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Correlation between Mental Workload and Work Stress in Nurses at Hospital X

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ABSTRACT

Background: A mismatch between job requirements and individual abilities can lead to reduced performance due to work-related stress. Work stress affects many professions, but nurses at Hospital X experience it most frequently. A national Indonesian survey reported that 50.9% of nurses across the country experienced work stress in 2018. Previous studies have also examined how stress levels among nurses are associated with individual characteristics (such as age, gender, and length of service) and the mental workload they face.
Objectives: This study examined which nurse characteristics, combined with their mental workload, influence their work-related stress levels.
Methods: This study used a cross-sectional quantitative design to collect data from nurses at Hospital X in August 2025 through the distribution of the NASA-TLX and ENSS questionnaires. A total of 30 nurses participated through purposive sampling. Frequency distribution tables were used for univariate analysis, while chi-square and Fisher's exact tests were performed for bivariate analysis.
Results: The univariate analysis showed that 63.3% of participants were under 29 years old, 90.0% were female, and 53.3% had worked for less than four years. The results also indicated that 56.7% of participants experienced a high mental workload, while 60.0% reported low levels of work stress. Bivariate analysis using the chi-square test revealed a significant relationship between mental workload and work stress (p=0.035). However, no significant relationships were found between age and work stress (p=0.266), gender and work stress (p=0.548), or length of service and work stress (p=0.765).
Conclusion: This study found that mental workload significantly affects work stress levels among nurses at Hospital X. However, age, gender, and length of service were not found to influence work stress among nurses in this setting.

Keywords: Ergonomic Balance, Good Health and Well-Being, Mental Workload, Nurses, Work Stress

INTRODUCTION

The concept of ergonomic balance examines the relationship between work capacity and task demands, which must remain aligned to achieve optimal performance. Work capacity refers to an individual's personal, physiological, psychological, and biomechanical abilities. In contrast, task demands involve task characteristics, material characteristics, organizational factors, and environmental conditions. When task demands exceed work capacity, overstress may occur, leading to discomfort, fatigue, accidents, injuries, pain, illness, and reduced productivity (Tarwaka, Hadi, & Sudiajeng, 2019).

In the healthcare setting, work stress refers to the psychological and physiological strain that arises when professional responsibilities become overwhelming. Nursing is particularly susceptible to work stress, as it is a high-pressure profession requiring continuous alertness, precision, and emotional stability (Harshana, 2018; Tang et al., 2022). The demanding nature of nursing results in

consistently high workloads, which, when sustained over time, can negatively affect nurse performance and compromise both staff and patient safety (Tarwaka, Hadi, & Sudiajeng, 2019).

The American Institute for Occupational Safety and Health (OSH) identifies nursing as the occupation with the highest mental workload. This finding is consistent with a national survey in Indonesia, which reported that 50.9% of nurses experience work stress. Addressing this issue is essential, as work stress can reduce motivation and negatively impact healthcare service quality (Rhamdani & Wartono, 2019; Susanti et al., 2024). Preventive measures can be implemented through the Hospital Occupational Safety and Health Management System (HOSHMS). According to Ministry of Health Regulation No. 66 of 2016, hospitals must protect workers from both physical and psychological harm. Effective implementation of HOSHMS can promote fair workload distribution, improve worker welfare, and maintain service quality. Beyond ergonomic and physical risks, psychological burdens—such as workload pressure, emotional labor, and role conflict are increasingly recognized as significant threats to nurses' mental well-being (Kementerian Kesehatan RI, 2016).

Previous studies indicate that age influences an individual's ability to tolerate stress and the types of stressors perceived as most disruptive. In general, adults tend to have higher stress tolerance (Ansori & Martiana, 2017). Gender has also been found to affect work stress in nurses; individuals with more masculine personality traits may manage stressors with less emotional response and lower anxiety than those with more feminine traits (Awalia et al., 2021). Length of service is another aspect that may influence work performance. It is generally assumed that longer work experience improves an individual's skills and ability to cope with job demands (Verantie et al., 2025). Mental workload itself is a common contributor to work stress when job demands exceed individual capacity (Mustakim & Putri, 2023).

A preliminary study involving field observations and interviews with the OSH team at Hospital X revealed that the hospital had never assessed physical or mental workload or work stress among nurses, despite increases in absenteeism, declining motivation, and incident reports. The hospital is currently working to strengthen its implementation of HOSHMS, and the findings from this study are expected to support evaluations related to psychological risks at Hospital X. This study aims to examine how mental workload influences work stress among nurses at Hospital X. It focuses on identifying factors that contribute to work-related stress. Since Hospital X lacks research examining how personal characteristics relate to mental workload and work stress, additional studies are needed to better understand the existing work environment.

METHODS

This study employed a quantitative analytical observational design using a cross-sectional approach. In essence, it examined the relationship between specific risk factors (independent variables) and their effects (dependent variables) by collecting data at a single point in time. The study was conducted at Hospital X in August 2025. Hospital X employs 43 nurses across five service units, and from this population, 30 nurses were selected through purposive sampling, meaning participants were chosen based on criteria relevant to the study's objectives.

To be included in the study, nurses were required to meet the following criteria: (1) have worked at Hospital X for at least six months; (2) be directly involved in patient care; (3) be actively working during the study period; and (4) be willing to participate and provide written informed consent. Exclusion criteria included: (1) nurses who were on leave (sick, maternity, or special leave); (2) nurses with structural positions not directly involved in patient care; and (3) questionnaires that were incomplete and could not be analyzed. Thus, the study focused on nurses who were actively engaged in patient care and agreed to participate.

The research examined individual characteristics (age, gender, and length of service) and mental workload as independent variables, while work stress served as the main dependent variable. Data collection involved the use of primary data obtained directly through questionnaires. Three instruments were employed: an individual characteristics questionnaire, the National Aeronautics and Space Administration Task Load Index (NASA-TLX), and the Expanded Nursing Stress Scale (ENSS).

The NASA-TLX assessed mental workload through six dimensions: mental demand, physical demand, time demand, performance, effort, and frustration. Each dimension contributes to a weighted score that results in an overall mental workload index (Sevy, 2019). Work stress was measured using the validated ENSS questionnaire, which covers various aspects such as workload, interactions with patients and families, workplace conflict, and uncertainty related to patient care (Harsono et al., 2024).

Following data collection, researchers conducted data processing steps that included editing, cleaning, coding, and data entry. A descriptive tabular analysis was used to display the distribution of each variable across categories. The chi-square test and Fisher's exact test were applied for correlation analysis, as all variables in this study used nominal and ordinal measurement scales. The

study received ethical approval from the Health Research Ethics Committee of the Faculty of Dentistry, Airlangga University (Approval Number: 0951/HRECC.FODM/IX/2025). All research procedures adhered to ethical guidelines, and each participant provided informed consent voluntarily and consciously.

RESULTS AND DISCUSSION

Frequency Distribution of Individual Characteristics, Mental Workload, and Work Stress among Nurses at Hospital X

In this study, the individual characteristics examined included age, gender, and length of service. Age was calculated as the number of years from the respondent's birth to the time of the study and categorized into two groups: <29 years and ≥29 years. This categorization was based on the mean value, as the age data were normally distributed. Gender referred to the respondents' biological sex and was classified as either male or female. Length of service represented the number of years the respondents had worked as nurses from the time they began employment until the study period. Length of service was also categorized into two groups, <4 years and ≥4 years, based on the mean value because the data showed a normal distribution. All three variables were obtained through questionnaires. Categorizing variables using the mean cutoff is a commonly used statistical approach when standardized classifications are unavailable, and it helps achieve balanced sample sizes across groups.

The task demand examined in this study was mental workload, which falls under task characteristics. Mental workload data were collected using the National Aeronautics and Space Administration Task Load Index (NASA-TLX) questionnaire. Mental workload was categorized into two groups: low (<70.7) and high (≥70.7), with the cutoff determined by the median value because the data were not normally distributed. The performance variable assessed in this study was work stress, measured using the Expanded Nursing Stress Scale (ENSS). Work stress scores were categorized into low (<122.5) and high (≥122.5), also based on the median value due to the non-normal distribution of the data.

Table 1. Frequency Distribution of Individual Characteristics (Age, Gender, Length of Service), Mental Workload, and Work Stress among Nurses at Hospital X

Variable	n	%
Age		
<29 years old	19	63.3
≥29 years old	11	36.7
Gender		
Male	3	10.0
Female	27	90.0
Length of Service		
<4years	16	53.3
≥4years	14	46.7
Mental Workload		
Low	13	43.3
High	17	56.7
Work Stress		
Low	18	60.0
High	12	40.0
Total	**30**	**100.0**

Based on Table 1, most respondents were younger than 29 years (63.3%) and female (90.0%). The majority had worked as nurses for less than four years (53.3%). More than half of the respondents (56.7%) reported experiencing a high mental workload. Additionally, 60.0% of respondents reported high levels of work stress.

Correlation between Individual Characteristics and Work Stress among Nurses at Hospital X

The correlation analysis was conducted using the chi-square test for variables that met the required assumptions, while the Fisher's exact test was applied when these assumptions were not satisfied. The purpose of this analysis was to assess the relationship between individual characteristics and work stress among nurses at Hospital X. In this study, the relationship between age and work stress was examined using Fisher's exact test, whereas the relationships between gender and work stress, as well as length of service and work stress, were analyzed using the chi-square test.

Table 2. Cross Tabulation of Individual Characteristics (Age, Gender, Length of Service) with Work Stress among Nurses at Hospital X

Variable	Work Stress				Total		p-value
	Low		High				
	n	%	n	%	n	%	
Age							
<29 years old	13	68.4	6	31.6	19	100.0	0.266*
≥29 years old	5	45.5	6	54.5	11	100.0	
Gender							
Male	1	33.3	2	66.7	3	100.0	0.548
Female	17	63.0	10	37.0	27	100.0	
Length of Service							
<4years	10	62.5	6	37.5	16	100.0	0.765
≥4years	8	57.1	6	42.9	14	100.0	

Note: *Fisher's exact test

Table 2 presents the cross-tabulation and correlation test results. The cross-tabulation shows that respondents aged <29 years mostly experienced low work stress (68.4%), whereas those aged ≥29 years mostly experienced high work stress (54.5%). However, the correlation analysis using Fisher's exact test produced a p-value of 0.266 (>0.05), indicating no significant relationship between age and work stress among nurses at Hospital X. These findings align with those of Awalia et al. (2021), who also reported no significant association between age and work stress. Similarly, Rhamdani and Wartono (2019) found no relationship between age and work stress among nurses. This may be because work stress is influenced by multiple factors, making age difficult to analyze in isolation. Additionally, increasing age often brings greater experience, knowledge, and responsibility, which may help compensate for reduced adaptability.

Regarding gender, most male respondents experienced high work stress (66.7%), while most female respondents experienced low work stress (63.0%). The chi-square test yielded a p-value of 0.548 (>0.05), indicating no significant relationship between gender and work stress at Hospital X. This result is consistent with findings by Maranden et al. (2023), who also reported no association between gender and work stress. One possible explanation is that the hospital applies the same task distribution for male and female nurses, resulting in similar exposure to stressors. However, these results differ from those reported by Alfayad et al. (2024), who found gender to be significantly associated with work stress in hospital settings. Variations in working conditions, staffing composition, task allocation, and social support systems across hospitals may contribute to these differences. Field observations also revealed that several nurses at Hospital X have developed effective coping strategies. Senior nurses reported feeling more confident in managing stress, whereas junior nurses noted strong social support from their colleagues.

For the length of service variable, 62.5% of nurses with less than four years of service experienced low work stress, while 57.1% of those with ≥4 years of service experienced high work stress. The chi-square test produced a p-value of 0.765 (>0.05), indicating no significant relationship between length of service and work stress among nurses at Hospital X. These findings differ from studies by Verantie et al. (2025) and Pajow et al. (2020), which reported significant associations between these variables. Differences in respondent characteristics, workload levels, and organizational environments may explain the contrasting results. Additionally, long-serving nurses at Hospital X may have developed better adaptation and coping strategies, reducing the impact of work stress.

Correlation between Mental Workload and Work Stress in Nurses at Hospital X

The chi-square test was used to determine the correlation between mental workload and work stress among nurses at Hospital X. A cross-tabulation table was also prepared to compare levels of mental workload with levels of work stress. The aim was to assess how work stress varied according to the mental workload experienced by the nurses.

Table 3. Cross-sectional Analysis and Correlation between Mental Workload and Work Stress in Nurses at Hospital X

Mental Workload	Work Stress				Total		p-value
	Low		High				
	n	%	n	%	n	%	
Low	5	38.5	8	61.5	13	100.0	0.035
High	13	76.5	4	23.5	17	100.0	

The cross-tabulation in Table 3 shows that nurses with a low level of mental workload predominantly experienced high work stress (61.5%). In contrast, nurses with a high level of mental workload mostly reported low work stress (76.5%). The chi-square statistical test produced a p-value of 0.035 (<0.05), indicating a significant relationship between mental workload and work stress among nurses at Hospital X. Observational findings suggest that nurses with higher workloads often move between units, resulting in limited rest time, which may contribute to increased mental strain. Furthermore, NASA-TLX measurements indicate that the dimensions contributing most to mental workload among nurses at Hospital X are mental demands, time demands, and performance.

These findings are consistent with those of Kusumaningrum et al. (2022), who reported a correlation between workload and work stress among nurses. The most common workload factor was a high number of tasks within limited time, contributing to elevated stress levels. Putra (2022) also noted that mental workload in nurses may be influenced by factors such as patient volume, time pressure, and multitasking demands. Additionally, Putra found a reciprocal relationship between mental workload and work stress, meaning that mental workload influences stress levels and vice versa. However, the present study differs slightly from previous research, as nurses with high workloads were found to exhibit relatively low levels of stress. This may result from other moderating factors such as strong coworker and family support, a positive work environment, or greater professional experience (Hermawan & Tarigan, 2021).

Based on these findings, hospital management should ensure balanced distribution of mental workload among nurses. Routine workload evaluations and stress management training are necessary to help nurses cope effectively with job demands. Supervisor and coworker support also plays an important role in minimizing the negative effects of work stress (Mudayana, 2020).

Work stress represents a psychological hazard within hospital settings. Therefore, hospitals are required to implement an occupational safety and health management system to minimize risks and ensure staff safety. Strategies that may help reduce stress include implementing a rolling shift system and encouraging nurses to engage in enjoyable activities before and after shifts. Nurses should also be guided to practice effective time management, ensuring adequate rest, exercise, sleep, and relaxation (Aminulloh & Tualeka, 2024).

This study has several strengths and limitations. A major strength is the use of validated measurement tools—the NASA-TLX and the Expanded Nursing Stress Scale which enhances the reliability of the findings. The study also provides valuable insights into the relationship between individual characteristics, mental workload, and work stress among nurses at Hospital X, offering useful information for improving workload distribution. However, the study's limitations include a relatively small sample size, which may reduce generalizability. The cross-sectional design also restricts causal interpretation, as data were collected at a single point in time. Additionally, the study relied on self-reported data, which may introduce response bias. Future research should consider larger samples, longitudinal designs, and additional variables to better understand the dynamics of mental workload and work stress.

CONCLUSION

The research findings show that the 30 nurses who participated in the study were mostly young females under 29 years of age. The majority of participants had less than four years of nursing experience. The survey results indicated that most participants experienced high levels of mental workload, and 60.0% reported symptoms of severe work-related stress. Mental workload was the only factor found to have a significant association with work stress among nurses at Hospital X. The study did not identify any substantial relationship between work stress and age, gender, or length of service.

These findings highlight the need for effective mental workload management to help nurses maintain their mental well-being while providing high-quality patient care. Future studies should explore additional factors such as social support, job satisfaction, and hospital management systems to better understand contributors to work-related stress among nursing professionals. The results of this research can serve as a reference for Hospital X in developing strategies to manage nurses' mental workload, thereby improving both staff well-being and service quality. Further research is recommended to examine the influence of social support, job satisfaction, and organizational factors on nurse work stress.

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Conflict of Interest and Funding Disclosure

None

Author Contributions

MSKH: conceptualization, investigation, methodology, supervision, writing–review and editing; RBBEK: methodology; formal analysis, writing–original draft; and AWS: writing–original draft, writing–review and editing.

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