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The Effect of Physical Workload, Work Shifts, Blood Sugar Levels, Uric Acid, Cholesterol and Nutritional Status on Fatigue Work on Nurse Performance at Stella Maris Hospital Makassar

Surya Nataniel*, Lalu Muhammad Saleh, Syamsiar S Russeng

Department of Occupational Safety and Health, Faculty of Public Health, Hasanuddin University, Makassar, Indonesia. *Corresponding Author's Email: suryanataniel.2899@gmail.com

Abstract

Work fatigue is a common occupational health problem among nurses and may negatively affect work performance and the quality of health services. Occupational and physiological factors such as physical workload, work shifts, blood glucose level, uric acid level, cholesterol level, and nutritional status may contribute to fatigue and reduced nurse performance. This study aimed to analyze the effects of these factors on nurse performance through work fatigue as an intervening variable. This study used a quantitative cross-sectional design and was conducted at Stella Maris Hospital Makassar, South Sulawesi, Indonesia, in 2025. A total of 120 nurses were included using a technique. Data were collected through physiological measurements, body mass index assessment, and structured questionnaires related to workload, work shifts, work fatigue, and nurse performance. Data were analyzed using univariate, bivariate, path analysis, and Sobel test analysis. The results showed that physical workload, cholesterol level, nutritional status, and work shift significantly affected work fatigue. Cholesterol level also significantly affected nurse performance directly. Work fatigue significantly affected nurse performance and mediated relationships between physical workload, cholesterol level, nutritional status, work shifts, and nurse performance. However, blood glucose and uric acid levels did not show significant indirect effects on nurse performance. In conclusion, work fatigue plays an important role in the relationship between occupational and physiological factors and nurse performance. Appropriate workload management, nutritional monitoring, shift scheduling, and health screening are recommended to reduce fatigue and maintain optimal nurse performance.

Keywords: Metabolic Indicators, Nurse Performance, Nutritional Status, Physical Workload, Work Fatigue.

Introduction

Nursing services are an essential part of hospital health care systems because nurses provide direct patient care for twenty-four hours every day. Nurses' performance greatly influences service quality, patient safety, treatment outcomes, and patient satisfaction with hospital services. Nurses are responsible for monitoring patient conditions, administering medications, documenting clinical information, communicating with patients and families, and responding to emergency situations. These responsibilities require good physical, mental, and emotional abilities. However, nurses often face job demands such as high workloads, shift schedules, prolonged standing, time pressure, and limited rest periods. These conditions may increase the risk of occupational fatigue, which can negatively affect nurses' health and work performance. Therefore, maintaining optimal nurse performance is an important aspect of hospital management and occupational health programs. Occupational fatigue is a multidimensional condition involving physical, mental, and emotional exhaustion caused by continuous work demands and insufficient recovery time. Fatigue among nurses may reduce concentration, alertness, thinking ability, reaction time, and work efficiency. This condition may also increase the risk of medical errors, reduce patient safety, and decrease the quality of nursing services. Previous studies have shown that occupational fatigue is one of the most common occupational health problems experienced by nurses in many countries. Nurses with high fatigue levels tend to experience lower work motivation, impaired communication, and decreased quality of patient care (1, 2). In addition, prolonged fatigue may lead

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to burnout, absenteeism, and turnover intention, ultimately affecting hospital service effectiveness. One of the main factors associated with occupational fatigue is workload. Nurses are often required to complete multiple tasks within limited time, especially in inpatient wards and units with high patient numbers. Heavy workload may involve physical activities such as lifting patients, prolonged standing, and repetitive movements, as well as mental demands related to clinical decision-making and patient monitoring. Excessive workload may increase physical and psychological pressure, leading to occupational fatigue. Previous research has shown that nurses with higher workloads are more likely to experience fatigue and decreased performance compared with nurses who have lighter workloads (3). Besides workload, shift work is another important factor affecting nurses' physical and mental conditions. Hospitals operate continuously for twenty-four hours, requiring nurses to work morning, evening, and night shifts. Night shifts and rotating schedules may disrupt circadian rhythms and normal sleep patterns. Nurses working night shifts often experience insufficient sleep and poor sleep quality, resulting in inadequate physical recovery. This condition may decrease concentration, alertness, and cognitive performance during work. Previous studies have reported that shift work is associated with increased fatigue, stress, and decreased work productivity among nurses (4). Limited recovery time between shifts may further worsen fatigue among nursing staff (5). In addition to occupational factors, physiological and metabolic health conditions may also influence occupational fatigue and nurse performance. Physiological indicators such as blood glucose level, uric acid level, cholesterol level, and nutritional status are important markers of individual health conditions. Disturbances in these indicators may affect energy metabolism, physical endurance, and cognitive function. Abnormal blood glucose levels may cause weakness and reduced concentration. High cholesterol levels may increase the risk of cardiovascular disorders and reduce physical fitness. Meanwhile, elevated uric acid levels may cause musculoskeletal problems and joint pain that can interfere with work activities. Therefore, poor physiological conditions may contribute to occupational fatigue among nurses. Nutritional status is also an important factor in maintaining work ability. Nurses with undernutrition may have lower energy reserves and physical endurance, while overweight and obesity may increase physical strain during work activities. Previous studies have shown that unhealthy eating habits, irregular meal schedules, and lack of physical activity among shift workers may increase the risk of metabolic disorders and nutritional problems (6, 7). Nurses working night shifts often experience difficulties maintaining healthy dietary patterns due to irregular work schedules. These conditions may increase the risk of metabolic syndrome and non-communicable diseases, eventually affecting work productivity.

Several previous studies have discussed the relationship between workload, shift work, fatigue, and metabolic health among nurses. A systematic review reported that most nurses experience moderate to high levels of acute and chronic fatigue with inadequate recovery time between shift (8). Other studies have shown that shift work is associated with increased risk of metabolic disorders such as altered lipid profiles, body mass index, and glucose regulation. Occupational fatigue has also been associated with decreased performance, impaired cognitive function, and increased risk of service errors among nurses (9). However, most previous studies have examined occupational and physiological factors separately. Research integrating occupational factors, physiological conditions, occupational fatigue, and nurse performance within one analytical model remains limited, particularly in hospital settings.

This research gap is important because occupational fatigue may act as an intervening variable linking occupational and physiological factors with nurse performance. Understanding the relationships among these variables may provide a more comprehensive explanation of occupational health problems among nurses and serve as a basis for developing fatigue prevention programs. Based on this background, this study aims to analyze relationships between physical workload, shift work, blood glucose level, uric acid level, cholesterol level, nutritional status, occupational fatigue, and nurse performance among nurses at Stella Maris Hospital Makassar. This study also aims to determine whether occupational fatigue plays a role in the relationship between occupational and physiological factors

and nurse performance. The findings are expected to support the development of occupational health programs and hospital management strategies to improve nurses' health, reduce occupational fatigue, and maintain nursing service quality (10).

Methodology

Study Design and Setting

This study used a quantitative research design with a cross-sectional approach. The research was conducted at Stella Maris Hospital Makassar, South Sulawesi, Indonesia, in 2025. Figure 1 showed the GPS of the hospital which is located at approximately 5.1456° S and 119.4045° E. This design was used to examine the relationship between physical workload, work shifts, physiological health indicators, nutritional status, work fatigue, and nurse performance at one point of data collection.

Figure 1: GPS of Stella Maris Hospital Makassar

Population and Sample

The population in this study consisted of all nurses working at Stella Maris Hospital Makassar. The total population was 120 nurses, and all of them were included as respondents using a total sampling technique. Therefore, the final sample consisted of 120 nurses. The inclusion criteria were nurses who were actively working during the data collection period, were involved in nursing services, and were willing to participate in the study. Nurses who were not present during data collection or had incomplete data were excluded from the analysis.

Data Collection and Measurement

Primary data were collected through direct measurements and structured questionnaires. Physiological health indicators included random blood glucose level, serum uric acid level, and total cholesterol level. Nutritional status was assessed using Body Mass Index (BMI), which was calculated based on body weight and height measurements. Physical workload was assessed through direct observation or measurement according to the study procedure, while work shift data were obtained based on the nurses' work schedule. Work fatigue was measured using the KAUPK2 questionnaire, and nurse performance was assessed using a structured performance questionnaire. Secondary data were obtained from hospital documents, including information related to the number of nurses and work shift arrangements. Before data collection, respondents were informed about the purpose and procedure of the study, and participation was based on their consent.

Data Analysis

Data analysis consisted of univariate, bivariate, and multivariate analysis. Univariate analysis was used to describe respondent characteristics and the distribution of each research variable.

Bivariate analysis was conducted to examine the relationship between physical workload, blood glucose level, uric acid level, cholesterol level, nutritional status, work shifts, work fatigue, and nurse performance. Multivariate analysis was performed using path analysis to examine the direct and indirect effects among variables. In this model, physical workload, work shifts, blood glucose level, uric acid level, cholesterol level, and nutritional status were treated as independent variables. Work fatigue was positioned as an intervening variable, while nurse performance was treated as the dependent variable. The indirect effect of each variable on nurse performance through work fatigue was tested using the Sobel test. Statistical significance was determined using a p-value of <0.05.

Results and Discussion

Table 1: Distribution of Respondents Based on Age, Gender, and Working Hours

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
24–28	57	47.5
29–33	35	29.2
34–38	20	16.7
39–43	8	6.7
Total	120	100.0
Gender		
Female	104	86.7
Male	16	13.3
Total	120	100.0
Working hours		
<8 hours	91	75.8
>8 hours	29	24.2
Total	120	100.0

Based on Table 1, most respondents were aged 24–28 years, with 57 nurses (47.5%), followed by those aged 29–33 years with 35 nurses (29.2%), 34–38 years with 20 nurses (16.7%), and 39–43 years with 8 nurses (6.7%). Based on gender, the majority of respondents were female, with 104 nurses (86.7%), while male respondents accounted for 16 nurses (13.3%). In terms of working hours, 91 nurses (75.8%) worked less than 8 hours, while 29 nurses (24.2%) worked more than 8 hours.

Table 2: Bivariate Analysis of Factors Associated with Nurse Performance

Variables	Category	Low n (%)	Moderate n (%)	High n (%)	Total n (%)	p-value
Physical workload	Light	34 (85.0)	4 (10.0)	2 (5.0)	40 (100.0)	<0.001
	Moderate	14 (20.3)	49 (71.0)	6 (8.7)	69 (100.0)	
	Heavy	6 (54.5)	3 (27.3)	2 (18.2)	11 (100.0)	
	Total	54 (45.0)	56 (46.7)	10 (8.3)	120 (100.0)	
Blood glucose	Low	2 (100.0)	0 (0.0)	0 (0.0)	2 (100.0)	0.399
	Normal	47 (42.7)	53 (48.2)	10 (9.1)	110 (100.0)	
	High	5 (62.5)	3 (37.5)	0 (0.0)	8 (100.0)	
	Total	54 (45.0)	56 (46.7)	10 (8.3)	120 (100.0)	
Uric acid	Normal	29 (41.4)	33 (47.1)	8 (11.4)	70 (100.0)	0.564
	High	24 (51.1)	21 (44.7)	2 (4.3)	47 (100.0)	
	Very high	1 (33.3)	2 (66.7)	0 (0.0)	3 (100.0)	
	Total	54 (45.0)	56 (46.7)	10 (8.3)	120 (100.0)	
Cholesterol	Normal	46 (74.2)	9 (14.5)	7 (11.3)	62 (100.0)	<0.001
	Borderline high	3 (6.8)	39 (88.6)	2 (4.5)	44 (100.0)	
	High	5 (35.7)	8 (57.1)	1 (7.1)	14 (100.0)	
	Total	54 (45.0)	56 (46.7)	10 (8.3)	120 (100.0)	
Nutritional status	Underweight	14 (100.0)	0 (0.0)	0 (0.0)	14 (100.0)	<0.001
	Normal	28 (36.8)	46 (60.5)	2 (2.6)	76 (100.0)	

	Overweight	12 (40.0)	10 (33.3)	8 (26.7)	30 (100.0)	
	Total	54 (45.0)	56 (46.7)	10 (8.3)	120 (100.0)	
Work shift	Morning	39 (83.0)	7 (14.9)	1 (2.1)	47 (100.0)	<0.001
	Afternoon	7 (15.9)	37 (84.1)	0 (0.0)	44 (100.0)	
	Night	8 (27.6)	12 (41.4)	9 (31.0)	29 (100.0)	
	Total	54 (45.0)	56 (46.7)	10 (8.3)	120 (100.0)	

Based on Table 2, physical workload was significantly associated with nurse performance (p<0.001). Blood glucose level was not significantly associated with nurse performance (p=0.399), and uric acid level also showed no significant association with nurse performance (p=0.564). Meanwhile, cholesterol level, nutritional status, and work shift were significantly associated with nurse performance, with p-values of <0.001 for each variable.

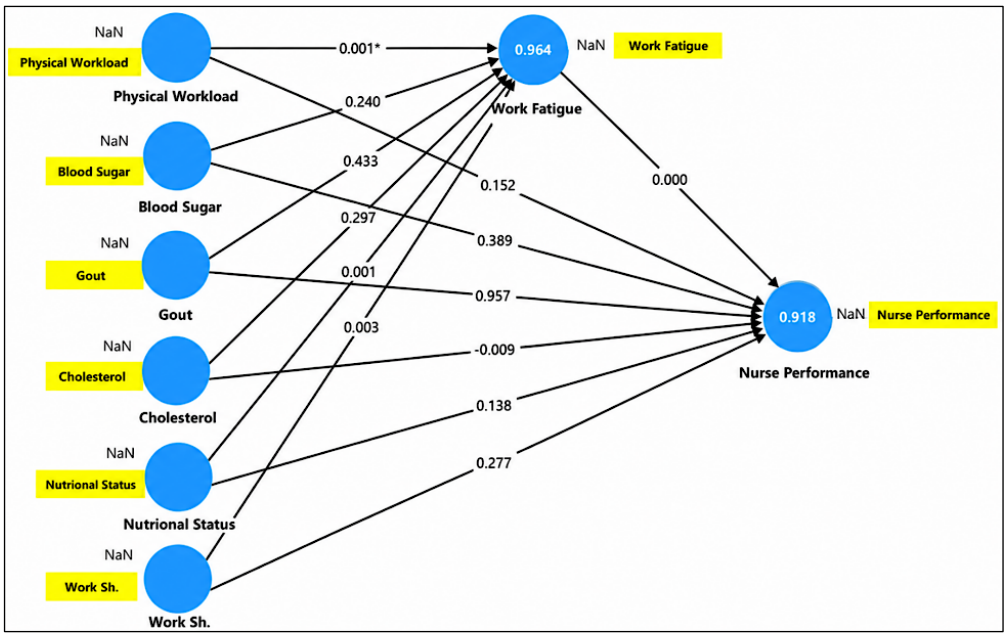

Figure 2: Path Analysis Model

Figure 2 Path analysis model showing the direct and indirect effects of physical workload, blood glucose, uric acid, cholesterol, nutritional status, and work shift on nurse performance, with work fatigue as an intervening variable. There were direct and indirect relationships examined in this study. The direct effects among variables are presented in Table 3.

Table 3: Direct Effects of Study Variables on Work Fatigue and Nurse Performance

Hypothesis	Path Coefficient	p-value	95% CI		f-square	Effect Size
			Lower	Upper		
Physical workload → Work fatigue	0.180	0.003	0.089	0.329	0.173	Moderate
Physical workload → Nurse performance	-0.090	0.152	-0.172	0.156	0.039	Small
Blood glucose → Work fatigue	-0.131	0.240	-0.359	0.043	0.041	Small
Blood glucose → Nurse performance	-0.102	0.389	-0.432	0.020	0.025	Small
Uric acid → Work fatigue	0.093	0.433	-0.139	0.276	0.022	Small
Uric acid → Nurse performance	0.006	0.957	-0.182	0.270	0.000	Very small
Cholesterol → Work fatigue	0.170	0.029	0.042	0.313	0.129	Small
Cholesterol → Nurse performance	0.352	0.009	0.188	0.646	0.519	Large
Nutritional status → Work fatigue	0.387	0.001	0.249	0.713	0.507	Large
Nutritional status → Nurse performance	-0.081	0.138	0.013	0.444	0.015	Very small
Work shift → Work fatigue	0.344	0.003	0.205	0.584	0.485	Large
Work shift → Nurse performance	0.124	0.277	0.201	0.664	0.045	Small
Work fatigue → Nurse performance	0.685	<0.001	0.288	0.963	0.495	Large

Based on Table 3, physical workload had a significant direct effect on work fatigue (β=0.180; p=0.003), but did not have a significant direct effect on nurse performance (β=-0.090; p=0.152). Blood glucose did not significantly affect either work fatigue (β=-0.131; p=0.240) or nurse performance (β=-0.102; p=0.389). Similarly, uric acid did not significantly affect work fatigue (β=0.093; p=0.433) or nurse performance (β=0.006; p=0.957). Cholesterol had a significant direct effect on both work fatigue (β=0.170; p=0.029) and nurse performance (β=0.352; p=0.009). Nutritional status significantly affected work fatigue (β=0.387; p=0.001), but did not significantly affect nurse performance (β=-0.081; p=0.138). Work shift also had a significant direct effect on work fatigue (β=0.344; p=0.003), but did not have a significant direct effect on nurse performance (β=0.124; p=0.277). Work fatigue showed a significant direct effect on nurse performance (β=0.685; p<0.001).

Table 4: Indirect Effects of Study Variables on Nurse Performance through Work Fatigue

Hypothesis	Path Coefficient	p-value	95% CI Lower	95% CI Upper	Z-Sobel	Interpretation
Physical workload → Work fatigue → Nurse performance	0.123	0.011	0.060	0.241	2.596	Significant
Blood glucose → Work fatigue → Nurse performance	-0.090	0.267	-0.301	0.023	1.116	Not significant
Uric acid → Work fatigue → Nurse performance	0.063	0.443	-0.062	0.193	0.770	Not significant
Cholesterol → Work fatigue → Nurse performance	0.116	0.041	0.046	0.250	2.067	Significant
Nutritional status → Work fatigue → Nurse performance	0.265	0.013	0.140	0.504	2.521	Significant
Work shift → Work fatigue → Nurse performance	0.236	0.015	0.108	0.433	2.470	Significant

Based on Table 4, work fatigue significantly mediated the relationship between physical workload and nurse performance (β=0.123; p=0.011; Z-Sobel=2.596). However, work fatigue did not significantly mediate the relationship between blood glucose and nurse performance (β=-0.090; p=0.267; Z-Sobel=1.116), nor the relationship between uric acid and nurse performance (β=0.063; p=0.443; Z-Sobel=0.770). Furthermore, work fatigue significantly mediated the relationship between cholesterol and nurse performance (β=0.116; p=0.041; Z-Sobel=2.067), nutritional status and nurse performance (β=0.265; p=0.013; Z-Sobel=2.521), and work shift and nurse performance (β=0.236; p=0.015; Z-Sobel=2.470). These findings indicate that work fatigue served as an important intervening variable in the effects of physical workload, cholesterol, nutritional status, and work shift on nurse performance, but not in the effects of blood glucose and uric acid.

Nursing staff are an important part of health care services because nursing care must be provided continuously to maintain the quality of hospital services (11). Nursing management needs to ensure that patient needs are fulfilled and that the quality of hospital services remains optimal. One common problem in nursing services is an imbalanced physical workload, which may lead to fatigue, reduced service quality, patient safety risks, and psychological strain among nurses (12). Fatigue Work can lower motivation, quality interaction with patients, as well as ability nurse fulfil standard Work (13). Work fatigue can reduce motivation, the quality of interaction with patients, and the ability of nurses to meet established work standards (14). Therefore, work shift arrange-ments, workload management, and adequate rest periods need to be considered by hospital management to maintain nurse performance. In this study, physical workload had a significant indirect effect on nurse performance through work fatigue, as indicated by a p-value of 0.011 and a Z-Sobel value of 2.596. This finding indicates that work fatigue acted as a significant intervening variable in the relationship between physical workload and nurse performance. A non-significant relationship between physical workload and work fatigue among night-shift nurses has been reported in previous research. However, a significant effect of physical workload on work fatigue has also been found in other

studies. Physical workload, such as prolonged standing, lifting patients, and pushing heavy medical equipment, may increase physical strain and reduce nurse performance if it is not properly managed.

Blood glucose levels play an important role in maintaining body function during work, especially among nurses who are required to perform activities involving both physical endurance and mental concentration. Unstable blood glucose levels may affect energy balance, focus, and daily work ability (15). Fatigue may also become a pathway through which physiological conditions, including blood glucose levels, are related to nurse performance. Nurses working in shift systems, particularly night shifts, may be vulnerable to blood glucose fluctuations due to irregular eating patterns and limited rest periods. Therefore, blood glucose stability needs to be supported through adequate nutritional intake and proper regulation of rest time (15, 16). In this study, blood glucose did not have a significant indirect effect on nurse performance through work fatigue, as shown by a p-value of 0.267 and a Z-Sobel value of 1.116. This result indicates that work fatigue did not significantly mediate the relationship between blood glucose and nurse performance. Although a relationship between glucose levels and fatigue has been reported in previous studies, most nurses in this study had blood glucose levels within the normal range of 80–144 mg/dL, although some respondents had values below or above the normal limit. Therefore, blood glucose was not identified as a dominant factor influencing work fatigue and nurse performance among nurses at Stella Maris Hospital Makassar.

Uric acid is the end product of purine metabolism and may function as an antioxidant at normal levels. However, high uric acid levels may trigger inflammation, joint pain, and decreased physical condition (17). Theoretically, increased uric acid levels may contribute to prolonged fatigue and reduced ability to perform work optimally, although this effect may vary depending on health status and work characteristics (18). In this study, uric acid did not have a significant indirect effect on nurse performance through work fatigue, as indicated by a p-value of 0.443 and a Z-Sobel value of 0.770. This result shows that uric acid level could not be considered a determinant factor of nurse performance through work fatigue. Although high uric acid levels have been associated with physical discomfort, pain, and reduced productivity in several health conditions, the variation in uric acid levels among nurses in this study was not strong enough to influence fatigue and performance. Other occupational factors, such as workload, shift duration, sleep quality, rest adequacy, and physical fitness, may have a greater role in determining work fatigue and nurse performance (19). In line with the results of this study, uric acid level was not found to be a significant factor affecting nurse performance through work fatigue at Stella Maris Hospital Makassar.

Cholesterol is a blood lipid component that plays an important role in hormone formation, cell membrane structure, and energy metabolism (20). However, high cholesterol levels may interfere with blood circulation and increase metabolic burden, which may contribute to fatigue and reduced physical capacity. Among nurses, this condition may reduce concentration, work stamina, and overall work effectiveness. In this study, cholesterol had a significant indirect effect on nurse performance through work fatigue, as indicated by a p-value of 0.041 and a Z-Sobel value of 2.067. This result shows that work fatigue significantly mediated the relationship between cholesterol level and nurse performance. Nurses with higher cholesterol levels may experience greater fatigue, which can then affect concentration, response speed, and work effectiveness. The relationship between physiological condition, metabolic disturbance, and fatigue has been supported in previous studies. In the context of nursing work, high workload, physical demands, and rotating work shifts may strengthen the effect of metabolic conditions on fatigue. Therefore, cholesterol level should be considered as one of the physiological indicators that may contribute to work fatigue and nurse performance among nurses at Stella Maris Hospital Makassar.

Nutritional status reflects the balance between nutrient intake and the body's energy requirements. Good nutritional status supports physiological functions, including muscle strength, concentration, and stamina, which are needed to perform work optimally. In contrast, poor or excessive nutritional status may disrupt energy metabolism, increase fatigue, reduce focus, and

lower productivity (21). In this study, nutritional status had a significant indirect effect on nurse performance through work fatigue, as indicated by a p-value of 0.013 and a Z-Sobel value of 2.521. This result indicates that work fatigue significantly mediated the relationship between nutritional status and nurse performance. Nurses with better nutritional status may have lower fatigue levels and more optimal performance compared with nurses with undernutrition or excessive nutritional status (22). The relationship between nutritional status and work fatigue has been reported in previous research. Nutritional status may influence work capacity because adequate nutrition is needed to support energy production, physical endurance, and cognitive function. However, the effect of nutritional status may vary depending on work characteristics, individual health conditions, and workplace environment. Overall, the findings of this study support that nutritional status is an important factor influencing nurse performance through work fatigue at Stella Maris Hospital Makassar.

Work shift is a work-time arrangement system used to ensure the continuity of health care services for 24 hours. In the health sector, this system is essential, but it may disrupt circadian rhythm, reduce sleep quality, trigger fatigue, and decrease concentration (23). In nursing practice, irregular work schedules may cause physical and mental fatigue, which can affect response speed, accuracy, and quality of care. In this study, work shift had a significant indirect effect on nurse performance through work fatigue, as indicated by a p-value of 0.015 and a Z-Sobel value of 2.470. This result indicates that work fatigue significantly mediated the relationship between work shift and nurse performance. Nurses working night shifts may experience higher levels of fatigue, which may then contribute to lower performance compared with nurses working morning or afternoon shifts (24). The effect of work shifts on fatigue and performance may occur because night-shift work can disturb sleep patterns, reduce recovery time, and increase physical and mental strain. However, the impact of work shifts may differ depending on workload, rest policies, time management, and organizational support. In this study, work shift was found to influence nurse performance through work fatigue, particularly because night-shift nurses may be more prone to reduced concentration, delayed responses, and increased work errors (25).

Conclusion

This study showed that work fatigue played an important role as an intervening variable in the relationship between several occupational and physiological factors and nurse performance at Stella Maris Hospital Makassar. Physical workload, cholesterol level, nutritional status, and work shift had significant indirect effects on nurse performance through work fatigue. In contrast, blood glucose and uric acid levels did not show significant indirect effects on nurse performance through work fatigue. These findings indicate that nurse performance is more strongly related to physical workload, selected metabolic conditions, nutritional status, and shift patterns than to blood glucose and uric acid levels. Therefore, hospital management should pay attention to workload distribution, shift scheduling, adequate rest periods, nutritional monitoring, and periodic health screening to reduce work fatigue and maintain optimal nurse performance. This study has several limitations. The cross-sectional design limits the ability to determine causal relationships among variables. In addition, nutritional status was assessed only using Body Mass Index, without a more comprehensive nutritional assessment such as dietary intake, body composition, or biochemical nutritional markers. Future studies are recommended to use longitudinal designs, include broader physiological and nutritional indicators, and examine other occupational factors such as sleep quality, work stress, staffing ratio, and years of employment to provide a more comprehensive understanding of nurse fatigue and performance.

Abbreviations

BMI: Body Mass Index, CI: Confidence Interval, GCU: Glucose, Cholesterol, and Uric Acid, KAUPK2: Kuesioner Alat Ukur Perasaan Kelelahan Kerja.

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Author Contributions

Surya Nataniel: Conceptualization, Methodology, Investigation, Data Collection, Formal Analysis, Data Curation, Writing–Original Draft, Visualization, Lalu Muhammad Saleh: Supervision, Methodology Validation, Statistical Analysis, Writing–Review and Editing, Interpretation of Findings, Syamsiar S Russeng: Supervision, Scientific Review, Methodology Evaluation, Validation, Writing–Review and Editing, Final Approval of the Manuscript. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the conduct, analysis, or publication of this study.

Data Availability

The data used and analyzed during this study are available from the corresponding author upon reasonable request. However, the data are not publicly available due to privacy and confidentiality considerations involving research participants.

Declaration of Artificial Intelligence (AI) Assistance

During the preparation of this manuscript, generative AI and AI-assisted technologies were used only to support language refinement, grammar correction, and improvement of readability. The authors reviewed, edited, and verified all content assisted by these technologies and take full responsibility for the final content of the manuscript.

Ethics Approval

This study was approved by the Ethics Committee of the Faculty of Public Health, Hasanuddin University, with ethical approval number 1831/UN4.14.1/TP.01.02/2025. All participants were informed about the objectives, procedures, benefits, and confidentiality of the study before data collection. Written informed consent was obtained from all participants prior to their involvement in the study.

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References

1. Yuliani R, Ginting CN, Chiuman L, Girsang E. The relationship between workload, job stress, nutritional status, and shift work the night with the fatigue of nurses working in hospitals Aceh Singkil 2020. International Journal of Research in Medical Sciences. 2021;9(7):2055. https://doi.org/10.18203/2320-6012.ijrms20212358
2. Mardiah RS, Putri DK. Impact of fatigue, sleep quality, and drowsiness on medical laboratory technologists' alertness during night shift. J Ilm Tek Ind. 2024;23(1):52-61. doi:10.23917/jiti.v23i1.3029
3. Bakirhan H, Bakirhan YE, Yaşar G. Shift work, sleep, and burnout: the impact of Mediterranean dietary pattern and nutritional status on emergency healthcare workers. Nutrition & Food Science. 2023;53(2):402-15. doi:10.1108/nfs-02-2022-0037
4. Keskin E, Kalkan I. Are Working Conditions of Nurses Associated with Nutrition, Physical Activity, and Stress Levels?. International Nursing Review. 2025;72(4):e70133. https://doi.org/10.1111/inr.70133
5. Pi R, Liu Y, Yan R, De Z, Wan Y, Chen Y, He Z, Liu F, Wang Y, Li S. Nurses' occupational fatigue level and risk factors: a systematic review and meta-analysis. PLoS One. 2025;20(7):e0326519. doi: 10.1371/journal.pone.0326519
6. Zeng Z, Zhou S, Liu M. Research progress on assessment tools related to occupational fatigue in nurses: a traditional review. Front Public Health. 2024;12:1508071. doi:10.3389/fpubh.2024.1508071
7. Rahmadani M, Kurniawidjaja L, Puspasari M, Istanti N, Fitriani D, Istiqomah MM, Sulistiyorini D, Modjo R. Workload, fatigue, and cognitive performance in university hospital nurses: a cross-sectional study. Salud Cienc Tecnol. 2025;5:1731. doi:10.56294/saludcyt20251731
8. Cao Y, Feng Y, Xia N, Zhang JC. Evaluating the impact of shift work on the risk of cardiometabolic disease: a Mendelian randomization study. Nutr Metab Cardiovasc Dis. 2024;34(12):2720-2728. doi: 10.1016/j.numecd.2024.08.010
9. Jung H, Dan H, Pang Y, Kim B, Jeong H, Lee JE, Kim O. Association between dietary habits, shift work, and the metabolic syndrome: the Korea Nurses' Health Study. Int J Environ Res Public Health. 2020;17(20):7697. doi:10.3390/ijerph17207697
10. Chico-Barba G, Jiménez-Limas K, Sánchez-Jiménez B, Sámano R, Rodríguez-Ventura AL, Castillo-Pérez R, Tolentino M. Burnout and metabolic syndrome in female nurses: an observational study. Int J Environ Res Public Health. 2019;16(11):1993. doi:10.3390/ijerph16111993

11. Roskoden FC, Krüger J, Vogt LJ, Gärtner S, Hannich HJ, Steveling A, Lerch MM, Aghdassi AA. Physical activity, energy expenditure, nutritional habits, quality of sleep and stress levels in shift-working health care personnel. PloS one. 2017;12(1):e0169983. https://doi.org/10.1371/journal.pone.0169983
12. Zhang H, Wang J, Zhang S, Tong S, Hu J, Che Y, Zhuo L, Wang P, Geng R, Zhou Y, Wang P. Relationship between night shift and sleep problems, risk of metabolic abnormalities of nurses: a 2 years follow-up retrospective analysis in the National Nurse Health Study (NNHS). International archives of occupational and environmental health. 2023;96(10):1361-71. doi: 10.1007/s00420-023-02014-2
13. Mehrafshar A, Dabirifard M, Delshad Z, Gharacheh L, Ahangarzadeh M, Askari A, Babaei Pouya A, Sepehr P, Salehi Sahlabadi A, Eshaghzadeh M, Khajehnasiri F. Survey on the relationship between stress and cardiovascular health among office employees at a university hospital in Iran. International Journal of Occupational Safety and Ergonomics. 2025;31(4):1084-9. doi: 10.1080/10803548.2025.2473806
14. Richter KD, Acker J, Scholz F, Niklewski G. Health promotion and work: prevention of shift work disorders in companies. EPMA Journal. 2010 1(4):611-8. doi: 10.1007/s13167-010-0057-7
15. Shrivastava R, Shrivastava P, Pathak T, *et al*. Effect of shift work on dietary habits and occupational stress among nurses in a tertiary care centre: an observational study. J Fam Med Prim Care. 2024;13(6):2242-2247. doi: 10.4103/jfmpc.jfmpc_1368_23
16. Tatzber F, Zelzer S, Obermayer-Pietsch B, Rinnerhofer S, Kundi M, Cvirn G, Wultsch G, Herrmann M, Mangge H, Niedrist T, Wonisch W. Occupational health aspects with special focus on physiological differences between office and metalworkers. Antioxidants. 2022;11(4):633. https://doi.org/10.3390/antiox11040633
17. Cortez-Gómez CA, Flores-Barrada MA, González-Garrido JA, Castillo-Avila RG, López-Victorio CJ, Arias-Vázquez PI, Tejas-Juárez JG, De la Cruz-Cano E, Díaz-Gandarilla JA. Sociodemographic factors, comorbidities, and biochemical parameters associated with poor adherence to antihypertensive treatment among university employees from Southeast Mexico: a cross-sectional study. Blood Pressure. 2026 D;35(1):2600736. https://doi.org/10.1080/08037051.2025.2600736
18. Chang HY, Lin YA, Yu WP, *et al*. Impact of nurses' peak workload and time pressure on work exhaustion and turnover intention. J Nurs Manag. 2025;2025:2311721. doi:10.1155/jonm/2311721
19. Thakali O, Raya S, Malla B, Tandukar S, Tiwari A, Sherchan SP, Sherchand JB, Haramoto E. Pilot study on wastewater surveillance of dengue virus RNA: lessons, challenges, and implications for future research. Environ Challenges. 2022;9:100614. doi:10.1016/j.envc.2022.100614
20. Tariq T, Raza KR, Qureshi R, Asghar A, Tahir MN, Ch NA. Prevalence And Determinants Of The Burn Out Syndrome (Bos) Among The Healthcare Practitioners In Tertiary Care Hospitals Of Punjab, Pakistan. Journal of Medical & Health Sciences Review. 2025;2(3). https://doi.org/10.62019/zcf0zs31
21. Gutiérrez-Esparza G, Martinez-Garcia M, Ramírez-delReal T, Groves-Miralrio LE, Marquez MF, Pulido T, Amezcua-Guerra LM, Hernández-Lemus E. Sleep quality, nutrient intake, and social development index predict metabolic syndrome in the Tlalpan 2020 cohort: a machine learning and synthetic data study. Nutrients. 2024;16(5):612. https://doi.org/10.3390/nu16050612
22. Mehrafshar A, Dabirifard M, Delshad Z, Gharacheh L, Ahangarzadeh M, Askari A, Babaei Pouya A, Sepehr P, Salehi Sahlabadi A, Eshaghzadeh M, Khajehnasiri F, Poursadeqiyan M. Survey on the relationship between stress and cardiovascular health among office employees at a university hospital in Iran. Int J Occup Saf Ergon. 2025;31(4):1084-1089. doi:10.1080/10803548.2025.2473806
23. Lin PY, Chang CC, Tung CY, Chu WH, Tong FG. Risk factors of prehypertension and hypertension among workers at public elderly welfare facilities in Taiwan: A cross sectional survey. Medicine. 2021;100(8):e24885. doi: 10.1097/MD.0000000000024885
24. Li H, Wei M, Zhang L, *et al*. Factors contributing to exercise tolerance in patients with coronary artery disease undergoing percutaneous coronary intervention. BMC Sports Sci Med Rehabil. 2023;15(1):35. doi: 10.1186/s13102-023-00640-4
25. Al-Musharaf S, Albedair B, Alfawaz W, Aldhwayan M, Aljuraiban GS. The relationships between various factors and sleep status: a cross-sectional study among healthy Saudi adults. Nutrients. 2023;15(18):4090. https://doi.org/10.3390/nu15184090

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