and increased fatigue levels. Conversely, nurses who predominantly sit, such as in the operating room, usually only need to sit for an average of ±74 minutes during work, as most of their tasks do not require prolonged standing.

3.3.4 Shift work

In this study, it is observed that out of 22 respondents working the night shift, 18 individuals (81.8%) experienced moderate levels of work fatigue. On the other hand, out of 26 respondents working the morning shift, 18 individuals (69.2%) experienced low levels of work fatigue. Bivariate analysis conducted indicated a significant relationship between

shift work and the level of work fatigue among the respondents. This finding is consistent with previous research conducted by Nuraini (2018), which also concluded a correlation between shift work and the level of work fatigue in specific job contexts (Nur'aini, 2018).

Shift work, particularly night shifts, often disrupts natural sleep rhythms and can lead to higher levels of physical and mental fatigue compared to those working morning shifts. Wise management of shift schedules and adequate rest planning can help mitigate the potential impact of work fatigue experienced by night shift workers. In Indonesia, the maximum daily working hours have been set at 8 hours, with the remainder allocated for rest and activities outside of work, such as family and community engagement. Extending working hours beyond this limit can reduce work efficiency, increase fatigue levels, and even raise the risk of accidents and occupational-related illnesses (Tarwaka, 2015). From the results of this study, it was found that nurses working the night shift tend to experience moderate levels of work fatigue. This is attributed to the extended working hours typically exceeding 8 hours, and nighttime work, which although considered a period for rest, often does not provide sufficient opportunity for quality rest or sleep. Even when there is an opportunity to sleep, the quality of sleep tends to be poorer compared to non-working periods.

On the other hand, nurses working the morning shift experienced moderate levels of work fatigue at 30.8%. This is influenced by tasks requiring risky work postures, such as preparing therapeutic drugs, administering intravenous fluids, and monitoring patient conditions, which often involve prolonged standing, approximately 1 hour. Some respondents who previously worked the afternoon shift also experienced insufficient sleep, which can affect their level of work fatigue. However, a higher percentage of respondents (81.8%) experienced moderate levels of work fatigue when working the night shift, mainly due to their poorer quality of sleep.

3.3.5 Sleep quality

In this study, it was found that out of 39 respondents who experienced poor sleep quality, 33 respondents (84.6%) reported moderate levels of work fatigue. On the other hand, out of 36 respondents with good sleep quality, 28 respondents (77.8%) experienced low levels of work fatigue. These findings support previous research by Rizky (2017), which indicated a significant relationship between sleep quality and levels of work fatigue (Rizky, 2017). This study highlights the importance of sleep quality in influencing work well-being, demonstrating that insufficient quality sleep can increase the risk of higher work fatigue.

Sleep quality encompasses aspects such as sleep duration, time taken to fall asleep (sleep latency), as well as subjective aspects like feeling refreshed upon waking, daytime sleepiness levels, and physical symptoms such as dark circles around the eyes and a feeling of heaviness in the head. Persistent sleep disturbances can lead to serious health issues such as swollen eyelids, red eyes, difficulty concentrating, and headaches, all of which can contribute to higher levels of fatigue (Kartika, 2018).

The results of this study indicate that respondents with poor sleep quality tend to experience moderate levels of work fatigue. This underscores the significant role that sleep quality plays in influencing work fatigue levels. Based on interview findings, respondents' sleep duration varied from a minimum of 2 hours to a maximum of 9 hours per day, with an average of 6 hours of sleep per day. Factors such as night shift work often leading to staying awake and issues like insomnia, as well as insufficient rest time after night shifts, particularly among female respondents, are common contributors to poor sleep quality (Kartika, 2018).

Among respondents with poor sleep quality, a higher proportion experienced moderate work fatigue. This indicates that sleep quality affects work fatigue (Johnson et al., 2021). The study revealed that respondents' sleep duration ranged from a minimum of 2 hours to a maximum of 9 hours per day, with an average sleep duration of 6 hours per day (Dall'Ora et al., 2020). Interviews revealed that insufficient sleep time was due to night

shifts, which led to habitual staying up late and insomnia, and for female respondents, difficulties in getting back to sleep after working night shifts (Zhang et al., 2022).

However, in this study, there were respondents with good sleep quality who also experienced moderate work fatigue, accounting for 22.2%. This was attributed to risk factors related to work attitudes, such as performing nursing tasks like patient infusions or suturing wounds, which required standing for approximately 1 hour, and standing in the Central Surgical Installation (CSI) room with an average of ±115 minutes per day (Cho et al., 2021). Nevertheless, the majority of respondents who experienced moderate work fatigue, 84.6%, were those with poor sleep quality and who worked night shifts (Alameri et al., 2024). These findings underscore the complex relationship between sleep quality, work schedules, and fatigue among healthcare professionals, highlighting the need for comprehensive strategies to address these interconnected issues and improve both worker well-being and patient care quality.

4. Conclusions

Based on the study results at Dr Adjidarmo Hospital, it can be concluded that of the 75 respondents studied, 41 people (54.7%) experienced moderate levels of work fatigue. Most respondents were women, namely 56 people (74.7%), and most had long work experience, namely 61 people (81.3%). In addition, 38 people (50.7%) showed risky work attitudes, 22 people (29.3%) worked the night shift, and 39 people (52%) reported poor sleep quality.

The analysis showed a significant relationship between work attitudes, shift schedules, sleep quality and the level of work fatigue in nurses at Dr Adjidarmo Hospital. Seeing these findings, the hospital has taken several steps to overcome work fatigue. The hospital is implementing uniform shift scheduling on the third shift to reduce uneven workload. In addition, the hospital collaborated with the Infection Prevention and Control Department (IPCN) to promote stretching practices during work breaks, emphasize the importance of 8 hours of sleep a day, teach healthy eating habits, and launch a "let's drink water" campaign to prevent dehydration. All these efforts aim to reduce nurses' fatigue and improve their well-being and performance in the hospital environment.

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Author Contribution
T. S. D. conceived and designed the study, performed the experiments, analyzed and interpreted the data, contributed reagents/materials/analysis tools, wrote the paper, prepared figures and/or tables, reviewed drafts of the paper and approved the final draft.

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References

Alameri, R. A., Almulla, H. A., Swyan, H. A., Hammad, S. S. (2024). Sleep quality and fatigue among nurses working in high-acuity clinical settings in Saudi Arabia: a cross-sectional study. *BMC Nursing, 23*(51). https://doi.org/10.1186/s12912-023-01693-z

Astuti. F, W, Ekawati, Wahyuni, I. (2017). Hubungan antara faktor individu, beban kerja dan shift kerja dengan kelelahan kerja pada perawat di RSJD Dr. Amino Gondohutomo Semarang. *Jurnal Kesehatan Masyarakat (e-Journal), 5*(5). https://doi.org/10.14710/jkm.v5i5.18925

Behrens, M., Gube, M., Chaabene, H., Prieske, O., Zenon, A., Broscheid, K. C., Schega, L., Husmann, F., & Weippert, M. (2023). Fatigue and Human Performance: An Updated Framework. *Sports medicine (Auckland, N.Z.)*, *53*(1), 7–31. https://doi.org/10.1007/s40279-022-01748-2

Chen, Jie. Nansi, M. Daraisech. Davis, Kermit, G. Wei Pan. (2014). Sources of work-related acute fatigue in United States hospital nurses. *Nursing and Health Sciences, Vol. 16*, Hal 19–25. https://doi.org/10.1111/nhs.12104

Cho H, Steege LM. Nurse Fatigue and Nurse, Patient Safety, and Organizational Outcomes: A Systematic Review. *Western Journal of Nursing Research*. 2021;43(12):1157-1168. doi:10.1177/0193945921990892

Cunningham, T. R., Guerin, R. J., Ferguson, J., & Cavallari, J. (2022). Work-related fatigue: A hazard for workers experiencing disproportionate occupational risks. *American journal of industrial medicine*, *65*(11), 913–925. https://doi.org/10.1002/ajim.23325

Dall'Ora, C., Ball, J., Reinius, M., & Griffiths, P. (2020). Burnout in nursing: a theoretical review. *Human resources for health*, *18*(1), 41. https://doi.org/10.1186/s12960-020-00469-9

Departemen Kesehatan RI. (2003). *Modul pelatihan bagi fasilitator kesehatan kerja*. Departemen Kesehatan RI. Repository - Aplikasi Repository Kementrian Kesehatan Republik Indonesia (kemkes.go.id)

Desta, M., Ayenew, T., Sitotaw, N., Tegegne, N., Dires, M., & Getie, M. (2018). Knowledge, practice and associated factors of infection prevention among healthcare workers in Debre Markos referral hospital, Northwest Ethiopia. *BMC health services research*, *18*(1), 465. https://doi.org/10.1186/s12913-018-3277-5

Grandjean, E. (1991). Fatique. In *Parmeggiani, L.ed. Encyclopedia of Ocuupational Health and Safety*. ILO, 837-839. General Fatigue (iloencyclopaedia.org)

Frone, M. R., & Tidwell, M. O. (2015). The meaning and measurement of work fatigue: Development and evaluation of the Three-Dimensional Work Fatigue Inventory (3D-WFI). *Journal of occupational health psychology*, *20*(3), 273–288. https://doi.org/10.1037/a0038700

Hastono. (2016). *Analisa data pada bidang kesehatan*. Raja Grafindo Persada.

Hanken, K., Bosse, M., Möhrke, K., Eling, P., Kastrup, A., Antal, A., & Hildebrandt, H. (2016). Counteracting Fatigue in Multiple Sclerosis with Right Parietal Anodal Transcranial Direct Current Stimulation. *Frontiers in neurology*, *7*, 154. https://doi.org/10.3389/fneur.2016.00154

Johnson, A. L., Jung, L., Song, Y., Brown, K. C., Weaver, M. T., & Richards, K. C. (2014). Sleep deprivation and error in nurses who work the night shift. *The Journal of nursing administration*, *44*(1), 17–22. https://doi.org/10.1097/NNA.0000000000000016

Juliana. M, Camelia, A, Rahmiwati, A. (2018). Analisis faktor risiko kelelahan kerja pada karyawan bagian produksi PT. Arwana Anugerah Keramik, Tbk. *Jurnal Ilmu Kesehatan Masyarakat, Vol. 9,* No. 1: 53-63. https://doi.org/10.26553/jikm.2018.9.1.53-63

Kartika, O.R. (2018). *Faktor-faktor yang berhubungan dengan kelelahan kerja pada karyawan bagian produksi PT. Unggul Cipta Teknologi Serang-Banten Tahun 2018.* STIKes Faletehan.

Feng, W., Sae-Sia, W., & Kitrungrote, L. (2022). Knowledge, attitude, and practice of surgical site infection prevention among operating room nurses in southwest China. *Belitung nursing journal*, *8*(2), 124–131. https://doi.org/10.33546/bnj.2018

Notoatmodjo. (2018). *Metodelogi penelitian kesehatan*. Rineka Cipta.

Nur'aini. (2018). Hubungan shift kerja dengan kelelahan kerja pada perawat di instalasi rawat inap di Rumah Sakit Herna Medan Tahun 2018. Institut Kesehatan Helvetia Medan. *Jumantik: Jurnal Ilmiah Penelitian Kesehatan, 4*(1). http://dx.doi.org/10.30829/jumantik.v4i1.4061

Nurmianto, E. (2008). *Ergonomi: Konsep dasar dan aplikasinya*. Guna Widya.

Permatasari, A. Rezal, F. Munandar, S. (2017). Faktor yang berhubungan dengan kelelahan kerja pada karyawan di matahari department store cabang lippo plaza Kendari tahun 2016. *Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat, 2*(5). http://dx.doi.org/10.37887/jimkesmas.v2i5.2009

Perwitasari, D. (2014). Faktor yang hubungan dengan kelelahan subyektif pada perawat di RSUD Dr. Mohamad Soewandhi Surabaya. *The Indonesia Journal Of Occupational Safety, Health and Environment, 1*(1), 15-23 https://doi.org/10.20473/ijosh.v6i3.2017.362-370

Priono, N. J. (2018). *Data kasus kecelakaan kerja di Indonesia.* https://sadkes.net/2018/12/30/data-kasus-kecelakaan-kerja-di-indonesia/

Rizky, K., & ., H. (2018). Relationship of Sleep Quality and Perceived Fatigue Among Nurses at the Cibinong Regional Public Hospital, 2017. *KnE Life Sciences*, *4*(5), 399–406. https://doi.org/10.18502/kls.v4i5.2570

Safe Work Australia. (2013). *Guide for managing the risk of fatigue at work.* Safe Work Australia. Guide for managing the risk of fatigue at work | Safe Work Australia

Schuler, R. S., & Jackson, S. E. (1999). *Strategic human resource management*. Blackwell.

Silvestri, M., Dobrinja, C., Scomersi, S., Giudici, F., Turoldo, A., Princic, E., Luzzati, R., de Manzini, N., & Bortul, M. (2018). Modifiable and non-modifiable risk factors for surgical site infection after colorectal surgery: a single-center experience. *Surgery today*, *48*(3), 338–345. https://doi.org/10.1007/s00595-017-1590-y

Suma'mur, P. K. (2009). *Higiene perusahaan dan kesehatan kerja.* CV Sagung Seto. https://perpus.poltekkes-mks.ac.id/opac/detail-opac?id=5803

Tarwaka. (2015). *Ergonomi industri*. Harapan Press

Wang, Z., Chen, J., Wang, P., Jie, Z., Jin, W., Wang, G., Li, J., & Ren, J. (2019). Surgical site infection after gastrointestinal surgery in China: A multicenter prospective study. *Journal of Surgical Research*, 240, 206-218. https://doi.org/10.1016/j.jss.2019.03.017

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