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Nurses' Practices Concerning Infection Control Measures in Intensive Care Units

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Authors
Najm A.M.A.[1]* *MA*
Yasir A.A.[1] *PhD*

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[1]Department of Community Health Nursing, Faculty of Nursing, University of Babylon, Babylon, Iraq

Correspondence
Address: Faculty of Nursing, University of Babylon, Algeria Street, Babylon, Iraq. Postal Code: -
Phone: +07708026597
Fax: -
amer.najm.nurh135@student.babylon.edu.iq

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ABSTRACT

Aims Evaluating nurses' infection control practices is essential for maintaining established protocols and identifying weaknesses and areas for improvement. Therefore, the study aimed to evaluate nurses' practices regarding infection control measures in intensive care units.
Instrument & Methods This descriptive cross-sectional study was conducted in Hilla City at the four main teaching hospitals on 200 nurses selected using a non-probability sampling from October 1, 2023, to April 8, 2024. The total number of practices included in the evaluation list was 55 items. The evaluation checklist was validated by experts, and its reliability was verified through a pilot study. Data were collected using three observation methods and analyzed using descriptive and inferential statistics.
Findings A considerable portion (81%) of nurses demonstrated inadequate practices in infection control measures within intensive care units, with relatively low average scores. Nurses' age (p=0.013), education level (p=0.0001), years of experience (p=0.0001), years of experience in the current workplace (p=0.0001), and the number of training courses attended (p=0.0001) were associated with these practices.
Conclusion Older age, higher education level, more years of experience, longer tenure in the current workplace, and participa tion in more training courses are associated with better nurses' practices regarding infection control measures.

Keywords Nurses; Infection Control; Intensive Care Unit

CITATION LINKS

[1] Strategies to prevent healthcare-associated infections ... [2] Assessment of health care workers knowledge towards nosocomial infections in ... [3] Evolution of infection control in Egypt ... [4] Home care nurses' identification of patients at risk of infection and their risk mitigation strategies: A ... [5] Epidemiology of carbapenem-resistant Enterobacteriaceae in Egyptian intensive care units using national healthcare-associated infections surveillance ... [6] Prevalence of viral hepatitis infections in Babylon province, Iraq, during the interval ... [7] Infection control measures for nurses staff concerning with hepatitis b and c at hemodialysis ... [8] Nosocomial infections in neonatal intensive care units: cost-effective control strategies in ... [9] Nurses' adherence to patient safety principles ... [10] Burden of endemic health-care-associated infection in developing countries: systematic review ... [11] Safety: principle of nursing ... [12] Intensive care nurses' knowledge & practices regarding infection control standard precautions at a selected ... [13] Healthcare workers' perspectives on healthcare-associated infections and infection control practices: a video-reflexive ethnography study in the Asir ... [14] Hospital environment as a reservoir for cross transmission. Cleaning ... [15] The opinions of nurses regarding low adherence to standard precautions to prevent ... [16] Paediatric nurses', children's and parents' adherence to infection prevention and control and knowledge of antimicrobial ... [17] Knowledge, attitude, and practice regarding COVID-19 among healthcare ... [18] Factors influencing self-reported adherence to standard precautions among Thai nursing students ... [19] Strategies to promote infection prevention and control in acute care hospitals with the help of infection control link nurses: A ... [20] Roles of nursing skills in improving quality of rehabilitative health services for patients ... [21] Knowledge, attitude and practice of intensive care unit nurses about prevention and ... [22] Determination the causes of neonatal mortality during the last 3 years ... [23] Experiences of compliance with standard precautions during emergencies: A qualitative study of nurses working in ... [24] Knowledge, attitudes and practices of healthcare workers within an Australian tertiary hospital to managing high ... [25] Efficacy of implementation management program about infection control ... [26] Knowledge and practices of infection control among healthcare workers in a ... [27] Assessment of risk management concerning environmental pollution resulting from Musayyib electricity generation ...

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Introduction

Healthcare-associated infections (HAIs) are infections that are acquired during the course of medical treatment and are not present at the time of a patient's admission to a hospital or other healthcare facility. These infections contribute to increased rates of morbidity and mortality among critically ill patients, primarily due to the severity of their conditions, which makes them more vulnerable to acquiring additional microorganisms in the intensive care unit (ICU). Infection control strategies in ICUs are key to ensuring patient safety and the high quality of healthcare [1]. Critical care nurses are responsible for safeguarding critically ill patients, particularly those with compromised immune systems, from infections. This is essential for promoting recovery, preventing health deterioration, and ensuring high-quality nursing care. Consequently, critical care nurses must possess a thorough understanding of and strictly adhere to infection control standard precautions. Since nurses are the ones caring for patients and often have direct contact with them, they play a fundamental role in implementing measures to prevent HAIs [2]. Infection control and prevention are key responsibilities of critical care nurses and are a vital part of patient safety programs. This involves the processes and activities aimed at identifying and minimizing the risks of acquiring and spreading endemic or epidemic infections among individuals [3]. Furthermore, the commitment of nurses is highly emphasized, as the effectiveness of infection control routines depends on the guidelines and protocols prescribed to mitigate risks within these high-risk environments [4]. The risk of hospital-acquired infections continues to be a concern, even with improvements in the healthcare system. Insufficient understanding of infection control measures among healthcare workers leads to lower adherence to these protocols. Despite advancements in healthcare, the danger of HAIs still exists.

The World Health Organization states that HAIs are one of the top causes of morbidity and mortality worldwide, with ICUs being at the highest risk due to the severity of patient conditions and the invasive nature of the procedures they undergo [5]. Infection control encompasses hand hygiene, standard precautions, transmission-based precautions, and care bundles aimed at preventing urinary tract infections, central line infections, and ventilator-associated pneumonia. Poor infection control not only poses a problem for patients' health and outcomes but also burdens healthcare systems, which face increased healthcare costs and the evolution of antimicrobial resistance [6]. Therefore, analyzing nursing care practices concerning infection control measures in ICUs is essential for improving patient safety and healthcare settings [7].

Approximately 5% to 10% of patients in acute care hospitals in developed nations acquire HAIs at any given time, while the risk of infection is 2 to 20 times greater in developing countries. Healthcare-associated infections represent a significant global health issue and are recognized as one of the primary contributors to increased morbidity and mortality. They lead to longer hospital and ICU stays, greater severity of underlying conditions, higher use of monitoring and treatment devices, increased treatment costs in both developed and resource-limited countries, and a decline in the quality of life for patients and their families [8].

The key role of nurses' performance in adhering to infection control standards within ICUs has been demonstrated by many researchers. This issue is particularly important because hand hygiene compliance among nurses can be a major cause of HAIs in ICUs [9]. Additionally, emphasis is placed on environmental cleaning and disinfection as methods to reduce pathogen transmission in ICUs. The results of this study highlight the complex nature of infection control techniques and the need for thorough assessments to identify areas of strength and weakness.

A significant number of immunocompromised patients are admitted to ICUs. Approximately 30% of ICU patients experience one or more episodes of HAIs [10]. To assess the prevalence of HAIs across 27 hospitals in the Mediterranean region, research in countries, such as Jordan, Egypt, Morocco, Lebanon, and Tunisia showed that the prevalence was 10.5% among young adults, compared to 11.3% among pediatric patients. Consequently, nurses have both a professional and ethical responsibility to safeguard their patient's health and to contribute to the preservation of the natural environment. These nursing practice principles establish a comprehensive framework for delivering high-quality nursing care and highlight nursing's role in enhancing healthcare outcomes and patient experiences [11].

In the study conducted by Eskander *et al.*, the evaluation of nurses' knowledge indicated that over two-thirds of the nurses studied exhibited unsatisfactory levels of understanding, while about one-third demonstrated satisfactory knowledge. To pinpoint the specific areas where the majority displayed knowledge deficits, it was discovered that the primary gaps included: the concepts of infections and nosocomial infections, isolation precautions, sterilization, disinfection, bloodborne diseases, the administration of intravenous solutions, and antibiotics. Also, in this study, unsatisfactory knowledge was found among around two-thirds of the studied sample in relation to body fluid spillage, linen management, and waste disposal [12].

The U.S. Centers for Disease Control and Prevention (CDC) highlights the importance of healthcare workers possessing a thorough understanding of HAIs and their various types to ensure effective

prevention and control. The qualitative data from the study conducted by Paul *et al.* indicated that participants had a solid grasp of the definition of HAIs, the different types, and which types were most prevalent in their hospital, as well as the overall significance of implementing proper infection control measures. However, some junior residents in the study exhibited a lack of knowledge regarding the various types of HAIs. Additionally, participants were aware of the presence of an infection control department in their hospital that operated in accordance with CDC guidelines [13].

Nurses have played a pivotal role in preventing the spread of infections, but they may not be able to do so to the greatest extent possible due to heavy workloads, lack of resources, and gaps in their knowledge. Up-to-date knowledge and refined practical nursing skills can play important roles in preventing infection. The research agenda should focus on enhancing established effective preventive measures and creating new protocols aimed at high-risk procedures and particular microorganisms [14]. Nurses should have the opportunity to practice infection control on a day-to-day basis as an integral part of patients' care. Therefore, understanding the factors influencing nurses' compliance is fundamental for developing targeted interventions aimed at improving the safety of critical care patients, as well as for general purposes. This study aimed to evaluate nurses' practices regarding infection control measures in ICUs.

Instrument and Methods

This descriptive cross-sectional study was conducted in Hilla City at the four main teaching hospitals on 200 nurses selected using a non-probability sampling from October 1, 2023, to April 8, 2024.

Research tools

We assessed socio-demographic details, including age, gender, education level, years of experience in the field of nursing, current workplace, and number of training courses. Accordingly, following a thorough investigation of pertinent references, a 55-item checklist was created. This evaluation checklist was validated by experts, and its reliability was verified through a pilot study and its items were rated using a three-level Likert scale (never, sometimes, and always).

During observation, practices were scored based on the frequency of occurrence. If all three observations confirm the use of proper practices, they are counted as "Always" and awarded a score of three. If correct practices were used in two out of three situations, they were coded as "Sometimes" and scored as two. The same practice without correct practices was rated "Never" and assigned a score of one.

The researcher employed direct observation to gather responses from the subjects. Nurses were observed during their shifts in ICUs, with each nurse being observed three times over five days.

Statistical analysis

Statistical analysis was performed using SPSS 20.0 software. Numbers and percentages were used to rank the parameters, while the mean and standard deviation were utilized to statistically describe the continuous parameters. A Kolmogorov-Smirnov test was used to evaluate the normality. Additionally, Pearson's correlation coefficient and simple linear regression analysis were conducted to evaluate any predicted relationships. A threshold of 0.05 for statistical significance was applied.

Findings

A total of 200 nurses participated in this study, with a mean age of 31.04±6.29 years and a mean work experience of 7.16±5.27 years. The participants' mean years of experience in their current workplace and the number of training courses were 6.02±4.54 and 0.63±0.99, respectively (Table 1).

Table 1. Frequency of socio-demographic characteristics

Parameter	Classification	Values
Age (years)	20-29	99(49.5)
	30-39	84(42.0)
	40-49	17(8.5)
Education level	Secondary school nursing	20(10.0)
	Diploma nursing	132(66.0)
	Bachelor's degree	48(24.0)
Years of work experience	<5	64(32.0)
	5-10	98(49.0)
	11-15	17(8.5)
	>15	21(10.5)
Years of experience in ICU	<5	84(42.0)
	5-10	82(41.0)
	11-15	18(9.0)
	>15	16(8.0)
Number of training courses	Not once	135(67.5)
	Once	19(9.5)
	Twice	31(15.5)
	More than two	15(7.5)

Regarding nurses' practices concerning infection control measures in ICUs, 162 cases (81.0%) were found with inadequate, 27 cases (13.5%) with partially adequate, and 11 cases (5.5) with adequate practices, as evidenced by their comparatively low average scores (83.76±13.29).

Table 2. Relationship between nurses' practices and their socio-demographic characteristics

Parameter	Unstandardized coefficients		Standardized coefficients	T	p-Value
	β	Std. Error	Beta		
Age	3.628	1.44	0.176	2.511	0.013
Education level	11.078	1.46	0.473	7.553	0.0001
Years of experience	1.352	0.15	0.537	8.948	0.0001
Years of experience in ICU	1.735	0.15	0.614	10.952	0.0001
Number of training courses	9.944	0.61	0.753	16.110	0.0001

Dependent variable: Nurses' practices.

The results of the simple linear regression analysis indicated a predicted relationship between nurses' practices regarding infection control measures in ICUs and their age (β=0.176; p=0.013), education level (β=0.473; p=0.0001), years of experience (β=0.537; p=0.0001), years of experience in the ICU (β=0.614; p=0.0001), and number of training courses (β=9.944; p=0.0001; Table 2).

Discussion

This study aimed to evaluate nurses' practices regarding infection control measures in ICUs. The ICU is a place where patients' health comes first, and it is essential to maintain strict infection control procedures to ensure patient safety. Evaluating nurses in this context is crucial for upholding established protocols and identifying weaknesses and areas for improvement. The assessment was designed to evaluate nurses' competency and compliance with infection control practices in the ICU, which include hand washing, aseptic techniques, isolation procedures, and the use of personal protective equipment. By analyzing these practices, the goal is to reduce the chances of harm to patients, lower the risk of infection in healthcare settings, and improve the overall level of care in the ICU. The results of this study highlighted a serious shortcoming in the infection control skills of nurses working in the ICU, as the majority (81%) acknowledged that they did not follow the prescribed protocols. The study in question was evaluated using a mixed-method approach that involved applying a checklist to ascertain the nurses' infection control practices. The results indicated a significant deviation from optimal infection control measures. This evidence raises crucial questions about the potential consequences for patient safety and the spread of hospital-acquired infections within the ICU. This aligns with the findings of previous studies, showing that nurses do not adhere to infection control measures as required [15, 16].

There are a few possible causes behind the observed issues with infection control among critical care nurses, with factors, such as work stress, staff shortages, and inadequate training likely being the main contributors. The unintentional distractions that the ICU environment presents, due to its demanding nature characterized by high patient acuity and complex care needs, may adversely affect adherence to proper infection control protocols. Additionally, restrictions on resources and time constraints can reduce nurses' ability to consistently implement recommended practices, thereby widening the gap in infection control measures.

The results of the simple linear regression analysis showed that the age of the nurses was a predictor of infection control practices in ICUs. An additional observation was that as the age of nurses increased, there was also a corresponding increase in their adherence to infection control procedures in ICUs. The significance of this relationship emphasizes the need to include age as a factor when developing interventions aimed at improving infection control practices among ICU nurses. The results indicated a direct link between the age of nurses and their compliance with infection control protocols in ICUs. The statistics showed a consistent trend where, as nurses' ages increased, so did the probability of their adherence to infection control rules. In particular, it can be concluded that the likelihood of a nurse who is one year older following the infection control measures in ICUs was significantly higher than that of a worker who was one year younger. This aligns with the fact that professional experience and maturity are among the factors that determine the degree of adherence to infection control protocols by healthcare professionals. For example, research has shown that healthcare workers' attitudes toward infection prevention behaviors can be greatly influenced by their experience [17]. The authors argued that experienced healthcare workers are more likely to deploy the knowledge and skills acquired over many years of practice with greater vigilance and adherence to protocols.

The outcomes of a simple linear regression analysis indicated a significant predicted relationship between nurses' practices addressing infection control measures in ICUs and their educational level. This conclusion shows that nurses' adherence to infection control measures in ICUs increased along with their level of education. Correspondingly, this outcome can be explained by previous studies indicating a positive association between education level and adherence to healthcare protocols [4, 15]. This positive association may result from the comprehensive training and knowledge acquisition that typically accompanies a BSc in nursing. Nurses with advanced degrees may have a better understanding and reasoning for why infection control measures are necessary, as well as the ability to use critical thinking skills in clinical settings to apply these measures effectively [18]. Consequently, they might demonstrate greater dedication by adhering to best practices, which translates to a reduced risk of infections acquired in the ICU. We also found that the likelihood of implementing infection control measures in ICUs increased with an increase in the nurse's educational degree. This graphical presentation reinforces the statistical significance observed in the regression analysis, providing a concrete illustration of the association between education and practice in healthcare environments. The implications of these findings are significant for healthcare organizations and policymakers. Providing educational access for nurses not only ensures their professional development but also facilitates the strategy of infection prevention in ICUs. By implementing interventions focused on infection prevention and control education, healthcare

institutions have a great opportunity to reduce the risk of nosocomial infections and improve safety outcomes for patients [19].

The results of the simple linear regression analysis showed that the association between nurses' experience and infection control in the ICU was significant. This indicates that over time, nurses with experience in the hospital developed a higher level of compliance with infection control. This finding is in line with previous studies showing a positive connection between experience and adherence to evidence-based practices in healthcare [20, 21].

Long-serving nurses have had the opportunity to gain varied experiences and have come to understand the significance of infection control, which translates into a consistent application of standard protocols.

Additionally, the substantial increase in the likelihood that nurses followed infection control measures for every extra year of experience highlights the primary role of accumulated knowledge and skill improvement in enhancing healthcare. Also, there was a strong correlation between the explanatory variables and the nurses' practices regarding infection control measures. This relationship was demonstrated by the fact that the probability of nurses' adherence to these practices increased with each increment in years of experience. The results revealed that for every unit increase in a nurse's experience, there was an increase in adherence to infection control protocols within ICUs. This result aligns with the notion that experienced healthcare professionals typically possess a high level of knowledge regarding infection prevention strategies, which is usually gained from their years of exposure to diverse clinical scenarios, as well as continuous professional development and training [22, 23].

The results of the simple linear regression analysis showed a statistically significant relationship between nurses' adherence to infection control measures in ICUs and their participation in training. This finding demonstrates the necessity of continued education and professional development for nurses, especially in settings where infection prevention is a top priority.

Studies have shown that trained health workers are more competent in health protocols [1, 24].

For each additional training course completed by a nurse, there was an increase in adherence to infection control practices. This coefficient serves as a quantifiable metric for the degree and direction of the impact of training on adherence. It should be noted that such significant coefficients indicate that nursing education and training are effective investment tools for improving patient safety and preventing the spread of infections within healthcare facilities [25]. Moreover, this result aligns with previous studies indicating that education plays a significant role in the formation of a culture of patient safety and high-quality care [26, 27].

Through learning updates and training initiatives, nurses can enhance their skills, which can help them implement evidence-based practices and stay up to date with the guidelines for infection control. Furthermore, healthcare organizations must prioritize the provision of comprehensive training programs tailored to the specific needs of nurses working in ICUs to enhance their ability to prevent HAIs and protect the health of patients.

Conclusion

Older age, higher education level, more years of experience, longer tenure in the current workplace, and participation in more training courses are associated with better nurses' practices regarding infection control measures.

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