Research Paper

Investigating the Knowledge, Attitude, and Practice of Iraqi Intensive Care Nursing Staff Regarding Hand Hygiene

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ABSTRACT

Background: Hospital-acquired infections are recognized as a major risk factor in healthcare settings. Hand hygiene as the first stage of infection control plays an important role in reducing these infections. This study assesses the knowledge, attitudes, and practice regarding hand hygiene among nurses in intensive care units (ICUs) of Basrah City and Dhi Qar City, Iraq.

Methods: This descriptive cross-sectional study targeted 231 ICU nursing staff working in hospitals of Al-Basra and Dhi-Qar in Iraq in 2022. The subjects were recruited through the census. To assess the nurses' hand hygiene knowledge, attitude, and practice, electronic questionnaires were administered via WhatsApp. The collected data were analyzed using descriptive statistics (absolute and relative frequency, Mean±SD) and inferential statistics (independent t-test, chi-square test, and Fisher test). The data analysis was performed using the SPSS software, version 22. Meanwhile, a significance level of <0.05 was considered for all statistical tests.

Results: The mean scores (ranges) of nurses' hand hygiene knowledge, attitude, and practice were 4.74±1.82 (1-10), 77.25±7.89 (55-95), and 49.80±12.23 (21-70), respectively. There was a significant relationship between hand hygiene knowledge and gender, with female nurses' knowledge being higher compared to male nurses (P=0.03). Furthermore, nurses with less than 5 years of practical experience in the ICU had a higher mean score of attitudes toward hand hygiene compared to nurses with 5-10 years of practical experience (P=0.015). Additionally, nurses with less than 5 years of experience in the ICU showed a higher mean score of hand hygiene practice compared to nurses with more than 10 years of practical experience (P=0.028).

Conclusion: According to the findings, the knowledge, attitude, and practice of ICU nurses about hand hygiene were inappropriate. It is necessary to implement educational programs to improve the knowledge, attitude, and practice of Iraqi ICU nurses in this area.

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Highlights

- Hand hygiene serves as a critical first line of defense in reducing hospital-acquired infections.
- A lack of knowledge and an unfavorable level of attitude and practice about hand hygiene were observed among the ICU nurses.
- Female nurses demonstrated higher knowledge compared to male nurses.
- Nurses with a bachelor's degree in nursing exhibited more positive attitudes and practices about hand hygiene compared to those with school nursing degrees and diplomas.
- A significant association was found between nurses' attitudes and practices about hand hygiene and their years of practical experience in the ICU.

Plain Language Summary

Hand hygiene serves as a critical first line of defense in reducing hospital-acquired infections and is paramount for infection control. This study determined the knowledge, attitudes, and practices of nurses in the ICUs of Basrah Hospital and Dhi Qar Hospital in Iraq regarding hand hygiene. The findings indicated that ICU nurses exhibit a deficiency in knowledge, an unfavorable attitude, and poor adherence to hand hygiene practices.

Introduction

Hospital-acquired infections pose a significant concern for patients' health and safety (Clack et al., 2017). They rank among the most common adverse events in healthcare, placing considerable strain on the core priorities of each hospital (Goodarzi et al., 2020). These infections represent a critical global public health issue (Sarani et al., 2016). According to the World Health Organization (WHO) estimates, approximately 15% of hospitalized patients are affected by such infections (WHO, 2010). The incidence rates vary, with high-income countries experiencing rates from 3.5% to 12%, and middle to low-income countries witnessing rates between 5.7% and 19.1% (Wang et al., 2018). Hospital-acquired infections have serious implications, leading to prolonged hospitalizations, increased antibiotic resistance, higher mortality rates, and escalated treatment expenses for patients and the healthcare system (Kwon et al., 2015). Intensive care units (ICUs) have a higher prevalence of hospital-acquired infections compared to other hospital settings (Albughbish et al., 2016). Healthcare workers play a critical role in supporting high-risk patients in ICUs to reduce their risk of such infections (Alsubaie et al., 2013). Hand hygiene is a fundamental factor in preventing the spread of healthcare-associated infectious diseases, as microorganisms are primarily transmitted in the hospital environment through the hands of healthcare workers (Wetzker et al., 2016); accordingly, proper hand hygiene is the most effective method to prevent hospital-acquired infections in healthcare settings (Hosseinialhashemi et al., 2015).

Nurses are in direct contact with patients; therefore, they may inadvertently transmit infections through daily care activities and the use of medical tools (Khan, 2021). Several factors contribute to nurses' inconsistent handwashing practices, including the characteristics of ICU patients, heavy workloads, nursing shortages, and inadequate resources (Fouad & Elther, 2020). Various issues, such as the lack of hand-washing sinks, limited time for hand hygiene, patients' underlying conditions, and inadequate knowledge of hand hygiene standards result in low adherence to proper hand hygiene (Tan et al., 2020). Some nurses prefer using gloves rather than washing their hands, leading to potential cross-contamination when gloves are improperly discarded after use (Gunasekara et al., 2009).

Evaluating nurses' hand hygiene knowledge, attitude, and practice is crucial to improving infection control. Previous studies among ICU nurses in Iran and Saudi Arabia showed varying levels of knowledge and positive perceptions of hand hygiene (Aledeilah et al., 2018). However, limited research has been conducted in Iraq on this topic, and existing studies have used instruments that lack adequate validity and reliability for assessment

(Abduawahid & Mahmood, 2020). ICU nursing staff operate in a demanding and intricate sector of nursing. In Iraq's healthcare system, baccalaureate, technical, and skilled nurses are all considered graduate-trained nurses and work collaboratively. Evaluating the knowledge, attitude, and practice of nursing staff regarding hand hygiene is crucial as it plays a pivotal role in preventing nosocomial infections. To improve nurses' knowledge, attitude, and practice in hand hygiene, it is essential to assess the current situation and develop an effective plan. This study aimed to determine the knowledge, attitude, and practice of nursing personnel in ICUs of the hospitals in Basrah and Dhi-Qar in Iraq, where limited research has been conducted. This study can serve as a valuable foundation for future research endeavors, aimed at enhancing the knowledge, attitude, and practice of intensive care nurses in the field of hand hygiene.

Materials and Methods

Study design, setting, and sample

This was a descriptive cross-sectional study. In this study, knowledge, attitudes, and practice regarding hand hygiene among ICU nursing staff in governmental (teaching and non-teaching) hospitals of Al-Basra and Dhi-Qar cities in Iraq were investigated. In this study, all ICU nursing staff in governmental hospitals (teaching and non-teaching) of both cities were recruited through census, and all nursing staff working in the ICUs affiliated with Basra Hospital (Al-Basra Teaching Hospital, Al-Sadr Teaching Hospital, Al-Mawani Teaching Hospital, Al-Fayha Teaching Hospital, Al-Qurna General Hospital, Al-Mudaina General Hospital) and Nasiriyah hospitals (Nasiriyah Teaching Hospital, Nasiriyah Heart Center) participated in the study. In total, 231 nurses were included in the study. All nursing staff who were willing to participate in the research and were directly involved in patient care in the mentioned governmental hospitals of Al-Basra and Dhi-Qar cities, Iraq, were recruited for participation. However, head nurses who did not provide direct care for patients were excluded.

The data were collected from August to September 2022, employing various questionnaires, including a demographic form, nurses' hand hygiene knowledge questionnaire, nurses' hand hygiene attitude questionnaire, and nurses' hand hygiene practice questionnaire. The data collection process utilized online electronic questionnaires created through Google Forms and distributed via social media, specifically WhatsApp. The researchers obtained the nurses' cell phone numbers and formed WhatsApp groups for effective communication. The online electronic questionnaires were disseminated through WhatsApp groups, attracting participation from all eligible participants. The researcher further clarified the study's procedure and objectives in person to ensure clarity and understanding among the participants.

Study instruments

Demographic form

The demographic form included various items, encompassing age, gender, marital status, level of education, nursing work experience, work experience in the ICU, working hours per week, and history of participation in an in-service training program related to controlling nosocomial infections within the past year.

Nurses' hand hygiene knowledge questionnaire

The questionnaire was developed by Van de Mortel in 2009. It evaluates nurses' knowledge about hand hygiene through 12 four-choice questions. Each correct answer was given a score of one, while incorrect answers received a score of zero, resulting in a knowledge score range of 0 to 12. A higher score indicated a greater level of knowledge among nurses regarding hand hygiene. The Cronbach α coefficient is reported at 0.83, demonstrating acceptable internal consistency (Van De Mortel, 2009). Nursing staff determined their knowledge about hand hygiene by choosing the appropriate options. A score of more than 75% was considered good knowledge, 50%-74% was rendered moderate, and less than 50% was poor knowledge.

To translate the nurses' hand hygiene knowledge questionnaire, the translation-retranslation method was employed. Initially, a translator familiar with medical concepts translated the text into Arabic. Subsequently, another translator, a bilingual specialist, translated the text from Arabic to English without the knowledge of the original questionnaire. Subsequently, the researcher and their supervisor compared the translated Arabic and English texts with the main questionnaire to ensure the accuracy of concepts and wording. The content validity of this translated questionnaire was reviewed by a panel of experts comprising three faculty members from the School of Nursing and Midwifery of University of Basrah, Iraq. In the present study, the Kuder Richardson 21 method was used to calculate the internal consistency of the questionnaire, yielding a value of 0.72.

Nurses' hand hygiene attitude questionnaire

The attitude questionnaire regarding hand hygiene comprised 22 items. Nurses indicated their attitude toward hand hygiene using a 5-point Likert scale (I strongly disagree=1, I disagree=2, I am not sure=3, I agree=4, I strongly agree=5). The scores ranged from 22 to 110, with higher mean scores indicating a more favorable attitude toward hand hygiene. For specific items (5, 8, 10, 16, 17, 18, 19, and 20) in the nurses' hand hygiene attitude questionnaire, the scoring is inverse, meaning a grade of 5 is considered complete disagreement and a score of 1 is intended for agreeing. A score of more than 75% is considered positive and indicative of a favorable attitude. The Cronbach α coefficient was reported at 0.87, indicating that the internal consistency of the questionnaire was appropriate (Van de Mortel, 2009).

To translate the nurses' hand hygiene attitude questionnaire, the translation-back translation method was used. Initially, a translator familiar with the medical concepts translated the text into Arabic. Subsequently, another translator (a bilingual specialist) translated the text from Arabic to English without the knowledge of the original version. The researchers compared the translated Arabic and English texts with the main questionnaire to ensure the accuracy of concepts and wording. The content validity of the Arabic version of the questionnaire was assessed by a panel of experts comprising three faculty members from University of Basrah's School of Nursing and Midwifery. The Cronbach α coefficient was calculated for the studied samples to determine the internal consistency of the questionnaire, yielding a value of 0.79.

Nurses' hand hygiene practice questionnaire

The practice questionnaire consisted of 14 items, and the nurses showed their practice on hand hygiene on a 5-point Likert scale (never=1, sometimes=2, half of the time=3, most of the time=4, always=5). The scores ranged from 14 to 70, and higher mean scores indicated better practice of hand hygiene (Van de Mortel, 2009). In this study, the translation-retranslation method was used to translate the transliteration practice questionnaire. To describe the samples, it was considered sufficient and desirable for nurses and staff to have answered 90% or more of the questions correctly. In a study on nursing staff, the Cronbach α coefficient was reported at 0.91 (Van de Mortel, 2009). The nursing staff was asked to complete the questionnaire. For this purpose, at first, a translator who was familiar with medical concepts translated the text into Arabic. Another translator (a bilingual specialist) then translated the text from Arabic to English. This translator was unaware of the original questionnaire. The translated Arabic and English texts were compared with the text of the main questionnaire and finalized for validity evaluation. The content validity of this questionnaire was reviewed by a panel of experts, consisting of three faculty members of the School of Nursing and Midwifery of University of Basrah. In the present study, the Cronbach α coefficient was calculated for the studied samples to determine the internal consistency of the questionnaire, yielding a value of 0.92.

Study procedure

The questionnaires were administered using Google Forms, which were distributed on social media platforms. Before data collection, all study subjects provided written informed consent. They were thoroughly briefed on the data collection method and study procedures during an in-person meeting. Subsequently, the nurses' cell phone numbers were obtained to form a WhatsApp group, facilitating efficient communication. The questionnaires were delivered through this WhatsApp group, and regular weekly reminders were sent to prompt the nurses to complete them. The data collection process spanned four months.

After collecting the data from Google Forms, the information was exported to Excel software, and then transferred to SPSS software, version 22 for analysis. Descriptive statistics (absolute and relative frequency, Mean±SD) were used to summarize the data. Furthermore, inferential statistics (independent t-test, chi-square test, and Fisher test) were applied to achieve the research objectives. The Kolmogorov-Smirnov test was utilized to assess the normality of variables. Data analysis was conducted using the SPSS software, version 22. A significance level of <0.05 was considered for all statistical tests.

Results

In this study, 231 questionnaires were distributed in 8 selected hospitals in Al-Basra and Dhi-Qar cities. Table 1 shows that the age of the majority of participants (66.7%) was <30 years. Concerning gender, more than half of the sample (52.8%) was female, and more than half of them (50.2%) were married. More than half of the samples (59.3%) had a bachelor's degree, and 52.5% of them had <5 years of practical experience in nursing. Meanwhile, more than half of the samples (72.7%) had practical experience in ICU. The results revealed that 88.8% of the participants worked 50 h or less per week. Finally, Table 1 shows that 54.1% of the samples partici-

Table 1. Demographic characteristics of the study units and their relationship with the knowledge, attitude, and performance of the nursing staff regarding hand hygiene

Demographic Characteristics		No. (%)	Knowledge		Attitude		Practice	
			Mean±SD	Results	Mean±SD	Results	Mean±SD	Results
Age (y)	<30	154(66.7)	4.82±1.86	F=0.37* P=0.68	77.71±7.60	F=0.37* P=0.68	50.57±11.81	F=1.16* P=0.31
	30-40	66(28.6)	4.61±1.79		76.02±8.96		47.98±12.84	
	>40	11(4.8)	4.55±1.63		78.27±3.90		50.00±14.41	
	Total	231(100.0)						
Gender	Male	109(47.2)	4.48±1.68	t=2.11** df=229 P=0.03	77.96±8.07	t=1.28** df=229 P=0.19	50.00±11.76	t=0.22** df=229 P=0.82
	Female	122(52.8)	4.98±1.92		76.62±7.73		49.63±12.69	
	Total	231(100.0)						
Marital status	Single	115(49.8)	4.63±1.77	t=-0.90** df=229 P=0.36	77.83±7.90	t=1.11** df=229 P=0.26	50.24±12.29	t=0.54** df=229 P=0.58
	Married	116(50.2)	4.85±1.88		76.68±7.89		49.37±12.22	
	Total	231(100.0)						
Education level	Secondary school	20(8.7)	4.55±1.90	F=1.43* P=0.24	70.60±7.21	F=42.85* P<0.001	39.10±13.56	F=56.05* P<0.001
	Diploma	74(32.0)	4.49±1.177		72.80±7.11		42.01±11.75	
	BS	137(59.3)	4.91±1.84		80.64±6.50		55.58±8.36	
	Total	231(100.0)						
Practical experience in nursing (y)	<5	121(52.5)	4.75±1.83	F=0.15* P=0.92	77.94±7.59	F=0.74* P=0.52	50.44±11.91	F=0.74* P=0.41
	5-9	75(32.0)	4.80±1.99		76.72±8.72		49.91±11.65	
	10-15	18(7.8)	4.72±1.56		75.56±8.17		49.61±1269	
	>15	17(7.4)	4.47±1.37		76.53±5.80		45.06±16.18	
	Total	231(100.0)						
Practical experience in ICU (y)	<5	168(72.7)	4.80±1.88	F=0.44* P=0.64	78.26±7.59	F=5.02* P=0.006	50.63±11.73	F=3.35* P=0.03
	5-10	40(17.3)	4.68±1.79		74.43±9.07		49.90±12.45	
	>10	23(10.0)	4.43±1.47		74.83±6.35		43.65±14.18	
	Total	231(100.0)						
Working hours per week	≤50	204(88.8)	4.71±1.85	t=0.57** df=229 P=0.45	77.22±8.15	t=0.22** df=39.67 P=0.82	50.08±12.21	t=0.96** df=229 P=0.33
	>50	26(11.3)	5.00±1.67		77.50±5.64		47.62±12.48	
	Total	231(100.0)						
Participated in an in-service training program	Yes	125(54.1)	4.72±1.82	t=0.22** df=229 P=0.82	77.75±8.33	t=1.03** df=229 P=0.30	50.02±12.63	t=-0.29** df=229 P=0.76
	No	106(54.1)	4.77±1.85		76.67±7.35		49.55±11.81	
	Total	231(100.0)						

*One-way ANOVA, **Independent sample t-test.

Client- Centered Nursing Care

Abbreviations: SD: Standard deviation; ICU: Intensive care unit; BS: Bachelor of science.

Table 2. Mean±SD of knowledge regarding hand hygiene among intensive care unit nursing staff

Knowledge (0-12)	No. (%)
Poor (<6)	154(66.7)
Moderate (6-9)	71(30.7)
Good (≥9)	6(2.6)
Total	231(100)
Mean±SD (Min-Max)	4.74±1.82 (1-10)

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Table 3. Mean±SD of attitude regarding hand hygiene among intensive care unit nursing staff

Attitude (22-110)	No. (%)
Unfavorable (≤82.5)	171(74.0)
Favorable (>82.5)	60(26.0)
Total	231(100)
Mean±SD (Min-Max)	77.25±7.89 (55-95)

Client- Centered Nursing Care

pated in an in-service training program. In addition, Table 1 shows a significant relationship between hand hygiene knowledge and gender. Female nurses' knowledge (4.98±1.92) was higher compared to males (4.48±1.68) (P=0.03). Also, there was a significant association between nurses' attitudes and practices regarding hand hygiene and education level (P<0.001). Attitudes and practices regarding hand hygiene were higher among nurses who had a bachelor's degree in nursing compared to others (P<0.001). There was a significant association between nurses' attitudes toward hand hygiene and years of practical experience in the ICU (P=0.006). The mean score of attitude toward hand hygiene was lower among nurses with 5 to 10 years of experience in the ICU compared to those with less than 5 years of practical experience (P=0.015). Moreover, a significant association was found between nurses' hand hygiene practices and their years of practical experience in the ICU (P=0.03). The results indicated that the mean score of hand hygiene practice was lower among nurses with more than 10 years of experience in the ICU than those with less than 5 years of practical experience (P=0.028) (Table 1).

Table 2 illustrates that most nurses (66.7%) had poor knowledge. According to Table 3, most nurses (74%) had unfavorable attitudes. Table 4 indicated that most nurses (83.1%) had poor practice.

Discussion

The study was conducted to determine the knowledge, attitudes, and behaviors of ICU nursing staff in hospitals of Basrah City and Dhi- Qar City, in Iraq.

The results showed that the overall knowledge of the majority of the subjects about hand hygiene was low.

Table 4. Mean±SD of practice regarding hand hygiene among ICU nursing staff

Practice (14-70)	No. (%)
Poor (≤63)	192(83.1)
Good (>63)	39(16.9)
Total	231(100)
Mean±SD (Min-Max)	49.80±12.23 (21-70)

Client- Centered Nursing Care

The lack of previous training on hand hygiene for almost half of the subjects may explain the poor knowledge levels. Additionally, hospitals in Iraq lack educational interventions on hand hygiene, contributing to the issue. The study highlighted that more than half of the nurses had not received any training programs on hand hygiene, and even those who attended had low scores, due to inadequate quality, frequency, and time intervals between their in-service training. The authorities should prioritize providing in-service education about hand hygiene and nosocomial infections, focusing on the quality and methods of education and the frequency of updating nurses' knowledge. Infection supervisors can also play a vital role in training, assessing, and evaluating nurses' knowledge in this area. Frequent infection rounds and evaluations can help enhance nurses' awareness and knowledge about hand hygiene.

These findings are in line with previous research conducted by Najafi Ghezeljeh et al. (2015) in Iran, which also explored nurses' knowledge of hand hygiene. In a study conducted in Pakistan by Zil-E-Ali et al. (2017), it was found that less than half of the respondents had an acceptable level of knowledge about hand hygiene, a result similar to the study of Dutta et al. (2020), who reported that half of the participants had poor knowledge about hand hygiene, with nearly half of them lacking any hand hygiene training. In contrast to the findings of the present study, Ango et al. (2017), Aledeilah et al. (2018), Deepak et al. (2020), and Arthi et al. (2016) found that the majority of the participants had a high level of knowledge of hand hygiene. Also, in a study, almost all employees were aware of the seven steps to proper hand washing (Hammerschmidt & Manser, 2019).

Moreover, the current study reveals that female nurses possess better hand hygiene knowledge compared to their male counterparts. This gender-based difference in hand hygiene knowledge among Iraqi nurses calls for further investigation to identify its possible underlying causes. This could be attributed to cultural norms or a more targeted and focused education approach for female nurses within the Iraqi context. These results echo the findings of Zil-E-Ali et al. (2017), who also reported significant gender differences in nursing knowledge about hand hygiene, with female nurses demonstrating greater knowledge in this area. This emphasizes the need for continued research and attention to improve hand hygiene practices among all nurses, while also researching to clarify the potential gender-specific differences in knowledge about hand hygiene.

According to the findings, a significant number of Iraqi ICU nurses displayed an unfavorable attitude toward hand hygiene. This unfavorable attitude can be attributed to their low knowledge about hand hygiene, which leads to a lack of awareness regarding its importance in preventing infections in hospitals. Consequently, this lack of awareness appears to have a direct impact on their attitudes. However, nurses must recognize hand hygiene as a critical patient safety indicator. This result is consistent with a descriptive cross-sectional study conducted by Arthi et al. (2016) in India, which also indicated unfavorable attitudes toward hand hygiene among general nursing staff. Furthermore, similar findings were reported in a study conducted among nursing staff in hospitals in Kuwait by Al-Wazzan et al. (2011), which also identified weaknesses in attitudes toward hand hygiene. In contrast, the current finding contradicts the results of Ango et al. (2017), Aledeilah et al. (2018), and Hammerschmidt and Manser (2019), whose studies found that the majority of healthcare providers exhibited a positive attitude toward hand hygiene.

The study revealed a significant relationship between the educational level and nursing attitudes toward hand hygiene, with nurses holding a bachelor's degree displaying a more favorable attitude. Additionally, the results demonstrated that nurses with less than 5 years of practical experience in the ICU exhibited a more favorable attitude toward hand hygiene compared to those with 5-10 years of experience. These findings underscore the importance of university education, as well as high-quality and effective in-service education, in fostering and maintaining favorable attitudes toward hand hygiene among ICU nurses. However, the observed differences in hand hygiene attitudes based on practical experiences in the ICU among Iraqi nurses call for further investigation. It is essential to explore the factors contributing to this variation to gain a deeper understanding of how practical experience in the ICU may influence nurses' attitudes toward hand hygiene.

According to the findings, ICU nurses' practice of hand hygiene was poor, which can be attributed to their low knowledge and unfavorable attitude toward hand hygiene. Several factors contribute to this poor practice, including the demanding nature of their work, such as high workload and time constraints. Additionally, inadequate in-service training, lack of proper infrastructure for hand hygiene implementation, and insufficient or inefficient surveillance systems and nursing leadership also play a role. As nurses, protecting patients from harm is one of their ethical and professional obligations (Zil-E-Ali et al., 2017).

These results align with previous studies, such as those conducted by Arthi et al. (2016) and Deepak et al. (2020), which also reported the majority of nurses exhibiting poor hand hygiene practices. However, Aledeilah et al. (2018) reported a moderate level of hand hygiene practice among participants in their study.

The study's findings revealed that nurses with a bachelor's degree in nursing demonstrated better hand hygiene practices. This suggests that university education plays a significant role in influencing nursing practices regarding hand hygiene, leading to improved adherence to hand hygiene protocols. Furthermore, the results indicated that nurses with 5 years of experience had better hand hygiene practices compared to those with more than 10 years of experience in the ICU. This difference warrants further investigation to identify the reasons behind the higher hand hygiene practices among the 5-year experience group compared to the other groups. The overall findings underscore the importance of university education and the implementation of high-quality and efficient in-service education for promoting and maintaining appropriate hand hygiene practices among ICU nurses in Iraq. These educational initiatives are crucial in fostering a culture of effective hand hygiene, which ultimately contributes to better patient care and safety.

Conclusion

Based on the results, the nursing staff in this study had a lack of knowledge and an unfavorable level of attitude and practice. The study's findings highlight the need for interventions to improve knowledge and awareness about hand hygiene among ICU nurses in Iraq, which could ultimately lead to more favorable attitudes and better adherence to hand hygiene practices, consequently enhancing patient safety in hospitals. Nurses' knowledge and current skill sets in critical care units should be updated through high-quality and efficient in-service programs. To provide high-quality and safe nursing care, knowledge, attitude and practice of hand hygiene should be considered as part of the routine evaluation of ICU nurses. It is also suggested to consider more education time at nursing schools to train nursing staff about this important subject, in addition to evaluating and revising the educational programs for other nursing staff.

The findings of this study cannot be universally applied to all of Iraq due to its restriction to a specific section of the country. Consequently, further research of a similar nature is necessary in other regions to draw more comprehensive conclusions.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of the Iran University of Medical Sciences (IUMS) (Code: IR.IUMS.REC.1401.649). The required permissions were obtained from the Faculty of Nursing and Midwifery of IUMS the Director of Basrah a Dhi-Qar and the Health Department. The study's objectives and voluntary participation of subjects were explained to all participants. All participants provided written informed consent.

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Authors' contributions

Study design and data analysis: Tahereh Najafi Ghezeljeh, Maha Muqdad Idan, Shima Haghani; Initial draft: Tahereh Najafi Ghezeljeh, Maha Muqdad Idan, Abdul Kareem Salman Khudhair; Figures and tables: Tahereh Najafi Ghezeljeh, Maha Muqdad Idan; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

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