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Barriers encountered by nurses while caring of mechanically ventilated adult patients: a cross-sectional study

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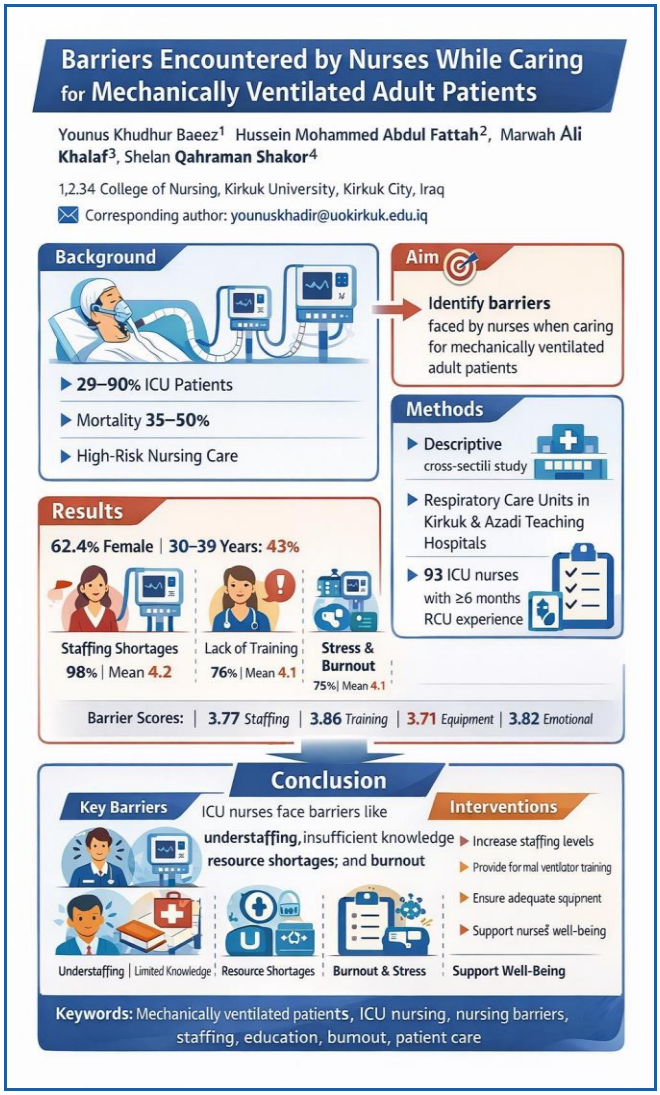
Abstract

Introduction: Mechanical ventilation (MV) is a critical and frequently used intervention in intensive care units (ICUs), with up to 70% of ICU patients requiring it. The rates of invasive mechanical ventilation range from 29.1% to nearly 90% in some studies, particularly during the COVID-19 pandemic, with associated mortality rates exceeding 35% to 50%. Providing care for mechanically ventilated adult patients is a complex and high-risk nursing responsibility. **Objective:** This study aimed to identify the primary barriers encountered by nurses when caring for mechanically ventilated adult patients and to examine how these barriers relate to their demographic and professional characteristics. **Methods:** A descriptive cross-sectional study was conducted in the Respiratory Care Units (RCUs) of Kirkuk and Azadi Teaching Hospitals to identify barriers encountered by ICU nurses caring for mechanically ventilated adult patients. The study included 93 nurses with at least six months of RCU experience, recruited using a convenience sampling technique. Sample size adequacy was justified using a single-proportion formula at 95% confidence and 5% margin of error. Data were collected via a structured, self-administered questionnaire covering demographics, staffing/workload, knowledge/training, equipment/resources, and communication/emotional barriers, measured on a 5-point Likert scale. The questionnaire was validated by experts and piloted (Cronbach's alpha = 0.87). Ethical approval was obtained, and participants provided informed consent with confidentiality ensured. Data were analyzed using SPSS 26.0, employing descriptive statistics, t-tests, and ANOVA, with $p < 0.05$ considered statistically significant. **Results:** The majority of participants were female (62.4%) and aged 30–39 years (43.0%). The most prominent barriers identified were staffing shortages (mean = 4.2), lack of formal ventilator training (mean = 4.1), stress and burnout (mean = 4.1), and equipment shortages (mean = 3.9). Overall mean scores for staffing/workload, knowledge/training, equipment/resources, and communication/emotional barriers were 3.77, 3.86, 3.71, and 3.82, respectively. No statistically significant relationships were observed between demographic variables and perceived barriers ($p > 0.05$). **Conclusion:** ICU nurses face multiple, interconnected barriers when caring for mechanically ventilated adult patients, including inadequate staffing, insufficient knowledge, limited availability of equipment, and work-related psychological stress. Organizational interventions such as improving staffing levels, providing formal training, ensuring resource availability, and supporting nurses' well-being are essential to enhance the quality of patient care.

Keywords: Mechanically ventilated patients, ICU nursing, nursing barriers, staffing, education, burnout, patient care.

Graphical Abstract



Source: Own authorship.

Introduction

Mechanical ventilation (MV) and ventilator weaning are common but complex interventions in intensive care units (ICUs). Internationally, nurses play a central role in ventilator weaning, and evidence indicates that nurse-led weaning can positively affect the duration of MV **[1]**. The ICU is critical for managing severely ill patients, particularly those requiring mechanical ventilation. Nurses are essential for coordinating care and addressing gaps within the ICU team. This study aimed to evaluate the care coordination competency of nurses in Iranian ICUs, specifically regarding mechanically ventilated patients **[2]**.

Effective nursing care depends not only on nurses' clinical knowledge and skills but also on workplace conditions that influence their ability to provide safe, evidence-based care **[3]**. One of the most consistently reported barriers in ICUs is staffing shortages and excessive workload. Studies examining compliance with ventilator-associated pneumonia (VAP) prevention practices have shown that a majority of nurses identify insufficient staffing as a principal barrier to implementing guideline-based care **[4]**. Inadequate staffing increases workload, reduces time for patient-centered care, and contributes to higher levels of stress and burnout among critical care nurses **[5]**. Heavy workloads also limit nurses' ability to perform essential tasks, such as frequent patient assessments, accurate documentation, and preventive care **[6]**.

Insufficient formal training and limited opportunities for ongoing professional development in ventilator management may negatively affect nurses' confidence and competence **[7]**. Lack of targeted training is associated with variability in practice and lower adherence to evidence-based protocols, particularly in preventing ventilatorassociated complications **[8]**. Additionally, limited exposure to emergency ventilator situations can hinder nurses' ability to respond effectively to rapid patient deterioration **[9]**.

The availability of equipment and institutional resources is another critical barrier. Adequate supplies of functioning ventilators, monitoring devices, and other ICU equipment are essential for safe patient care. Equipment shortages or malfunctions are linked to challenges in following recommended care practices **[10]** and are often exacerbated in settings without standardized protocols or clear guidelines **[11]**.

Communication barriers with mechanically ventilated patients are also well documented. Since these patients are often unable to speak, nurses must rely on nonverbal or augmentative communication methods. Limited access to communication aids, combined with insufficient training, can impede nurse–patient interactions, negatively affecting patient comfort, anxiety levels, and engagement in care **[12]**. Inadequate communication and teamwork among healthcare professionals can further disrupt care coordination and reduce the effectiveness of multidisciplinary ICU care **[13]**.

Emotional and psychological stress—including burnout, fear of harming patients, and high emotional demands—is prevalent among ICU nurses and can affect their performance and job satisfaction. Observational studies have reported that a significant proportion of ICU nurses experience moderate to high stress and burnout, primarily due to heavy workloads and insufficient support **[14]**. These stressors can diminish cognitive capacity for critical tasks and increase the risk of clinical errors **[15]**.

The purpose of this study was to identify the main barriers encountered by nurses while caring for mechanically ventilated adult patients in ICU settings and to examine how staffing, knowledge, equipment, and psychological factors impede effective care.

Methods

Study Design

A descriptive cross-sectional study was conducted to identify the barriers encountered by nurses in caring for mechanically ventilated adult patients.

Study Setting

The study was carried out in the Respiratory Care Units (RCUs) of Kirkuk and Azadi Teaching Hospitals.

Study Population

The study population consisted of ICU nurses providing care for mechanically ventilated adult patients in the RCUs of Kirkuk and Azadi Teaching Hospitals during the data collection period. Participants were required to have at least six months of RCU experience and be directly involved in patient care. Nurses on administrative duties or trainees with less than six months of RCU exposure were excluded.

Sample Size, Sampling Technique, and Rationale

A total of 93 nurses participated in the study. The sample size was determined based on feasibility, hospital staffing, and statistical considerations to ensure adequate representation of the target population. To justify adequacy, a sample size calculation for estimating a population proportion was performed using the standard single-proportion formula, assuming a 95% confidence level, a 5% margin of error, and an expected prevalence of 50% (to maximize sample size). Although the calculated minimum required sample was 384, the final recruited sample of 93 nurses was considered sufficient to identify the key barriers within this clinical setting.

A convenience sampling technique was employed to recruit eligible participants. Nurses present during the data collection period who met the inclusion criteria were invited to participate. While this non-probabilistic approach limits generalizability to other ICUs or regions, it was suitable for capturing readily accessible nurses within the clinical context.

The selected sample size and recruitment method allowed for effective identification of staffing, knowledge, equipment, and psychological barriers encountered in real-world ICU practice. Despite limitations in external validity, the findings provide meaningful insights into systemic challenges affecting nurses caring for mechanically ventilated patients.

Inclusion Criteria

- Nurses with at least six months of RCU experience.
- Nurses who consented to participate in the study.

Exclusion Criteria

- Nurses on administrative duties or not directly involved in patient care.
- Trainee nurses or interns with less than six months of RCU exposure.

Data Collection Tool

Data were collected using a structured, self-administered questionnaire developed based on a literature review of barriers in RCU nursing. The questionnaire was organized into five sections:

1. **Demographic and Professional Characteristics:** Age, gender, highest nursing qualification, total nursing experience, and ICU/mechanical ventilation experience.
2. **Staffing and Workload Barriers:** Staff shortages, patient-to-nurse ratios, overtime, and limited time for documentation and patient care.
3. **Knowledge and Training Barriers:** Formal ventilator training, access to continuing education, orientation programs, and experience handling emergency situations.
4. **Equipment, Policies, and Resources Barriers:** Ventilator and monitoring equipment availability, functionality, hospital protocols, and administrative restrictions.
5. **Communication, Emotional, and Psychological Barriers:** Nurse–patient communication, teamwork and interdisciplinary collaboration, stress, burnout, and other emotional challenges.

All items were measured on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Validity and Reliability

The questionnaire was reviewed by a panel of experts to ensure content validity. A pilot test was conducted among 10 RCU nurses to assess clarity and reliability, resulting in a Cronbach's alpha coefficient of 0.87, indicating good internal consistency.

Data Collection Procedure

- Ethical approval was obtained from the institutional review board prior to data collection.
- Participants were informed about the purpose, confidentiality, and voluntary nature of the study.
- Written informed consent was obtained, and questionnaires were distributed during RCU shifts and collected after completion.

Ethical Considerations

Ethical approval was obtained from the Scientific

and Ethical Committee of the College of Nursing, Kirkuk University (approval number: 15/6/3036, reference: 17-12-2025), as well as from relevant hospital authorities. Participants were informed that:

- Participation was voluntary.
- They could withdraw at any time without consequences.
- All collected data would be kept confidential and used solely for research purposes.

Anonymity was ensured by using codes instead of personal identifiers.

Data Analysis

Data were entered and analyzed using SPSS version 26.0. Descriptive statistics were used to summarize demographic and professional characteristics and to calculate mean scores for each barrier category. Independent t-tests and ANOVA were used to explore potential relationships between nurses' demographic and professional characteristics and their reported barrier scores. A p-value of < 0.05 was considered statistically significant.

Results

Table 1. The majority of the 93 ICU nurses were female (62.4%) and aged 30-39 years (43%), with an average age of 34.6 ± 6.8 years. Most held a bachelor's degree (64.5%) and had 6-10 years of overall nursing experience (37.6%), while nearly two-thirds had 1-6 years of RCU/mechanical ventilation experience. This indicates a moderately experienced, well-educated nursing workforce actively engaged in ventilated patient care.

Table 1. Demographic and Professional Information (n=93).

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	20–29	25	26.9%
	30–39	40	43.0%
	40–49	20	21.5%
	50+	8	8.6%
		34.6 ± 6.8	
Gender	Male	35	37.6%
	Female	58	62.4%
Highest Nursing Qualification	Diploma	18	19.4%
	Bachelor's	60	64.5%
	Master's	12	12.9%
	Other	3	3.2%
Total Nursing Experience (years)	<1	5	5.4%
	1–5	30	32.3%
	6–10	35	37.6%
	>10	23	24.7%
RCU/Mechanical Ventilation Experience (years)	<1	8	8.6%
	1–3	25	26.9%
	4–6	30	32.3%
	>6	30	32.3%

Source: Own authorship.

Responses were measured on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The table shows the frequency (F) and percentage (%) of participants selecting each response for each item. The Mean Score (MS) represents the average response for each item, with higher scores indicating greater agreement or higher perceived impact. The Total Mean Score summarizes the overall staffing and workload-related challenge level among participants. ICU nurses reported that staffing shortages and high workload were the most significant barriers, with mean scores of 4.2 and 3.9, respectively. Other notable challenges included frequent overtime, high patient-to-nurse ratios, and insufficient support from assistant staff. Overall, the mean score of 3.77 indicates that staffing and workload issues are prominent and impact the quality of care for mechanically ventilated patients (Table 2).

Table 2. Staffing and Workload Barriers (n = 93).

Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean
	F	%	F	%	F	%	F	%	F	%	
Shortage of nursing staff affects patient care	2	2.2	3	3.2	13	14	40	43	35	37.6	4.2
High workload limits time with each ventilated patient	3	3.2	5	5.4	17	18.3	38	40.9	30	32.3	3.9
Frequent overtime or extended shifts negatively impact care	5	5.4	8	8.6	20	21.5	35	37.6	25	26.9	3.7
Assigning too many patients per nurse affects quality	6	6.5	10	10.8	22	23.7	30	32.3	25	26.9	3.6
Insufficient support from assistant staff hinders care	8	8.6	12	12.9	23	24.7	25	26.9	25	26.9	3.5
Lack of time for proper documentation	4	4.3	7	7.5	18	19.4	32	34.4	32	34.4	3.9
nadequate staffing during night shifts	5	5.4	9	9.7	20	21.5	31	33.3	28	30.1	3.8
Total/Overall Mean	–		–		–			–		–	3.77

Source: Own authorship.

Responses were measured on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The table shows the frequency (F) and percentage (%) of participants selecting each response for each item. The Mean Score (MS) represents the average response for each item, with higher scores indicating greater agreement or higher perceived impact. The Total Mean Score summarizes the overall knowledge and training-related challenge level among

participants. Nurses identified lack of formal ventilator training (mean = 4.1) and insufficient knowledge of ventilator management (mean = 4.0) as the most significant knowledge and training barriers. Limited access to continuing education and inadequate orientation for new staff also contributed to challenges in providing safe care. The overall mean score of 3.86 suggests that training and knowledge gaps are a notable obstacle in ICU nursing for mechanically ventilated patients (Table 3).

Table 3. Knowledge and Training Barriers (n = 93).

Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean
	F	%	F	%	F	%	F	%	F	%	
Lack of formal training in mechanical ventilation	2	2.2	5	5.4	14	15.1	36	38.7	36	38.7	4.1
Limited access to continuing education	3	3.2	7	7.5	20	21.5	33	35.5	30	32.3	3.9
Insufficient knowledge of ventilator management	2	2.2	5	5.4	17	18.3	37	39.8	32	34.4	4.0
Inadequate orientation for new staff	5	5.4	10	10.8	23	24.7	30	32.3	25	26.9	3.6
Lack of exposure to ventilator emergencies	4	4.3	9	9.7	22	23.7	31	33.3	27	29.0	3.7
Total/Overall Mean	–		–		–			–		–	3.86

Source: Own authorship.

Responses were measured on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The table shows the frequency (F) and percentage (%) of participants selecting each response for each item. The Mean Score (MS) represents the average response for each item, with higher scores indicating greater agreement or higher perceived impact. The Total Mean Score summarizes the overall level of challenge related to equipment, policy, and resources among participants. Nurses reported that shortages of ventilators and essential equipment (mean = 3.9) and poorly maintained devices (mean = 3.7) were the primary barriers affecting patient care. Additional challenges included unclear hospital protocols, administrative delays, and limited monitoring resources. The overall mean of 3.71 indicates that equipment, policy, and resource limitations moderately hinder effective care for mechanically ventilated patients (Table 4).

Table 4. Equipment, Policies, and Resources Barriers (n = 93).

Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean
	F	%	F	%	F	%	F	%	F	%	
Shortage of ventilators/ equipment	3	3.2	7	7.5	18	19.4	33	35.5	32	34.4	3.9
Malfunctioning or poorly maintained equipment	5	5.4	10	10.8	21	22.6	30	32.3	27	29.0	3.7
Lack of clear hospital protocols/ guidelines	3	3.2	8	8.6	20	21.5	33	35.5	29	31.2	3.8
Administrative / policy restrictions delay interventions	6	6.5	12	12.9	22	23.7	28	30.1	25	26.9	3.6
Limited availability of monitoring devices	7	7.5	15	16.1	21	22.6	25	26.9	25	26.9	3.5
Lack of spare parts or backup equipment	4	4.3	9	9.7	19	20.4	32	34.4	29	31.2	3.8
Total/Overall Mean	–		–		–			–		–	3.71

Source: Own authorship.

Responses were measured on a 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The table shows the frequency (F) and percentage (%) of participants selecting each response for each item. The Mean Score (MS) represents the average response for each item, with higher scores indicating greater agreement or higher perceived impact. The Total Mean Score summarizes the overall level of psychological and social challenges among participants. Nurses identified stress, burnout, and fear of harming patients (mean = 4.1) as the most significant emotional and psychological barriers, followed by poor communication within the healthcare team (mean = 3.9). Collaboration issues with physicians/therapists and challenges in reporting patient concerns were also notable. The overall mean of 3.82 indicates that communication, emotional, and psychological factors moderately to strongly impact nurses' ability to care for mechanically ventilated patients (Table 5).

Table 5. Communication, Emotional, and Psychological Barriers (n = 93).

Items	Strongly Disagree		Disagree		Neutral		Agree		Strongly Agree		Mean
	F	%	F	%	F	%	F	%	F	%	
Poor communication between healthcare team members	3	3.2	7	7.5	15	16.1	36	38.7	32	34.4	3.9
Lack of collaboration with physicians/ therapists	4	4.3	8	8.6	20	21.5	33	35.5	28	30.1	3.8

Stress, burnout, or fear of harming patients	2	2.2	5	5.4	16	17.2	36	38.7	34	36.6	4.1
Emotional challenges care quality	5	5.4	10	10.8	20	21.5	32	34.4	26	28.0	3.7
Difficulties in reporting patient issues	6	6.5	11	11.8	21	22.6	28	30.1	27	29.0	3.6
Total/Overall Mean	–		–		–			–		–	3.82

Source: Own authorship.

Here's a concise 3-line interpretation of Table 6:

No statistically significant relationships were found between nurses' demographic or professional characteristics (age, gender, qualification, total experience, or ICU/ventilation experience) and the perceived barriers ($p > 0.05$). Mean scores across all barrier categories were fairly consistent, indicating that staffing, knowledge, equipment, and psychological challenges affect nurses similarly regardless of their background. This suggests that the barriers are systemic rather than dependent on individual nurse characteristics.

Table 6. Relationship Between Demographic Characteristics and Barriers Encountered by Nurses (n = 93).

Characteristic	Category	Part B (Mean, p value)	Part C (Mean, p value)	Part D (Mean, p value)	Part E (Mean, p-value)
Age (years)	20–29	3.70, 0.12	3.80, 0.08	3.65, 0.15	3.78, 0.10
	30–39	3.78	3.85	3.72	3.83
	40–49	3.82	3.87	3.75	3.85
	50+	3.80	3.88	3.70	3.80
Gender	Male	3.76, 0.45	3.84, 0.50	3.70, 0.60	3.80, 0.55
	Female	3.78	3.87	3.72	3.83
Highest Nursing Qualification	Diploma	3.70, 0.09	3.80, 0.10	3.65, 0.12	3.78, 0.08
	Bachelor's	3.78	3.86	3.72	3.82
	Master's	3.82	3.88	3.75	3.85
	Other	3.75	3.85	3.70	3.80
Total Nursing Experience (years)	<1	3.70, 0.14	3.80, 0.12	3.65, 0.16	3.78, 0.10
	1–5	3.75	3.84	3.70	3.80
	6–10	3.80	3.87	3.73	3.83
	>10	3.78	3.86	3.72	3.82
ICU/Mechanical Ventilation Experience (years)	<1	3.70, 0.11	3.82, 0.09	3.68, 0.14	3.78, 0.10
	1–3	3.75	3.85	3.70	3.80
	4–6	3.78	3.87	3.72	3.82
	>6	3.80	3.88	3.73	3.85

Source: Own authorship.

Discussion

The study sample was predominantly female (62.4%), with the largest age group between 30 and 39 years (43.0%). Most participants held a bachelor's degree (64.5%) and had 4–6 years of ICU experience (32.3%). These findings align with Abdelrazik et al. **[16]**, who reported that nurses with moderate experience and higher academic qualifications are better equipped for ICU care. However, the results suggest that even well-educated nurses face challenges in managing complex ventilated patients without ongoing professional development.

Consistent with Tabaeian et al. **[17]**, excessive workloads and insufficient staffing were identified as major barriers, potentially compromising patient safety and increasing the risk of ventilator-related complications. Osti et al. **[18]** emphasized that structured educational interventions enhance nurses' ventilator management skills and patient outcomes, highlighting the need for continuous training and simulation-based education in ICU settings.

Al-Sayaghi et al. **[9]** reported that limited resources and unclear protocols hinder evidence-based care, reinforcing the importance of ensuring not only the availability but also the maintenance of critical equipment and accessible guidelines. Aloush et al. **[19]** found that burnout and emotional strain negatively affect nurses' performance; addressing these psychological barriers through structured communication, counseling, and workload management can improve resilience and patient outcomes.

Furthermore, Rashnou et al. **[20]** noted that staffing, knowledge, and resource barriers broadly impact ICU nurses, suggesting that interventions should target system-level improvements rather than individual competencies alone. This is supported by Dadnew et al. **[21]** and Kim and Jansson et al. **[22]**, who advocate integrated strategies including optimized staffing, structured training, adequate resources, clear protocols, and psychological support to enhance nurse effectiveness and patient care quality.

Limitations

The descriptive cross-sectional design captures data at a single point in time, limiting the ability to establish causal relationships between barriers and outcomes. Only nurses available during the data collection period in two hospitals were included, which may limit the generalizability of the findings to other ICUs or regions.

Conclusion

Nurses caring for mechanically ventilated adult patients face multiple, interconnected barriers, including staffing shortages, insufficient formal training, limited equipment availability, and high levels of stress and burnout. These challenges can compromise patient safety, care quality, and nurses' well-being. The study found no significant association between demographic characteristics and perceived barriers, indicating that these issues are systemic rather than individual. Addressing these barriers requires organizational interventions, such as

improving nurse-to-patient ratios, providing structured ventilator training, ensuring adequate resources, and supporting psychological health. Enhancing communication and teamwork among ICU staff is also crucial to mitigate care challenges. Overall, a multifaceted, system-level approach is essential to improve outcomes for both patients and nurses.

CRediT

Author contributions: **Conceptualization-** Younus Khudhur Baeez, Hussein Mohammed Abdul Fattah, Marwah Ali Khalaf, Shelan Qahraman Shakor. **Data curation-** Younus Khudhur Baeez, Hussein Mohammed Abdul Fattah; **Formal Analysis-** Marwah Ali Khalaf, Shelan Qahraman Shakor; **Investigation-** Younus Khudhur Baeez, Hussein Mohammed Abdul Fattah, Marwah Ali Khalaf, Shelan Qahraman Shakor; **Methodology-** Younus Khudhur Baeez, Hussein Mohammed Abdul Fattah, Marwah Ali Khalaf, Shelan Qahraman Shakor; **Project administration-** Younus Khudhur Baeez; **Supervision-** Younus Khudhur Baeez; **Writing- original draft-** Younus Khudhur Baeez, Hussein Mohammed Abdul Fattah, Marwah Ali Khalaf, Shelan Qahraman Shakor; **Writing-review & editing-** Younus Khudhur Baeez, Hussein Mohammed Abdul Fattah, Marwah Ali Khalaf, Shelan Qahraman Shakor.

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Ethical Approval

Ethical approval was obtained from the Scientific and Ethical Committee of the College of Nursing, Kirkuk University (approval number: 15/6/3036, reference: 17-12-2025), as well as from relevant hospital authorities. Participants were informed that: Participation was voluntary; They could withdraw at any time without consequences; All collected data would be kept confidential and used solely for research purposes; Anonymity was ensured by using codes instead of personal identifiers.

Informed Consent

It was applicable.

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Data Sharing Statement

All referenced sources are accessible through the respective journals or public repositories.

Conflict of Interest

The authors declare no conflict of interest.

Similarity Check

It was applied by Ithenticate®.

Application of Artificial Intelligence (AI)

Not applicable.

Peer Review Process

It was performed.

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