

Original Article

Investigating the Impact of Standard Physical Environment of Operating Room on Job Satisfaction Among Operating Room Staff in Maragheh Hospitals, Iran, in 2024

Nasrin Aghazadeh¹ , Arash Neshati² , Ashkan Karimi^{3,4} , Maryam Jafari⁵ , Sadra Gholizadeh⁵ , Vahid Rahmani^{1,3} 

¹Research Center for Evidence-based Health Management, Maragheh University of Medical Sciences, Maragheh, Iran

²Department of Operating Room Technology, Behbahan Faculty of Medical Sciences, Behbahan, Iran

³Student Research Committee, Department of Medical Education, School of Medical Education and Learning Technologies, Shahid Beheshti University of Medical Sciences, Tehran, Iran

⁴Department of Operating Room Technology, Hamedan University of Medical Sciences, Hamedan, Iran

⁵Student Research Committee, Maragheh University of Medical Sciences, Maragheh, Iran

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***Corresponding author:**

Vahid Rahmani,

Email: vahid.rahmani.73@gmail.com



Abstract

Introduction: Job satisfaction among operating room personnel is a key factor in improving the quality of healthcare services and enhancing the efficiency of the health system. A standard physical environment serves as an essential foundation for achieving these goals. This study aimed to investigate the relationship between the compliance of operating room physical spaces with national standards and the level of job satisfaction among operating room staff in hospitals of Maragheh County in 2024.

Methods: In this descriptive-analytical study, 87 operating room personnel from hospitals in Maragheh County were examined through a census method. Data were collected using a researcher-made checklist assessing compliance with physical environment standards and the Minnesota Satisfaction Questionnaire (MSQ). Data analysis was performed using Pearson's correlation coefficient, independent *t*-test, and ANOVA or its non-parametric equivalent in SPSS version 24.0.

Results: Of the 87 participants, 66 were women, and 21 were men. The mean age of participants was 33.04 ± 1.7 years. The overall compliance of the physical environment with standards was 73.23%, and the mean job satisfaction score was 71.77 ± 13.54 . Although a positive numerical correlation was observed between the two variables ($r=0.540$), this relationship was not statistically significant ($P=0.076$). Additionally, significant associations were found between job satisfaction and gender ($P=0.008$), age ($P=0.01$, $r=0.334$), and workplace hospital ($P<0.05$).

Conclusion: The findings indicate that although a standard physical environment is an important prerequisite for optimal performance, it is not a strong standalone predictor of job satisfaction. Organizational and psychosocial factors play a substantial role in shaping job satisfaction among operating room staff. Therefore, adopting a systemic multidimensional approach that simultaneously improves the physical environment and strengthens motivational and organizational factors is crucial in enhancing job satisfaction in this department.

Keywords: Operating room, Physical environment, Standard, Job satisfaction

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Introduction

Hospitals, as the primary providers of healthcare services, play a crucial role in ensuring the continuity of medical care, especially during critical or emergency situations (1). The operating room (OR) is a particularly critical and complex environment in hospitals, influenced by both patient-related factors and advanced medical

technologies. Serving as the driving force of the hospital, the operating room is central to its function, providing essential scientific resources and technological capabilities that support various clinical units. However, it is also exposed to a wide range of risks, including electrical shocks, medical gas explosions, and fires (2, 3).

For many years, surgical outcomes were believed to



be mainly determined by patient-related factors and the technical skills of the surgeons. However, there has been increasing recognition of the vital role played by human factors, system-related components, and non-technical skills, such as situational awareness, communication, and organizational culture, in influencing overall surgical performance in recent years (4). The operating room is considered one of the high-risk areas in a hospital, where the environment can significantly impact patient outcomes. For instance, studies show that after just one year of clinical practice, 58%-90% of operating room personnel experience musculoskeletal problems due to poor ergonomic conditions in their workplace (5, 6).

The operating room is a highly controlled space designed to minimize the risk of surgical site infections and ensure patient safety (7, 8). As the core of surgical departments, the operating room should meet a variety of functional needs while simultaneously adhering to strict regulatory standards (9-11). Environmentally, the recommended conditions for operating rooms include a temperature range of 18–22°C and a relative humidity of 50–60%, balancing thermal comfort with infection control measures (12). Furthermore, the physical environment of the operating room, including its overall layout and specific design features, can directly affect the procedures performed and, consequently, the quality of care provided (13-15).

Physical environment is one of the overlooked factors in surgical settings. In high-pressure, non-surgical workplaces, variables such as lighting, temperature, humidity, noise, and background music are carefully regulated due to their known effects on well-being, focus, productivity, and safety of employees. These environmental conditions can also significantly influence surgical performance. Since surgeons can control these factors, they offer modifiable opportunities to optimize surgical outcomes (16).

Additionally, the operating room presents unique challenges regarding job satisfaction and mental health. Operating room nurses, for example, play a crucial role in managing emergencies, ensuring patient safety, and providing care before, during, and after surgery. They are often required to perform multiple tasks simultaneously and make rapid critical decisions under high-pressure conditions (17, 18). Their responsibilities include maintaining a sterile environment, monitoring vital signs, managing resources to prevent complications, and closely coordinating with surgical and anesthesia teams. Given that more than one-quarter of hospital admissions involve at least one surgical procedure, the significance and high-pressure nature of operating room cannot be overstated. These stress-inducing factors highlight the need to address job satisfaction among operating room nurses (19). Low job satisfaction can lead to decreased performance, mental health issues, and ultimately, reduced quality of patient care (20).

Concerns about job satisfaction among nurses are rising globally, mainly due to their crucial role in patient

care (21). Job satisfaction is a key determinant of effective and efficient job performance (22), and employees typically experience satisfaction when they can contribute effectively to meeting the needs of others, which in turn contributes to their own work satisfaction (23). On the other hand, job dissatisfaction stems from various factors such as poor working conditions, workload, night shifts, and social or family conflicts, along with stress, occupational burnout, and compassion fatigue (21). Given these trends, understanding and addressing the multi-dimensional factors affecting job satisfaction in healthcare personnel is crucial for maintaining the delivery of high-quality health services, especially in high-stress environments like the operating room (24, 25). Therefore, job satisfaction is essential for fostering motivation and commitment among healthcare workers, especially in the context of workforce shortages (26).

In summary, a review of the literature suggests that the operating room is not only a complex, high-risk, and technology-dependent environment but also it is a setting where multiple human, organizational, and environmental factors intersect, impacting both the quality of care and well-being of the staff. Despite the recognized importance of physical conditions in improving performance, reducing human errors, and ensuring safety, the influence of the physical environment of operating room on job satisfaction among staff has received relatively little attention. Given the critical role of job satisfaction, particularly among operating room nurses, in maintaining productivity, reducing turnover, and ensuring high-quality care, it is essential to scientifically evaluate the impact of standard environmental features, such as temperature, humidity, lighting, noise, and spatial design, on job satisfaction. Accordingly, this study aims to assess the effect of a standard physical environment of operating room on the job satisfaction of operating room staff, with the aim of improving working conditions, enhancing well-being of staff, and improving the overall quality of surgical services.

Materials and Methods

Study Design

This descriptive-analytical study was conducted from March 2023 to January 2024. In this design, data on the main research variables, including physical environment standards and staff job satisfaction, were collected at a single point in time without any researcher intervention. The relationship between these variables was subsequently analyzed.

Sample Size

Considering the limited and well-defined population of operating room personnel (including operating room nurses, anesthesia technicians, and recovery staff) working at Sina and Shahid Beheshti Hospitals in Maragheh County in 2024 (N=87), a census method was employed. Inclusion criteria consisted of full-time employment in the operating room of one of the aforementioned hospitals,

at least one year of operating room experience to ensure sufficient familiarity with the physical environment and job conditions, and voluntary informed consent to participate. Exclusion criteria included withdrawal from the study at any stage and incomplete questionnaire responses, defined as having more than 20% of items unanswered. This rigorous sampling framework ensured that data were collected from a relevant and valid cohort accurately representing the target population.

Data Collection Instruments

Three instruments were used in this study.

Demographic Questionnaire

The demographic information questionnaire consisted of 4 questions, including age, gender, education, and shift type.

Checklist for Assessing Physical Environment Standards

The second instrument was a researcher-developed checklist for evaluating physical environment standards of operating room. The checklist was designed using reputable national documents, including the Safe Hospital Planning and Design Guide and operating room accreditation standards issued by the Ministry of Health and Medical Education. The final checklist included 70 items covering three domains:

- Architectural design (35 items), addressing space dimensions, zoning, layout and interconnection of spaces, materials, and surface finishes
- Mechanical installations (20 items), covering HVAC systems, temperature and humidity control, and fire protection systems
- Electrical installations (15 items), assessing power supply systems, lighting, emergency power, and grounding

Each item was scored using a three-point scale (Good=3, Moderate=2, and Poor=1). Content validity was confirmed by 10 experts, including operating room faculty members, nursing managers, and hospital engineers, with a Content Validity Index (CVI) of 0.82 and a Content Validity Ratio (CVR) of 0.75. Reliability was assessed using a two-week test-retest method with 15 staff members (not included in the final sample), yielding an intraclass correlation coefficient (ICC) of 0.87, indicating satisfactory reliability.

Standard Job Satisfaction Questionnaire

The third instrument was the 20-item short form of the Minnesota Satisfaction Questionnaire (MSQ), one of the most widely used tools for assessing job satisfaction globally. Responses were rated on a 5-point Likert scale ranging from “strongly disagree” (score=1) to “strongly agree” (score=5). Total scores ranged from 20 to 100. According to the questionnaire guidelines, scores were categorized as follows: 20–47 indicating low job satisfaction, 48–76 indicating moderate job satisfaction, and 77–100 indicating high job satisfaction. To ensure

cultural reliability within the study population, this questionnaire had been validated in the study of Afkhami, with a Cronbach’s alpha of 0.80, indicating good internal consistency (27).

Data Analysis

All data manipulation and statistical analyses were performed using SPSS Software version 24. Results for quantitative factors were presented as mean $\pm$ standard deviation, whereas qualitative variables were provided as numbers and percentages. The Kolmogorov-Smirnov test was used to check the normality of continuous data. The association between variables was assessed using Pearson’s correlation coefficient, independent *t*-test, and ANOVA or its non-parametric equivalent. A significance level of 0.05 or lower and a confidence level of 95% were applied in all analyses.

Results

This study investigated the effect of a standard operating room physical environment on staff job satisfaction. Data from 87 operating room personnel from hospitals affiliated with Maragheh University of Medical Sciences were analyzed. The findings are presented in 3 sections: the status of operating room physical environment standards, the level of staff job satisfaction, and the relationship between these two main variables.

Based on the results presented in Table 1, of the 87 operating room personnel who participated in the study, 66 (75.9 percent) were female and 21 (24.1 percent) were male. The mean age of the participants was 33.1 ± 7.04 years, ranging from 18 to 48 years. Regarding educational status, 43 participants (49.4%) held a bachelor’s degree in operating room technology, 18 (20.7%) had an associate degree in the same field, 17 (19.6%) had a bachelor’s degree in anesthesia technology, and 9 (10.3%) held a bachelor’s degree in nursing. Concerning work shifts, most participants (78.2%) worked rotating shifts, while only 21.8% worked fixed shifts. These results indicate that the study population represented a desirable level of demographic diversity and served as an appropriate sample of the operating room workforce in the hospitals studied.

Based on the findings presented in Table 2, compliance with operating room physical environment standards in Hospital A was 79.59% for architectural design, 85.71% for mechanical installations, and 90.47% for electrical installations. In Hospital B, compliance in these domains was 64.62%, 61.09%, and 57.14%, respectively. Overall, the highest compliance with standards in Hospital A was observed in mechanical installations, whereas it was observed in architectural design in Hospital B (Figure 1). Additionally, total compliance with standards was found to be 85.25% in Hospital A and 61.22% in Hospital B, with an overall average compliance of 73.23% across the two hospitals.

According to the results presented in Table 3, the mean job satisfaction score of operating room personnel

Table 1. Demographic Characteristics of the Study Participants (N=87)

Variable	Category	Frequency	Percentage	Job satisfaction <i>P</i> -value
Mean ± SD: 33.1 ± 7.04				
Age	20–30 years	42	48.3%	<i>P</i> =0.01 <i>r</i> =0.334
	31–40 years	31	39.7%	
	41 years and above	14	16%	
Gender	Male	21	24.1%	<i>P</i> =0.008 <i>df</i> =85
	Female	66	75.9%	
Education	Associate degree in OR	18	20.7%	<i>P</i> =0.307 <i>F</i> =1.232
	Bachelor's degree in OR	43	49.4%	
	Bachelor's degree in Anesthesia Tech	17	19.6%	
	Bachelor's degree in Nursing	9	10.3%	
Shift type	Fixed	19	21.8%	<i>P</i> =0.732 <i>r</i> =0.118
	Rotating	68	78.2%	

Table 2. Compliance of Operating Rooms with Physical Environment Standards

Hospital	Architectural design (%)	Mechanical installations (%)	Electrical installations (%)	Total
Operating room, Hospital A	79.59	85.71	90.47	85.25
Operating room, Hospital B	64.62	61.09	57.14	61.22
Total	72.11	73.40	73.81	73.23

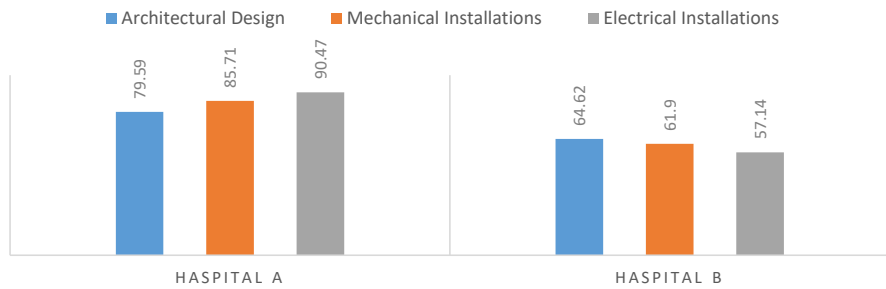


Figure 1. Comparison of the Compliance Rate of Maragheh Hospitals with Standards

was 67.58 ± 12.68 in Hospital A and 81.88 ± 10.11 in Hospital B. In Hospital A, 24.4% of staff reported high job satisfaction, 68.3% reported moderate satisfaction, and 7.3% reported low satisfaction. In contrast, in Hospital B, 64.7% of personnel reported high satisfaction and 35.3% reported moderate satisfaction, with no staff reporting low job satisfaction. The overall mean job satisfaction score across 2 hospitals was 71.77 ± 13.54 , indicating a moderate level of job satisfaction. Based on the results, job satisfaction in Hospital B was significantly higher than in Hospital A, which may be related to differences in compliance with physical environment standards. The absence of low job satisfaction levels among personnel in Hospital B further suggests a more positive working atmosphere in that hospital.

Based on the results, no statistically significant relationship was found between the standard physical environment and job satisfaction. Although the correlation coefficient indicated a positive relationship between the two variables, this association was not statistically significant (Table 4).

According to the results presented in Table 1, certain demographic variables showed significant associations

with job satisfaction. Gender had a statistically significant relationship with job satisfaction ($P=0.008$), with female staff reporting higher mean satisfaction scores than male staff. A positive and significant correlation was also found between age and job satisfaction ($P=0.01$, $r=0.334$), indicating that job satisfaction increases with age. Furthermore, a significant association was observed between the hospital of employment and job satisfaction ($P<0.05$), with staff at Hospital B reporting higher satisfaction levels than those at Hospital A. In contrast, educational level ($P=0.307$) and shift type ($P=0.732$) did not show significant relationships with job satisfaction.

Discussion

Job satisfaction among healthcare personnel is essential for care quality. Although the physical environment of operating rooms can influence safety and workflow, this study found no significant relationship between environmental standards and job satisfaction among staff. As highlighted by Joseph et al, the operating room is a complex setting where organizational and psychosocial factors such as safety culture, communication, procedural stress, and workload can outweigh the impact of

Table 3. Comparison of Job Satisfaction among Operating Room Personnel in Maragheh Hospitals

Hospital	Level	Percentage (%)	Mean $\pm$ SD
Operating room personnel of Hospital A	High	24.4	67.58 $\pm$ 12.68
	Moderate	68.3	
	Low	7.3	
Operating room personnel of Hospital B	High	64.7	81.88 $\pm$ 10.11
	Moderate	35.3	
	Low	—	
Total (all hospitals)			71.77 $\pm$ 13.54

Table 4. Correlation Between Standard Physical Environment and Job Satisfaction among Operating Room Personnel

Relationship	Significance level (P)	Correlation coefficient (r)
Physical environment and job satisfaction	0.076	0.540

physical conditions. Therefore, while necessary, physical standards alone are not sufficient to ensure sustained job satisfaction, and organizational and psychosocial factors should also be addressed (28).

The results of the present study are consistent with those of the study by Schouten et al (2025), which demonstrated that the level of technology and the nature of work directly influence job satisfaction. Contrary to expectations, open surgery, despite lower technological complexity, results in higher job satisfaction because it provides nurses with greater opportunities for active involvement, meaningful participation, and direct professional engagement. In contrast, robotic surgery, despite its technological advantages, tends to reduce job satisfaction due to diminished hands-on involvement and increased cognitive load associated with monitoring complex technologies. This suggests that job satisfaction in the operating room may depend more on meaningful engagement, workflow ergonomics, and the quality of team interactions than on physical standards alone (29).

Contrary to the initial hypothesis of this study, the findings showed no significant association between compliance with physical environment standards and staff job satisfaction. This outcome becomes more understandable when considered alongside the study by Eskola et al (2016), which illustrates that the culture of the work environment is shaped by far more complex factors. Their findings show that elements such as professional role (with anesthesia technicians experiencing higher stress compared to scrub nurses), the type of clinical unit and surgical workload (with higher satisfaction reported in local hospitals performing routine procedures), as well as interpersonal relationships and managerial support, play a more decisive role in determining job satisfaction than mere compliance with physical design standards. Therefore, in the high-pressure context of operating rooms, organizational and psychosocial variables may overshadow the influence of environmental physical factors, which may explain the absence of a direct relationship in the present study (30).

It can be concluded that although a standard physical environment is a fundamental prerequisite for safety and operational efficiency, it is not a strong predictor of job satisfaction among operating room personnel on its own. This is partly consistent with studies emphasizing the more pronounced role of organizational and psychosocial determinants. For instance, Babapour et al (2022) reported that job stress arising from heavy workload, conflict with physicians, and emotional pressures exerts a significant impact on quality of life and job satisfaction. Conversely, the present finding differs from studies that reported a direct and straightforward relationship between physical environment and job satisfaction. This discrepancy may be attributed to the influence of mediating variables such as organizational culture, leadership style, and social support, which were not examined in this study. In essence, while an optimal physical environment seems necessary to support job satisfaction, it is not sufficient; in other words, the sufficient conditions lie in the strength of human and organizational factors (31).

In comparison with studies such as that of Ern et al (2023), which emphasize a positive role of the physical environment in enhancing operational efficiency, it is important to note that such research focuses primarily on performance-related outcomes rather than on job satisfaction. Although a standard physical environment provides the essential infrastructure for efficient and safe performance, it does not inherently promote job satisfaction, which is a multifaceted construct shaped by motivational and psychological factors, including recognition, managerial support, collegial relationships, organizational justice, and the meaningfulness of work. Therefore, the present findings highlight the need to conceptually distinguish between operational efficiency and job satisfaction and to consider motivational factors alongside physical standards (32).

The results of this study also contrast with those of Basuki and Zakiyah (2023), who reported a positive and significant relationship between physical environment and job satisfaction in Anwar Medika Hospital. This inconsistency may stem from contextual differences, variations in working conditions, or methodological differences across studies. Nevertheless, both studies reinforce the notion that job satisfaction is a multidimensional construct. As highlighted in the study of Basuki, factors such as supervisor relationships, compensation, and reward systems may play more important roles and may dampen or overshadow the effects of the physical environment, even if the latter is favorable. It is likely that such intervening variables played a similar moderating role in the present study (33).

Although cultural contexts and sample characteristics differ, the present findings align with the study by Kagan et al (2021) in certain aspects. Both studies showed that gender is a significant predictor of job satisfaction, with female staff reporting higher satisfaction levels. However, in contrast to the finding of the current study regarding

the positive association between age and job satisfaction, Kagan et al did not identify age as a significant factor. This difference may stem from contextual variations, differences in measurement tools, or specific characteristics of the two study samples (34).

Consistent with the findings of the current study regarding predictors of job satisfaction, Bragadottir et al (2023) also emphasized the importance of demographic characteristics in hospital settings. Although their study did not find a direct relationship between age and job satisfaction, both studies found work experience in the current unit to be an important predictor. Both studies also reported that the majority of the staff were female and that rotational shifts were predominant, suggesting shared demographic patterns across hospital environments that should be considered in workforce planning (35).

The present finding that no significant relationship was observed between a standard physical environment and job satisfaction, while organizational and demographic factors showed significant effects, indicates that job satisfaction among operating room personnel is influenced more by the complexity of human and organizational variables than by physical criteria alone. This is consistent with the study by Kertovic et al (2023), which showed that although nurses reported satisfaction with the physical aspects of their work environment, their overall job satisfaction remained moderate due to deficiencies in motivational and organizational factors. Therefore, although standardizing the physical environment is essential for safety and performance, achieving higher levels of job satisfaction requires simultaneous attention to improving both organizational and psychosocial conditions (36).

An overall compliance rate of 73.23% was found with physical environment standards in the present study, which aligns with the research by Ramezani et al (2020), in which a compliance rate of 78.35% was reported. This similarity suggests that although challenges exist regarding operating room physical environments in the country, the overall situation remains relatively satisfactory. Both studies noted variability across hospitals, likely due to differences in management policies, facility age, and budget allocation. Nonetheless, achieving an optimal level of compliance still requires further planning and investment in improving and renovating operating room spaces (37).

Overall, the findings of this study indicate that although a standard physical environment is a necessary condition for job satisfaction, it is not sufficient on its own. While statistical analyses did not reveal a direct and significant association between compliance with physical environment standards and job satisfaction, further examination of the data highlighted the moderating role of demographic variables such as gender, age, and hospital of employment. Given the limited research in the Iranian context examining the combined effects of physical, demographic, and organizational factors, further studies are warranted. Ultimately, strategies to

enhance job satisfaction should adopt a holistic approach that concurrently addresses improvements in the physical environment alongside organizational and psychosocial factors.

Conclusion

The present study demonstrated that although a standard physical environment serves as a fundamental basis for safe and efficient performance in the operating room, no statistically significant relationship was found between compliance with physical environment standards and staff job satisfaction. This finding suggests that job satisfaction within the inherently complex operating room environment is a multidimensional construct influenced more strongly by organizational and psychosocial factors than by physical conditions alone. The significant associations found between demographic variables, including gender, age, and hospital of employment, highlight the importance of considering the moderating roles of these factors in future workforce planning. Therefore, achieving sustainable job satisfaction among operating room personnel requires a holistic approach that incorporates improvements in the physical environment alongside strengthened organizational culture, enhanced team communication, and greater attention to motivational factors.

Study Limitations

Despite the methodological rigor applied in this research, several limitations should be taken into account when interpreting the findings. The cross-sectional design of the study prevents the establishment of causal relationships. Additionally, because the study was conducted in hospitals within a single county, generalizability to other geographic regions should be approached with caution. Another limitation is the absence of certain potential intervening variables, such as leadership style and organizational culture, which may play important roles in shaping job satisfaction. Furthermore, reliance on self-reported questionnaires may have introduced social desirability bias.

Recommendations Research

In light of the findings and limitations of this study, longitudinal research examining the long-term effects of changes in the physical environment on job satisfaction is recommended. Future studies that incorporate mediating and moderating factors, such as job stress and social support, could provide a more comprehensive understanding of the mechanisms underlying these relationships. Additionally, qualitative research is recommended to explore organizational and psychosocial dimensions of job satisfaction in greater depth. Expanding research to include other healthcare facilities and assessing the impact of integrated interventions that simultaneously improve both physical and organizational environments may contribute to enhancing the quality of operating room services.

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Authors' Contribution

Conceptualization: Nasrin Aghazadeh, Vahid Rahmani, Ashkan Karimi.

Data Curation: Maryam Jafari, Sadra Gholizadeh.

Formal Analysis: Arash Neshati, Ashkan Karimi.

Investigation: Vahid Rahmani, Ashkan Karimi.

Methodology: Vahid Rahmani, Arash Neshati, Maryam Jafari.

Project Administration: Nasrin Aghazadeh.

Software: Arash Neshati, Ashkan Karimi.

Supervision: Nasrin Aghazadeh, Vahid Rahmani, Sadra Gholizadeh.

Writing–Original Draft: Nasrin Aghazadeh, Ashkan Karimi, Maryam Jafari.

Writing–Review & Editing: Vahid Rahmani, Arash Neshati, Sadra Gholizadeh.

Competing Interests

The authors declare that they have no conflict of interests related to the content of this article.

Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to privacy and ethical considerations but are available from the corresponding author upon reasonable request.

Ethical Approval

This study was approved by the Ethics Committee of Maragheh University of Medical Sciences (IR.MARAGHEH.UMS.REC.1399.012). Prior to data collection, participants were fully informed about the study objectives, procedures, and confidentiality measures. Written informed consent was obtained from all participants, who were assured that participation was voluntary and that their information would remain strictly confidential.

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