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MORALITY BEFORE KNOWLEDGE

The relationship between work life balance and mental workload in female nurses in the inpatient unit of Hospital X: A quantitative study

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ABSTRACT

Background: Mental workload in healthcare workers, especially female nurses, is a critical factor influencing job performance and well-being. Previous studies have suggested that work life balance significantly affects mental workload. This study aims to explore the relationship between work life balance and mental workload among female nurses in the inpatient unit of Hospital X. The findings could provide insights into how work-life balance interventions could reduce mental workload in healthcare settings. **Methods**: This quantitative study utilized a cross-sectional design, with data collected through questionnaires from 100 female nurses. The study employed chi-square tests to analyze the relationship between work life balance and mental workload, as well as logistic regression to identify dominant factors influencing mental workload. Statistical significance was determined at p<0.05. **Findings:** The results revealed a significant relationship between work life balance and mental workload (p-value=0.001). Nurses with higher education levels exhibited a stronger correlation with high mental workload (p-value=0.018). The most dominant factor influencing mental workload was the education level (p-value=0.004), with job satisfaction, employment status, and work experience serving as confounding variables. **Conclusion**: The study concludes that better work life balance, particularly through education, is crucial in mitigating mental workload in female nurses. Implementing work-life balance programs can improve the mental health and productivity of healthcare workers. **Novelty/Originality of this article:** This study contributes new insights into the relationship between work life balance and mental workload in the nursing profession, particularly in inpatient settings. It highlights the impact of education on mental workload, which has been less explored in previous studies.

KEYWORDS: work life balance; mental workload; nurses; healthcare workers; education level.

1. Introduction

Employee well-being encompasses physical, mental, and emotional health, all of which are essential components of occupational health. The level of mental workload experienced by employees is influenced by both internal and external factors. Internal factors, such as age and gender, show significant associations, with older age groups generally experiencing higher mental workloads compared to younger workers, and women often reporting higher mental workload levels (Anwar & Mutiara, 2015; Habibi et al., 2015; López-López et al., 2018; Cezar-Vaz et al., 2022; Widodo et al., 2022). Work stress, which is significantly

associated with high mental workload, can also be influenced by factors such as education level, employment status, marital status, years of service, and motivation (Manabung et al., 2018; Aini et al., 2021; Hidayat et al., 2022; Akrimah et al., 2023). External factors include work-related aspects such as job motivation, job satisfaction, job insecurity, role conflict, and interpersonal conflicts, as well as organizational factors like work duration, shift schedules, and income (Cezar-Vaz et al., 2022; Hidayat et al., 2022). Achieving work-life balance is crucial for maintaining employees' quality of life, as a balanced work-life dynamic positively impacts both health and productivity (Natanael et al., 2023).

According to the World Health Organization (2022), globally, approximately 12 million workdays are lost annually due to mental health problems such as depression and anxiety, resulting in economic losses amounting to $15 billion. Awareness of mental health issues continues to grow, and so does the prevalence of mental health challenges. Gallup's 2020 survey revealed an increase in global work-related stress, rising from 38% in 2019 to 43%, with further increases projected each year. Around 40% of workers experience severe stress, with data from the United States and Canada showing that female workers are the most affected demographic (Gallup, 2022). A McKinsey & Company survey in 2022 found that burnout levels among workers in Asia, specifically in India, Japan, and Australia, exceeded the global average at 44% (McKinsey & Company, 2022). In Indonesia, the 2018 Basic Health Research (Riskesdas) reported that work-related stress affected 9.8% (37,728 individuals) of the working-age population (>15 years) (Singal et al., 2021).

In 2021, out of Indonesia's 139.81 million workforce, women constituted 54.03% (Zulfiyandi et al., 2021). Despite their significant presence in the workforce, women often remain responsible for domestic duties, reflecting traditional gender norms. This dual burden—balancing professional responsibilities with household tasks—places significant physical and mental demands on working women (Swathi & Reddy, 2016).

As of early 2024, Indonesia had approximately 1.26 million healthcare workers, 524,508 of whom were nurses. Research by Gunawan et al. (2021) indicates that 70% of nurses in Indonesia are women. Studies on mental workload among Hospital nurses in Indonesia show moderate to high levels of mental workload (Achmad & Farihah, 2018; Citra et al., 2020; Abdurrahman & Suryadi, 2022). Nurses are subjected to both physical and mental demands in their roles, and their mental workload is influenced by both patient-related and non-patient-related factors. One significant factor affecting nurses' mental workload is the balance between personal life and professional responsibilities, known as work-life balance (Holland et al., 2019).

Preliminary data from the researcher's study on female nurses' mental workload in the inpatient unit of Hospital X revealed that out of nine nurses surveyed using the NASA-TLX mental workload questionnaire, eight (88.9%) reported high mental workload levels (average WWL of 971.25), while one nurse (11.1%) reported extremely high mental workload (WWL of 1200). These findings indicate that female nurses in Hospital X's inpatient unit experience significant mental workload challenges.

Given the multifactorial nature of mental workload, including internal and external influences, identifying and understanding these contributing factors is essential for developing preventive strategies to address mental health risks among nurses. This study aims to examine the relationship between various risk factors and the mental workload levels of female nurses in the inpatient unit at Hospital X, providing insights that could inform interventions to improve nurses' mental health and overall work-life balance.

2. Methods

2.1 Conceptual framework

Figure 1 presents the conceptual framework for this study, which highlights various risk factors that could influence the mental workload of female nurses. These factors include age, education level, marital status, employment status, work experience, income, job satisfaction, and work-life balance. Each of these variables has the potential to significantly

impact the mental workload of workers, potentially leading to an overload that exceeds the individual's capacity to handle it. When mental workload becomes excessive, it can lead to a range of health issues, including stress, burnout, and fatigue, which in turn can affect the quality of care provided by nurses.

Independent Variables   **Dependent Variable**

Individual Factors
  a. Age
  b. Edugaction level
  c. Marital status

Employment factor
  a. Employment status

Organizational factors
  a. Work experience
  b. Income

Miscellanous
  a. Job satisfaction

Work-Life Balance
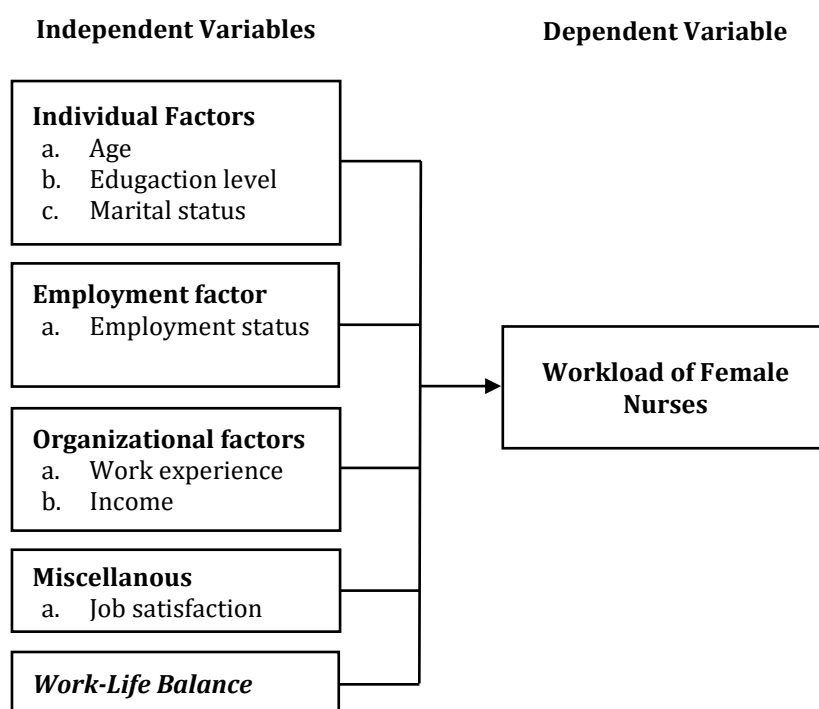
Workload of Female Nurses

Fig 1. Research conceptual framework

Figure 1 presents the conceptual framework for this study, which highlights various risk factors that could influence the mental workload of female nurses. These factors include age, education level, marital status, employment status, work experience, income, job satisfaction, and work-life balance. Each of these variables has the potential to significantly impact the mental workload of workers, potentially leading to an overload that exceeds the individual's capacity to handle it. When mental workload becomes excessive, it can lead to a range of health issues, including stress, burnout, and fatigue, which in turn can affect the quality of care provided by nurses.

On the other hand, when the mental workload is too light or insufficiently challenging, it may result in worker disengagement, lack of motivation, or burnout due to boredom. To prevent such mismatches in mental workload, it is essential to use appropriate measurement methods. One such method is NASA-TLX, which measures mental workload through various indicators that reflect the experiences of the workers. By analyzing the data obtained from these indicators, it is possible to identify the specific factors contributing to the mental workload and assess the causal relationship between stressors and the mental workload of female nurses. Variables such as work shift patterns, role conflict, interpersonal conflict, and role ambiguity were not included in this study due to limitations such as time constraints for instrument validation and reliability testing. Additionally, work motivation was not considered an independent variable as it was already addressed in the job satisfaction variable.

2.2 Operational definitions

The dependent variable, mental workload, refers to the capacity of workers to process information and manage cognitive demands related to their tasks. This variable is measured using the NASA-TLX questionnaire, which is filled out by the respondents themselves. The

mental workload scores are then analyzed through univariate analysis, with categories ranging from low to very high. The scale includes categories such as low (0-9), moderate (10-29), somewhat high (30-49), high (50-79), and very high (80-100). Bivariate and multivariate analysis is then conducted, classifying the workload as light (0-49) or heavy (50-100) based on established thresholds (Hart & Staveland, 1988).

The independent variables include work-life balance, which refers to the ability of workers to effectively manage their responsibilities at both home and work. This is assessed through the Fisher, Bulger, and Smith questionnaire. Based on the responses, the work-life balance is categorized as low (≤ 55) or high (> 55). Other independent variables include age, which is defined as the number of years from birth to the time the respondent participates in the study. The age of the respondents is divided into two categories: younger than 26 years and 26 years or older. Education level is also measured, with categories including diploma (D3), bachelor's degree (S1), and nursing degree (S1 Ners). Employment status is classified according to the employment contract, with options such as permanent employees, contract employees, and other statuses like civil servants or part-time workers. Marital status is categorized as either married or unmarried, based on the respondent's legal, religious, and societal marital status. Work experience, measured in years, is divided into two groups: ≤ 3 years and > 3 years of work experience. Job satisfaction, assessed using the Job Diagnostic Survey (Hackman & Oldham, 1975), reflects the respondent's satisfaction with their work and is categorized as high, medium, or low. Income, as measured by the respondent's monthly salary, is compared to the regional minimum wage in Bogor and is classified accordingly.

2.3 Research design

This study utilizes a quantitative research design with a cross-sectional approach to examine the relationship between the dependent variable, mental workload, and several independent variables that may serve as stressors for female nurses. These independent variables include age, educational level, employment status, marital status, income, job satisfaction, and work-life balance. The purpose of this research is to determine which factors contribute to the mental workload of female nurses working in the inpatient unit of Hospital X. By testing this hypothesis, the study aims to uncover how various demographic and work-related factors impact the mental workload of nurses and to identify the most significant predictors.

The cross-sectional design allows for data collection at a single point in time, which is ideal for identifying correlations between variables without the need for long-term data tracking. This method provides a snapshot of the factors influencing mental workload among female nurses, helping to identify patterns and relationships that could inform strategies to improve work conditions and mental well-being in healthcare settings. The research will also highlight areas where interventions may be needed to reduce mental workload and improve overall work-life balance for nurses, ultimately leading to better health outcomes for both the workers and the patients under their care.

2.4 Research location and timeframe

The preliminary study, including data collection, processing, and analysis, was conducted from April to June 2024. This period allowed sufficient time for the preparation and execution of the study, ensuring the accuracy and reliability of the data collected. Data collection took place at Hospital X, which is located in Bogor City. Hospital X was selected as the study site because it provides a suitable environment to investigate the mental workload of female nurses working in inpatient care. This setting offers a diverse group of respondents and allows for an in-depth examination of the factors influencing mental workload in a real-world healthcare setting.

The choice of Hospital X was also based on the availability of necessary resources, including access to female nurses who meet the study criteria. The data collected from

respondents will be analyzed to identify trends and correlations that contribute to the mental workload of nurses. This research provides valuable insights into how various factors, such as work-life balance, job satisfaction, and employment status, affect the mental health and performance of nurses, with implications for improving working conditions and ensuring the well-being of healthcare workers in general.

2.5 Population and sample of the study

2.5.1 Population of the study

The population in this study consists of female nurses working in the inpatient units of Hospital X, located in Bogor City. This Hospital has a total of 231 female nurses in the inpatient unit, which forms the focus of this study. The selection of this group was based on the assumption that nurses in inpatient units tend to experience a higher workload compared to nurses in other Hospital departments, such as the emergency room.

Given the unique nature of their work environment, nurses in inpatient units face significant stressors related to both patient care and the demands of the Hospital setting. According to Astari et al., (2024), the workload in inpatient units is categorized as high, affecting both physical and mental health. These findings emphasize the importance of focusing on this specific population for understanding the impact of work-related stressors, particularly mental workload, and their potential influence on work-life balance, job satisfaction, and overall well-being. This makes female nurses in inpatient units an ideal group for investigating the relationship between workload and various personal and professional factors.

2.5.2 Sample of the study

The sample for this study was selected using probability sampling, specifically through systematic random sampling. Systematic random sampling was chosen to ensure every nurse had an equal chance of being selected for participation. The minimum sample size was determined using the Lemeshow formula for comparing two population proportions. This method takes into account a 95% confidence level and a 90% power level, ensuring that the sample is sufficiently large to detect significant differences. The formula used for this calculation is as follows:

$$n = \frac{z_{1-\alpha/2}\sqrt{2P(1-P)} + z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)}}{(P_1 - P_2)^2}$$

(Eq 1.)

The calculation for the minimum required sample size (n) is based on several statistical parameters. The term $z_{1-\alpha/2}$ refers to the value from the standard normal distribution (Z-table) corresponding to a 5% significance level (α), while $z_{1-\beta}$ represents the Z-value at a 90% statistical power level (β). The values P_1 and P_2 indicate the proportions of mental workload associated with the risky and non-risky variables, respectively. Meanwhile, P is the average of P_1 and P_2, which is used to represent the combined proportion across both groups. The inclusion criteria for this study were female nurses who were willing to participate and who provided informed consent, as well as those who were not on leave during the data collection period. Nurses who did not complete the questionnaires or withdrew from the study were excluded.

The calculation for the minimum sample size considered various risk factors, such as mental workload and work-life balance. Based on the sample size formula, the minimum number of participants required was 106, after accounting for a potential 10% attrition rate to reduce the risk of data bias. To ensure accuracy and avoid sampling errors, participants were selected randomly from the available nurses in the inpatient units using a systematic

approach. This rigorous sampling process aimed to ensure that the results are generalizable to the broader population of female nurses working in inpatient settings at Hospital X, making the findings more robust and applicable to similar contexts.

2.6 Data collection method

Data for this study were collected through a primary data collection method, using online questionnaires distributed to the selected sample of female nurses in the inpatient units of Hospital X. The data collection period lasted for 14 days, ensuring sufficient time to gather the necessary number of responses to achieve statistical significance. The online questionnaire covered various aspects related to the nurses' demographic characteristics, including age, educational level, employment status, marital status, work experience, and income. These data were crucial for understanding the potential influencing factors on the nurses' mental workload and work-life balance.

In addition to demographic data, the questionnaires included standardized instruments for measuring specific variables relevant to the study. These included the NASA-TLX to assess mental workload, the Fisher, Bulger, and Smith Work-Life Balance Questionnaire to evaluate work-life balance, and the Job Diagnostic Survey (JDS) to measure job satisfaction. The online format of the questionnaire allowed for easy distribution and collection, while also minimizing potential biases that could arise from face-to-face interactions. To encourage participation, informed consent was obtained from all participants, and a small token of appreciation, such as a souvenir, was provided to those who completed the questionnaire. This approach helped maintain ethical standards while ensuring a high response rate.

2.7 Data processing

The data collected from the online questionnaires underwent a rigorous processing procedure to ensure that the results were reliable and valid. The first step in the data processing involved editing, where the responses were carefully examined for completeness and accuracy. Incomplete or invalid responses were removed, ensuring that only high-quality data were included in the analysis. Once the data were validated, the next step was coding, which involved assigning specific codes to each response based on predefined operational definitions. This coding process helped streamline the analysis and allowed for easier categorization of the data based on various factors, such as age, mental workload, and work-life balance.

After coding, the data were entered into statistical software for analysis. The data underwent a normality test using the Kolmogorov-Smirnov method, which revealed that the variables of age, work experience, and work-life balance did not follow a normal distribution ($p < 0.05$). As a result, the median was used as the cut-off point for these variables. The data were then cleaned to eliminate any errors or inconsistencies before being analyzed further. Descriptive statistics were used to summarize the data, and inferential statistical methods were employed to examine the relationships between the mental workload and other variables, including work-life balance and job satisfaction.

2.8 Univariate analysis

Univariate analysis is conducted to examine the distribution, frequency, and percentage of each variable in the study. The variables analyzed in this study include age, education level, marital status, employment status, job satisfaction, income, work-life balance, and mental workload. By analyzing each variable separately, the researcher can gain a clearer understanding of the characteristics of the sample and the key variables being studied. The results of the univariate analysis also serve as the foundation for further analysis, including bivariate and multivariate analysis.

Univariate analysis is crucial in this study as it provides in-depth information about each variable under investigation. The data obtained from this analysis will reveal distribution patterns, whether there are any specific trends in the sample characteristics, or whether certain variables dominate the studied group. It also helps the researcher better understand the general characteristics of the sample, such as age range, education, or employment status, which are highly relevant for determining factors that may be related to nurses' mental workload.

2.9 Bivariate analysis

Bivariate analysis is conducted to examine whether there is a relationship between the dependent variable, mental workload, and the independent variables, which include age, education level, marital status, employment status, work experience, income, job satisfaction, and work-life balance. In this analysis, the Chi-square test is used with a 95% confidence level, assuming that the data is categorical. The Chi-square test examines whether there is a significant relationship between the dependent and independent variables, providing further insights into the factors that influence mental workload.

There are several conditions that must be met for the Chi-square analysis to be valid. One of the conditions is that no cell should have an actual frequency of 0, and in a 2×2 table, no cell should have an expected count less than 5. In tables larger than 2×2, the number of cells with an expected count less than 5 should not exceed 20%. If the Chi-square test results in a p-value less than 0.05, it indicates a significant relationship between the independent and dependent variables (rejecting H0). Conversely, if the p-value is greater than 0.05, it suggests no significant relationship (failing to reject H0), indicating that the independent variables do not significantly influence the mental workload of female nurses.

2.10 Multivariate analysis

Multivariate analysis is performed to explore the relationships between several independent variables and the dependent variable, mental workload, in order to identify the most dominant factors affecting mental workload. Since mental workload (the dependent variable) is categorical, a predictive model is used for the analysis. In this study, multivariate analysis is conducted using multiple logistic regression, utilizing SPSS software, and focusing on variables that showed a p-value ≤ 0.25 in the bivariate analysis. Once the variables with p-values ≤ 0.25 are identified, the model is tested using a stepwise approach, eliminating variables with p-values greater than 0.05.

The comparison of Prevalence Odds Ratios (POR) is conducted before and after the variable elimination process. Any changes in the POR values (greater than 10%) are carefully monitored. If the POR changes significantly, the variable is reintroduced into the model. The process continues until only one variable remains or no further variables can be eliminated. This analysis aims to pinpoint the most influential independent variable(s) related to mental workload, thus providing a more refined understanding of the factors contributing to the nurses' mental workload.

2.11 Research ethics

The research titled "Analysis of the Relationship between Risk Factors and the Mental Workload of Female Nurses at Hospital X in 2024" has received ethical approval from the Research Ethics Committee of Hospital X, where the study was conducted. The ethical approval is documented in the ethics approval letter with protocol number 24-03-0020. The ethical review ensures the protection of the rights of the nurses as research participants, ensuring their voluntary participation (without coercion), safeguarding them from any potential harm or risk, and maintaining confidentiality regarding the data and research findings.

The ethical guidelines for this study emphasize several key principles. First, Respect for Persons requires that researchers treat participants as autonomous agents capable of making informed decisions regarding their participation. Researchers must provide complete information about the study and allow participants to decide whether to participate (informed consent). Furthermore, participants' privacy and their right to withdraw from the study without penalty must be respected.

Second, the principle of Beneficence requires that the research be conducted with the aim of maximizing benefits and minimizing harm. Researchers must act in the best interests of the participants, enhancing their well-being while ensuring that no harm or exploitation occurs. Finally, Justice in research means ensuring fair treatment of all participants. This principle guarantees that the risks and benefits of the study are distributed equally among participants and that no discrimination occurs, ensuring that all subjects are treated equitably and without bias throughout the research process.

3. Results and Discussion

3.1 Univariable analysis results

Univariable analysis was conducted on the dependent variable, which is the nurses' mental workload level, and the independent variables of the study, which include work-life balance condition, age, educational level, employment status, marital status, work experience, job satisfaction, and income, in order to display the frequency distribution and case prevalence among the research respondents.

Table 1. Frequency distribution of mental workload levels of female nurses at RS X.

Variable	Frequency (n=112)	Percentage (%)
Mental Workload Level		
Low	11	9.8
Moderate	11	9.8
Fairly High	13	11.6
High	49	43.8
Very High	28	25.0

The mental workload levels of the respondents were obtained from measurements using the NASA-TLX questionnaire, which produced data across categories of low, moderate, fairly high, high, and very high mental workload. Based on univariable analysis, it was found that the majority of female nurses in the inpatient units of X Hospita experienced a high mental workload, with 49 nurses (43.8%) reporting this level.

Table 2. Frequency distribution of characteristics of female nurses at X Hospital

Variable	Frequency (n)	Percentage (%)
Age		
<26 Years	63	56.3
>26 Years	49	43.8
Last Educational Level		
Diploma (D3)	73	65.2
Bachelor's Degree (S1)	8	7.1
Bachelor's Degree in Nursing (S1 Ners)	31	27.7
Employment Status		
Permanent Employee	38	33.9
Contract Employee	68	60.7
Other	6	5.4
Marital Status		
Unmarried	55	49.1
Married	57	50.9

Work Experience		
>3 Years	29	25.9
<3 Years	83	74.1
Income		
>UMK Bogor City	51	45.5
<UMK Bogor City	61	54.5

The univariable analysis of the study respondents' characteristics revealed the frequency distribution of the respondents' age, last educational level, employment status, marital status, work experience, and income. In terms of age, the analysis found that the majority of the nurse respondents were under 26 years old (56.3%). As for the last educational level, the majority of the respondents had a diploma (D3) in nursing, with 73 respondents (65.2%) reporting this level of education. Regarding employment status, most of the respondents were contract employees, with 68 respondents (60.7%) in this category. For marital status, the majority of the respondents were married, with 57 respondents (50.9%) reporting this status. In terms of work experience, a majority of the respondents had less than 3 years of experience (74.1%), while only 25.9% had more than 3 years. Finally, regarding income, the majority of respondents earned below the local minimum wage (UMK) of Bogor City (54.5%), with 61 respondents in this group.

Table 3. Frequency distribution of job satisfaction levels of female nurses at X Hospital

Variable	Frequency (n)	Percentage (%)
Job Satisfaction		
High	56	50.0
Moderate	47	42.0
Low	9	8.0

The job satisfaction levels of the respondents were measured using the Job Diagnostic Survey questionnaire, which classified satisfaction into three categories. The univariable analysis revealed that the majority of the nurses reported moderate job satisfaction, with 47 nurses (42.0%) in this category. The lowest distribution was found among those with low job satisfaction, comprising 9 nurses (8.0%).

Table 4. Frequency distribution of work-life balance levels of female nurses at X Hospital

Variable	Frequency (n)	Percentage (%)
Work-Life Balance		
High	50	44.6
Low	62	55.4

The work-life balance of the respondents was measured using the Fisher, Bulger, & Smith questionnaire, which categorized work-life balance into high and low levels. The univariable analysis of work-life balance showed that the majority of the respondents had a low level of work-life balance, with 62 respondents (55.4%) in this category.

3.2 Bivariate Analysis Results

Bivariate analysis was conducted using the Chi-square test to determine the association and relationship between the dependent variable (nurses' mental workload) and the independent variables (work-life balance, age, educational level, employment status, marital status, work experience, job satisfaction, and income).

Table 5. Relationship between work-life balance, age, educational level, employment status, marital status, work experience, job satisfaction, and income with nurses' mental workload at x hospital

Variable	Mental workload						P-value	Crude POR (95% CI)
	Low – fairly high		High & very high		Total			
	n	%	n	%	n	%		
Work Life Balance								
High	24	48.0	26	52.0	50	100.0		Ref
Low	11	17.7	51	82.3	62	100.0	0.001	4.28 (1.819–10.071)
Age								
≤26 years old	19	30.2	44	69.8	35	100.0		Ref
>26 years old	16	32.7	33	67.3	77	100.0	0.939	0.89 (0.399–1.990)
Educaltion level								
diploma (D3)	28	38.4	45	61.6	73	100.0		Ref
S1	3	37.5	5	62.5	8	100.0	0.703	0.74 (0.167–3.289)
S1 Nursing	4	12.9	27	87.1	31	100.0	0,018	4.19 (1.336–13.107)
Employment status								
Permanent employee	14	3.8	24	36.2	38	100.0		Ref
Contract employee	21	30.9	47	69.1	68	100.0	1.000	1.04 (0.461 – 2.364)
Others	0	0.0	6	100.0	6	100.0	0.174	0.67 (0.586 – 0.766)
Marital status								
Single	17	30.9	38	69.1	55	100.0		Ref
Married	18	31.6	39	68.4	57	100.0	1.000	0.97 (0.436 – 2.156)
Length of service								
>3 years	13	44.8	16	55.2	29	100.0		Ref
≤3 years	22	26.5	61	73.5	83	100.0	0.110	2.25 (0.935 – 5.428)
Job satisfaction								
High	21	37.5	35	62.5	56	100.0		Ref
Mid	14	29.8	33	70.2	47	100.0	0.938	1.12 (0.499–2.537)
Low	0	0.0	9	100.0	9	100.0	0.055	0.66 (0.575–0.758)
Income								
>Minimum wage of Bogor City	14	27.5	37	72.5	51	100.0		Ref
≤Minimum wage of Bogor City	21	34.4	40	65.6	61	100.0	0.556	0.72 (0.320–1.621)

The Chi-square test results indicated a significant relationship (p-value = 0.001) between the respondents' work-life balance condition and the level of mental workload experienced. Nurses with a low work-life balance were more likely to report a high or very high mental workload, with 51 nurses (82.3%) in this category. The odds ratio (4.28) suggests that nurses with a poor work-life balance (low) are 4.28 times more likely to experience a high mental workload.

3.3 Multivariate candidate selection

The selection of candidates for multivariate analysis was conducted to determine the research variables that would subsequently be tested to identify the variables most strongly associated with the dependent variable (mental workload level). The candidate selection was based on the p-value from the chi-square test between the independent and dependent variables. Variables with a p-value <0.25 in the bivariate analysis were selected for further testing in multivariate analysis. The results of the multivariate candidate selection are presented in the following table.

Table 6. Multivariate candidate selection results

Variable	p-value	Description
Work Life Balance	0.001	Candidate
Age	0.939	Not a Candidate

Last Education	0.018	Candidate
Employment Status	0.174	Candidate
Marital Status	1.000	Not a Candidate
Length of Service	0.110	Candidate
Job Satisfaction	0.055	Candidate
Income	0.556	Not a Candidate

Based on the multivariate candidate selection, five variables were selected for multivariate analysis using multiple logistic regression: work life balance, last education, employment status, length of service, and job satisfaction.

3.4 Multiple logistic regression modeling

The selected multivariate candidates were tested using multiple logistic regression. Variables with p-values >0.05 were eliminated step by step, starting with the highest p-value. The change in the odds ratio (OR) before and after eliminating each variable was calculated. If a variable was eliminated and there was a change in OR of >10%, it was re-entered into the model. If the change in OR was ≤10%, the variable was removed permanently. Below are the results of the first multivariate model:

Table 7. Full model logistic regression

Variable	B	p-value	POR	95% CI (lower)	95% CI (upper)
Work Life Balance (Low)	1.34	0.009	3.81	1.39	10.46
Last Education (S1)	0.67	0.426	1.96	0.37	10.21
Last Education (S1 Nursing)	1.85	0.004	6.36	1.80	22.47
Employment Status (Contract)	-0.14	0.174	0.87	0.26	2.96
Length of Service (<3 Years)	0.98	0.150	2.68	0.70	10.24
Job Satisfaction (Moderate)	-0.07	0.892	0.93	0.34	2.51

Table 7 shows the full model results from the multiple logistic regression. The next step is to eliminate the variable with the highest p-value, which is job satisfaction (p-value = 0.892).

Table 8. First logistic regression model

Variable	B	p-value	POR	95% CI (lower)	95% CI (upper)
Work Life Balance (Low)	1.55	0.001	4.72	1.83	12.17
Last Education (S1)	0.58	0.490	1.78	0.35	9.19
Last Education (S1 Nursing)	1.79	0.005	6.00	1.73	20.87
Employment Status (Contract)	-0.18	0.74	0.83	0.24	2.89
Length of Service (<3 Years)	0.77	0.256	2.15	0.57	0.08

Table 8 presents the first regression model after eliminating job satisfaction. The next step is to calculate the change in the odds ratio before and after eliminating job satisfaction. The results of the change in odds ratio are shown below.

Table 9. Odds ratio change without job satisfaction

Variable	Old POR	New POR	POR Change (%)
Work Life Balance	3.81	4.72	-19.3%
Last Education (S1)	1.96	1.78	10.1%
Last Education (S1 Nursing)	6.36	6.00	6.0%
Employment Status (Contract)	0.87	0.83	4.8%
Length of Service (<3 Years)	2.68	2.15	24.7%

Based on Table 9, the change in the odds ratio shows that there was a >10% change. Therefore, job satisfaction was re-entered into the model. The next step is to remove the variable employment status due to its p-value >0.05 (p-value = 0.821).

Table 10. Second logistic regression model

Variable	B	p-value	POR	95% CI (lower)	95% CI (upper)
Work Life Balance (Low)	1.36	0.008	3.89	1.44	10.58
Last Education (S1)	0.58	0.490	1.78	0.34	9.27
Last Education (S1 Nursing)	1.78	0.005	5.95	1.71	20.68
Length of Service (<3 Years)	0.85	0.113	2.32	0.81	6.62
Job Satisfaction (Moderate)	-0.04	0.934	0.96	0.36	2.56

Table 10 shows the second regression model after removing employment status. The next step is to calculate the change in the odds ratio before and after removing employment status:

Table 11. Odds ratio change without employment status

Variable	Old POR	New POR	POR Change (%)
Work Life Balance	3.81	3.90	-2.1%
Last Education (S1)	1.96	1.79	10.1%
Last Education (S1 Nursing)	6.36	5.95	6.9%
Length of Service (<3 Years)	2.68	2.33	15.5%
Job Satisfaction (Moderate)	0.93	0.96	-3.1%

Based on Table 11, the change in the odds ratio shows a >10% change. Therefore, employment status was re-entered into the model. The next step is to remove the variable length of service due to its p-value >0.05.

Table 12. Third logistic regression model

Variable	B	p-value	POR	95% CI (lower)	95% CI (upper)
Work Life Balance (Low)	1.46	0.004	4.33	1.60	11.68
Last Education (S1)	0.57	0.493	1.77	0.35	9.01
Last Education (S1 Nursing)	1.83	0.004	6.20	1.79	21.52
Employment Status (Contract)	0.37	0.448	1.45	0.56	3.79
Job Satisfaction (Moderate)	-0.06	0.908	0.94	0.36	2.51

This table shows the third regression model after removing length of service. The final model presents the variables that significantly influence mental workload.

Table 13. Calculation of POR Changes Without the Variable of Length of Service

Variable	Old POR	New POR	POR Change
Work Life Balance (Low)	3.81	4.33	-12.0%
Highest Education (Bachelor)	1.96	1.77	10.7%
Highest Education (Nursing Bachelor)	6.36	6.20	2.6%
Employment Status (Contract Employee)	0.87	1.45	-40.0%
Job Satisfaction (Medium)	0.93	0.94	-1.1%

Based on Table 13, the calculation of the change in POR values indicates that there is a change greater than 10%. Therefore, the length of service variable was reintroduced into

the model. All variables with a p-value greater than 0.05 were excluded. Consequently, the model fit for this study is the Full Model.

3.4 Final model

The final model indicates that the variable with the highest OR value is the most dominant. This suggests that the higher the OR value, the greater the influence of the independent variable on the dependent variable. The final model table of the logistic regression is presented below.

Table 14. Final logistic regression model

Variable	Mental workload				Total		Adjusted OR (95% CI)	P-value
	Low - fairly high		High & Very high					
	n	%	n	%	n	%		
Work Life Balance								
High	24	48.0	26	52,0	50	100.0	Ref	
Low	11	17.7	51	82.3	62	100.0	3.81 (1.389 –10.460)	0.009
Educaton level								
Diploma (D3)	28	38.4	45	61.6	73	100.0	Ref	
S1	3	37.5	5	62.5	8	100.0	1.96 (0.375–10.214)	0.426
S1 Nursing	4	12.9	27	87.1	31	100.0	6.36 (1.800–22.472)	0.004
Employment status								
Permanent employee	14	3.8	24	36.2	38	100.0	Ref	
Contract employee	21	30.9	47	69.1	68	100.0	0.87 (0.255–2.955)	0.821
Others								
Marital status								
Single	13	44.8	16	55.2	29	100.0	Ref	0.150
Married	22	26.5	61	73.5	83	100.0	2.68 (0.700-10.235)	
Job satisfaction								
High	21	37.5	35	62.5	56	100.0	Ref	0.892
Mid	14	29.8	33	70.2	47	100.0	0.93 (0.347 – 2.51)	

The final multivariate logistic regression model presented in Table 22 shows that the highest education level is the most significant variable influencing mental workload. Nurses with a Bachelor's degree in Nursing (S1 Ners) are 6.36 times more likely to experience high to very high mental workload compared to nurses with a Diploma (D3). Additionally, the work-life balance variable was also found to significantly affect mental workload. Nurses with low work-life balance have 3.81 times greater risk of experiencing high mental workload compared to those with high work-life balance.

3.5 Overview of mental workload, work-life balance, age, education level, marital status, employment status, length of service, job satisfaction, and income among female nurses in the inpatient unit of X Hospital (2024)

Based on the measurement of mental workload using the NASA-Task Load Index on 112 respondents, 43.8% of female nurses in the inpatient unit of X HOSPITAL reported experiencing high mental workload. This high mental workload may be attributed to dominant factors such as workload, task complexity, and job consequences (Tarwaka et al., 2004). External factors like job tasks, organizational aspects, and the work environment, as well as internal factors such as age, education level, and job satisfaction, significantly affect the perceived mental workload of nurses.

The high percentage of nurses experiencing mental workload can be caused by the demanding nature of nursing, which requires not only physical work but also mental efforts in caring for patients. Nurses are often under pressure due to self-expectations, patient or

family demands influenced by patient satisfaction, and high alertness required for immediate nursing actions (Permatasari et al., 2023).

The analysis of work-life balance, using the Fisher, Bulger, & Smith questionnaire, revealed that 55.4% of respondents had low work-life balance. The questionnaire measured four dimensions representing two aspects of work-life balance: WIPL (Work Interference with Personal Life) and PLIW (Personal Life Interference with Work), capturing both the demands and resources of personal and professional life.

The high proportion of nurses with low work-life balance suggests that many nurses struggle to maintain a balance between their personal and professional lives. This imbalance may result from the high demands placed on nurses, which prevent them from effectively managing both spheres of life. Various factors, such as work schedule flexibility, reward systems, social support, and policies on workers' rights and leave, along with personal life responsibilities, affect the work-life balance of nurses (Wulansari, 2023).

The analysis also examined individual characteristics such as age, education level, employment status, marital status, length of service, and income. The majority of respondents were female nurses under 26 years of age (56.3%), with a diploma (D3) as their highest education (65.2%), and most were contract employees (60.7%). The analysis found that the level of education, job satisfaction, and income significantly influence mental workload, with income levels correlating with job satisfaction and mental workload perceptions.

3.6 Variables most strongly associated with mental workload among female nurses in X Hospital's inpatient unit

Multivariate analysis identified education level as the most influential variable in determining mental workload among female nurses. The final logistic regression model indicated that nurses with a Bachelor's degree in Nursing (S1 Ners) had a 6.36 times higher risk of experiencing high mental workload compared to those with a Diploma (D3). This finding aligns with research by Xiao et al. (2011) and Rubio- Valdehita (2017), who also found that higher educational levels correlate with higher mental workload. Nurses with higher education tend to handle more complex tasks and responsibilities, which can lead to greater mental workload. Another significant variable was work-life balance. The final model showed that nurses with poor work-life balance were 3.81 times more likely to experience high mental workload compared to those with better balance. This result is consistent with Borowiec's (2022) findings that a lower work-life balance contributes to higher mental workload.

4. Conclusions

This study found that 43.8% of female nurses in the inpatient unit at X Hospital in 2024 experienced high mental workload, with 25.0% facing very high mental workload. Additionally, 55.4% reported poor work-life balance, while 50.0% expressed high job satisfaction. Demographic data revealed that the majority of respondents were under 26 years old, with 65.2% holding a diploma, 60.7% were on a contract, and 74.1% had less than three years of experience. Bivariate analysis identified significant relationships between work-life balance and education level (p-value=0.001 and p-value=0.018), indicating that these factors influence mental workload. Multivariate analysis revealed that an S1 Ners degree was the most significant factor affecting mental workload (p-value = 0.004; POR = 6.39), with job satisfaction, employment status, and years of experience acting as confounding variables.

To enhance work-life balance, nurses should conduct personal evaluations to better manage stressors and prevent negative outcomes such as burnout. RS. X is advised to implement mental health promotion programs, including recreational activities and

counseling services for nursing staff. Regular assessments of mental workload can help mitigate health risks associated with excessive mental demands. Future research should explore additional factors such as shift work, job insecurity, and role conflicts, while also examining other professions with similarly high mental workload demands to gain a broader understanding of the issue.

Acknowledgement

Author Contribution

The author was responsible for the entire process of the research, including the conceptualization, data collection, analysis, and manuscript preparation. The design, execution, and interpretation of the study were all conducted independently by the author.

Funding

Ethical Review Board Statement

Not available.

Informed Consent Statement

Not available.

Data Availability Statement

Not available.

Conflicts of Interest

The author declare no conflict of interest.

Open Access

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