

Investigating factors affecting mental workload in Emergency department nurses in Ilam province hospitals using the NASA-TLX index

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Article Info	ABSTRACT
Article type: Original article	Introduction: One of the factors affecting the behavior and performance and also on the efficiency and productivity of nurses in the workplace is mental work load. This study aimed to assess the mental work load and risk factors on emergency department nurses were employed in hospitals in Ilam.
Article History: Received: Sep. 24, 2025 Revised: Oct. 28, 2025 Accepted: Nov. 20, 2025 Published Online: Dec. 02, 2025	Materials & Methods: This descriptive, cross-sectional study was performed on 183 nursing were employed in the emergency department in hospitals Ilam. for collecting data NASA-TLX (measuring mental load) Specialized questionnaire was used. The data collected from the NASA-TLX questionnaire software was NASA-TLX. and the final score of mental work load was determined. Data collected analyzed use to SPSS statistical software and related test was performed.
 Correspondence to: Mehrdad Kazemi Department of Occupational Health Engineering, Faculty of Health, Ilam University of Medical Sciences, Ilam, Iran	Results: Spearman correlation test showed no significant relationship between the variables of subjective and mental work load. But correlation was significant between the number of Care individual patients on each shift and scores of mental work load in emergency department nurses (Pvalue<0.05). NASA's index showed that the lowest score of six scales was Temporal demand and the highest scores was mental demand.
Email: Kazemi.Mehrdad1362@gmail.com	Conclusion: Based on the findings of the study was to understand that the mental work load was high in nursing emergency department. Therefore, in this group use of intervention strategies to reduce mental work load seems to be necessary.
	Keywords: Mental work load, Nursing, Emergency department, NASA task load index (NASA-TLX)

➤ How to cite this paper

Kazemi M, Mehri A, Rashidi MA. Investigating factors affecting mental workload in Emergency department nurses in Ilam province hospitals using the NASA-TLX index. *Journal of Health Sciences Perspective*. 2026; 2(1):16-23.

Introduction

Earning income, purposeful physical and mental activity, creating opportunities for social contact and communication, feeling competent and self-esteem are among the needs of individuals for work (1). In this regard, hospitals and other health and medical centers, like an industrial unit, consist of production factors such as capital, human resources, technology and management, which take steps to produce a product called maintaining, restoring and promoting human health, and nurses are among the human resources of these centers (2). Nursing is an important part of quality healthcare, and nurses play a vital role in a country's healthcare system (3). In our country, 80% of the health care system employees are nurses. They also perform 80% of the work in this system (4), while the National Occupational Safety and Health Administration has identified nursing as one of the 40 professions with a high prevalence of work-related diseases and believes that nursing is probably the most stressful profession among health professions. Among health professions, intensive care nurses are most exposed to workplace stress due to their high level of responsibility (5,6).

In work environments, factors such as: high speed of work, high workload, lack of social support, etc. can create stress in an individual (7). Research has shown that the level of stress in nurses is inversely related to the quality of nursing care provided by them (8). One of the factors that affects the behavior and performance of nurses in the workplace and can affect their efficiency and productivity is mental workload. Mental workload is the amount of effort that the mind makes while performing a task (9). Various factors such as insufficient sleep time impact mental work load. Unsuitable sleep quality results in some side effects, including fatigue, health disorders (cardiac diseases, high blood pressure, diabetes, enteric problems, depression, decreased libido, overweight, and heightened risk of death), cognitive performance disorders (learning, retention, consciousness, concentration, and reasoning),

occupational events, irritability, improper decision-making, etc. (10).

Nurses are a group of individuals who encounter a high level of fatigue, improper sleep quality, implausible expectations, irregular and excessive working shift, and innately tense working environments. According to the results of different studies, more than half of nurses have severe sleep problems, which can impact the quality of care provided by them (11). In the study by Kovner et al. on novice nurses over a 10-year period, the results showed that 17.5% of nurses resigned their jobs in their first working year (12). In Iran, 80% of working individuals comprise the healthcare system of the country, and these people present healthcare services at the forefront. The above-explained issues and the fact that the health of nurses can impact the quality of the care they provide as well as the health of patients imply that they themselves should be healthy individuals to be able to reach their ideal conditions and desirable performances in the workplace (13). Hence, this study aimed to assess the mental work load and risk factors on emergency department nurses were employed in hospitals in Ilam.

Materials and methods

Study Design

This cross-sectional descriptive-analytical study was conducted in 2019 on 183 emergency department nurses in hospitals in Ilam province. The participants in this study were between 22 and 55 years old with at least one year of work experience in the emergency department. The data collection tool included a general questionnaire to measure the background variables of the target group and a specialized and standardized NASA mental workload questionnaire [National Aeronautics and Space Administration Task Load Index (NASA-TLX)] to measure the level of mental workload in nurses; the aforementioned questionnaire has acceptable validity and reliability in scientific communities. Regarding the validity of this questionnaire, we can refer to the study conducted by Safari (14) regarding the assessment of

workload. The reliability of this questionnaire was also evaluated by conducting a pilot study on 30 people from the study population, and the Cronbach's alpha value was 0.87. The NASA mental strain assessment model includes three dimensions of the demands imposed on the operator while performing the task (physical, mental, and time demands) and three factors related to the outcome of the task (personal performance, effort, and frustration level). The process of assessing mental workload using the NASA model consists of three stages: the first stage is to determine the weighting of the workload, the second stage is to determine the rating of each of the six scales, and finally the third stage is to determine the final mental workload score. In the first stage, the six scales are evaluated and selected by the operator. In the second stage, after determining the weighting of each scale, its rating must be determined by the operator, and in the last stage, the obtained weighting and rating scores are entered into the NASA mental workload software and the final mental workload score is calculated.

To conduct the study, the study objectives were first explained to each nurse, then necessary training and instructions were provided on how to complete the questionnaire. Finally, the mental load score obtained along with other demographic and specialized information from the questionnaire was entered into the SPSS-23 statistical software and analyzed using one-way analysis of variance to determine the relationship between marital status, education level, and gender with mental load and Pearson correlation test to determine the relationship between work experience, age, number of shifts per person per month, number of hours per shift, number of hours of rest after each shift, and number of patients under the care of the individual in each shift with mental load.

Results

his study was conducted among 183 nurses working in the emergency department. Information regarding the background and demographic variables of the study participants is presented in Table 1.

Table 1. Characteristics (Background and demographic factors) of Participants

Variable	variable description	Frequency	Percentage (%)
Gender	Male	67	36.6
	Female	116	63.4
Age groups (Year)	22-30	77	42.07
	31-40	85	46.44
	41-50	17	9.3
	>50	4	2.19
Marital Status	Single/ No Spouse	108	41
	Married	75	59
Education Level	Bachelor's Degree	142	77.6
	Master's Degree	39	21.31
	PhD	2	1.09
Work history (Year)	1-3	57	31.1
	3-10	105	57.4
	10-20	14	7.7
	>20	7	3.8
Shift hours (hr)	6	98	53.55
	12	71	38.8
	18	14	7.65
Rest period after each work shift (hr)	12	109	59.57
	12-24	56	30.6
	24-48	11	6.01
	>48	7	3.82

Number of shifts per month (shift)	<10	34	18.6
	10-20	67	36.6
	>20	82	44.8
Number of patients supervised per shift	1 patient	13	7.1
	2 patients	94	51.4
	3 patients	67	36.6
	Supervisor	9	4.9

The average of the six mental workload scales in nurses working in the emergency department is given based on the calculation of the Weight and the Rating for each of the scales. According to the results in

Table 2, the lowest mental workload value among the six scales was related to the effort score (56.64 ± 21.77) and the highest value was related to mental demand (85.30 ± 16.72).

Table 2. Average mental workload score among nurses working in the emergency department.

Scale	Mean	standard deviation
Mental Demand	85.3	16.72
Physical Demand	67.55	25.48
Time Demand	62.56	24.11
Performance Demand	80.25	16.84
Effort	56.64	21.77
Frustration	81.1	14.56

The results showed that the highest level of mental burden (Rating) related to the hopelessness scale with an average of 3.4 and also the effort scale with an average of 1.23 had the lowest level of mental burden.

Comparison between the age groups of the participants in the study showed that the age group of

22-30 years had the lowest level of mental burden and people over 50 years had the highest level of mental burden in the emergency department. Comparison of mental burden of work in different age groups is shown in Figure 1.

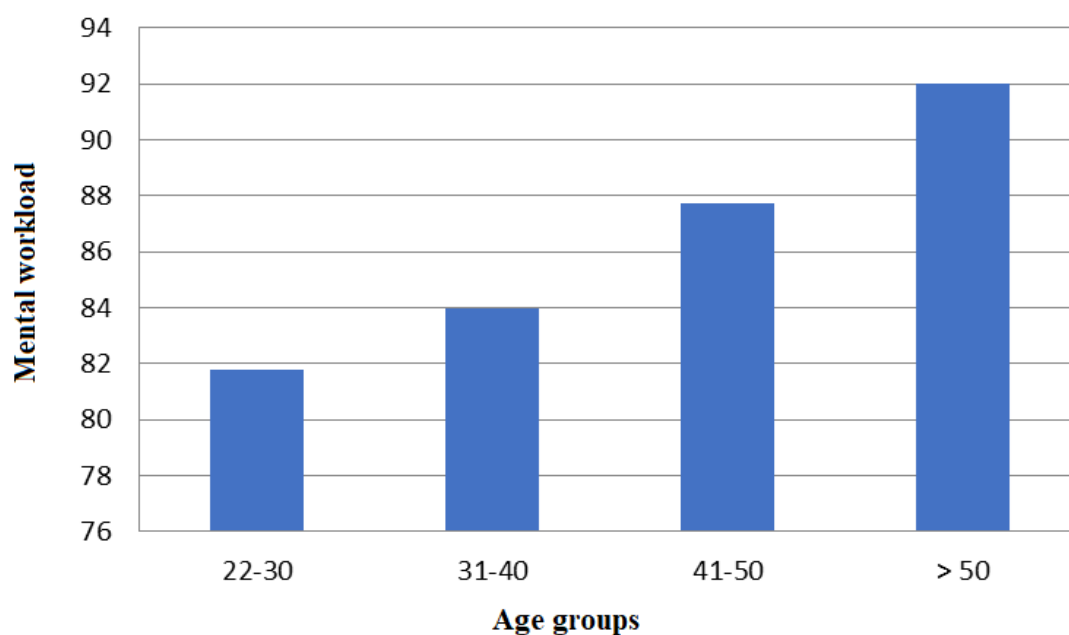


Figure 1. Comparison chart of mental workload in different age groups.

The highest level of burden assigned to the six scales in the study population was related to people with more than 20 years of work experience, and its value was equal to 2.5. Also, the lowest value was related to people with work experience between 3-10 years, and its value was equal to 2.

One-way analysis of variance test showed no significant relationship between marital status, education level of individuals, and gender with the mean mental burden score ($p > .05$).

Based on the results of the Pearson correlation test, no significant relationship was found between variables such as work experience, age, number of shifts per person per month, hours per shift, and hours of rest after each shift with the average mental load score ($p > .05$); however, this test showed a significant relationship between the number of patients under the supervision of the individual in each shift and the average mental load score ($p < .05$).

Discussion

One of the factors affecting the behavior and performance of people in the workplace and, consequently, the efficiency and productivity of

people is the mental workload. Mental workload is the amount of effort that the mind makes while performing a task. So far, extensive studies have been conducted on the physical workload of work, and less attention has been paid to the mental workload aspect of work in different jobs. Activities that require concentration, control measures, and speed of action create a significant mental and physical burden on their employees.

The results showed that the average mental burden score for emergency department nurses was high (72.84 ± 13.3), which indicates that nurses in the emergency department have a high mental burden score. One reason for this may be due to the sensitivity of the duties of nurses in the emergency department; any error may cause irreparable accidents and incidents for the patient. According to a report by the American Institute of Medicine (IOM), every year, due to the mental and physical burden of work on employees in various healthcare departments in the United States, approximately 44,000 to 98,000 people lose their lives due to medical errors, and most of these errors and human

errors occur in intensive care units and emergency departments (9)

A study conducted by Safari et al. showed that in hospitals, emergency and intensive care units are among the units where employees are exposed to high mental workload (14).

In the current study, among the six NASA mental workload scales, the lowest score was related to the effort score (56.64 ± 21.77) and the highest score was related to the mental demand score (85.30 ± 16.72) among emergency department nurses. In a study conducted by Smith using the NASA index on computer operators of a telecommunications company, it was found that there was a significant relationship between fatigue caused by long working hours and mental workload, and his results also showed that there was a direct linear relationship between mental demands and workload (15).

In Baker's study, the NASA index was used to examine the impact of jet noise on the mental strain of flight safety officers. The results of their study showed that the physical and mental performance of the subjects studied was affected by environmental noise, and of the six NASA index scales, mental demands and frustration were most correlated with mental strain (16).

As shown in Figure 1, the age group over 50 years had the highest mental burden and the age group 22-30 years had the lowest mental burden. One of the reasons for the high mental burden in older nurses is probably related to the nature of their job and work environment, as nursing is tiring and stressful in the long term (17,18). Also, given that studies have shown that nurses are exposed to high levels of burnout in their workplace (19), it is possible that one of the reasons for the increased mental burden in this age group is related to increasing age.

The results of this study showed no significant relationship between variables such as work experience, age, gender, education level, number of shifts per month, hours per shift, and hours of rest

after each shift for nurses working in the emergency department with the average mental burden score. However, there was a significant relationship between the number of patients under the care of an individual in each shift and the nurses' perceived mental burden. In other words, when a nurse was responsible for the care and maintenance of several patients simultaneously in a shift and had more responsibility in providing services and maintaining the health of patients, she also had a higher mental workload score.

Conclusion

According to the obtained results and regardless of the working ward, the nurses working in hospital environments are exposed to inappropriate Poor quality of life and high occupational fatigue. Lastly, to improve quality of life and decrease the job-related fatigue, we recommend the adoption of some steps, including training some issues relevant to the importance and necessity of sufficient sleep quality and the undesirable effects of sleep quality and occupational fatigue on individuals' health, training the skills that increase resiliency, employing new nurses in emergency department of hospitals, employing highly resilient individuals, financing nurses, exercising, and creating variety in the workplace.

Acknowledgements

The authors would like to thank all personnel and nurses of Hospitals in Ilam city that participated in the survey and responded to the questionnaire.

Ethics approval

The present study was the result of a research project with an ethics code IR.MEDILAM.REC.1397.008 which was funded by the Honorable Deputy of Research and Technology of Ilam University of Medical Sciences.

Financial support

No financial support was provided for conducting this study.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contributions

Research Design: M.K & M.A.R.

Data collection: M.A.R.& M.K

Data analysis: A.M & M.K

Writing and proofreading: A.M & M.K.

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