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An Examination of Disinfection and Sterilization Practices, Attitudes, and Knowledge in Healthcare Facilities

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Abstract

Healthcare-associated infections (HAIs) are a significant global concern, leading to increased morbidity, mortality, and healthcare costs. Effective disinfection and sterilization practices among healthcare workers (HCWs), particularly nurses, are vital for preventing HAIs. However, adherence to established protocols is inconsistent, and research examining the knowledge, attitudes, and practices of nurses in this domain is limited.This study assessed the knowledge, attitudes, and compliance with disinfection procedures among a random sample of nurses from eight public hospitals. Data were collected through structured face-to-face interviews using a validated questionnaire. Statistical analyses included multivariate logistic and linear regression to evaluate predictors of knowledge, attitudes, and compliance with disinfection practices.Of the 540 nurses approached, 533 participated (response rate: 98.7%). While most nurses recognized the importance of disinfection in preventing HAIs, only 30% correctly identified urinary and respiratory tract infections as the most common HAIs. Higher education levels were significantly associated with greater knowledge and adherence to proper disinfection practices (OR = 1.68, p = 0.028). Despite positive attitudes toward disinfection protocols, adherence to correct practices varied, with only 62.6% appropriately disinfecting surgical wounds and 57.5% performing proper hand hygiene. The majority expressed a strong interest in further education on disinfection.This study highlights critical gaps in nurses' knowledge and inconsistent adherence to disinfection protocols despite positive attitudes. Addressing these deficiencies through targeted education and training programs is essential to improve compliance, enhance patient safety, and reduce the incidence of HAIs.

Keywords: *Sterilization Practices, Healthcare Facilities, Attitudes.*

Introduction

Background

Healthcare-associated infections (HAIs) remain a critical public health concern globally, significantly impacting hospitalized patients by contributing to increased morbidity, mortality, and healthcare costs (1-3). The transmission of pathogens during medical care can be mitigated, and the incidence of HAIs reduced, by adhering to standardized preventive measures (4,5). Despite the availability of evidence-based protocols designed to promote effective practices among healthcare workers (HCWs), compliance with these measures has consistently fallen short of expectations (6-12).

The consistent implementation of proven prevention and control strategies is essential for addressing HAIs effectively. Among these strategies, strict adherence to disinfection guidelines plays a pivotal role in reducing infection rates. Nurses, as key contributors to patient care, are central to these preventive efforts. Their knowledge, attitudes, and practices concerning disinfection are crucial factors in minimizing HAIs. However, research exploring these aspects among HCWs, particularly nurses, remains limited (15-20).

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Understanding these factors could aid in designing programs aimed at enhancing compliance and improving outcomes.

Therefore, this study aimed to assess the level of knowledge, attitudes, and proper application of disinfection procedures among a random sample of nurses in hospitals and to examine the characteristics influencing these factors.

Methods

This study was conducted ، The following steps were implemented for the study:

- Eight non-academic acute general public hospitals were selected randomly.
- A letter describing the survey was sent to the medical director of each hospital, providing contact details for the study coordinator to answer any questions about participation.
- A random sample of nurses from each participating hospital was selected.
- On the designated survey day, each randomly selected nurse was informed verbally in person by a trained interviewer about the study's purpose, procedures, voluntary participation, anonymity, and asked for consent to participate.
- Informed consent was obtained from all participants.
- Trained interviewers conducted face-to-face interviews, ensuring privacy despite the survey's nature, and maintaining the confidentiality of individual results.

The authors designed a questionnaire consisting of five sections: (1) demographic and professional characteristics; (2) knowledge about the frequency of healthcare-associated infections (HAIs) and disinfection procedures; (3) attitudes toward the usefulness of guidelines and the perception of HAI transmission risks; (4) behaviors and compliance with antiseptic/disinfection protocols; and (5) sources of information commonly used to stay updated on disinfection practices. Knowledge about disinfection practices was assessed through true/false questions rated on a three-point Likert scale (agree, uncertain, disagree), while the frequency of HAIs was determined using "yes" or "no" answers. Attitudes were gauged using a ten-point Likert scale, from "not likely at all" to "very likely" for perceived risk of acquiring or transmitting HAIs, and "not at all" to "very much" for the usefulness of disinfection guidelines. Behavioral responses about performing antisepsis and disinfection procedures were recorded as "yes" or "no."

Compliance with disinfection guidelines was evaluated based on current criteria in use during the survey (17,21-23).

To ensure the questionnaire's clarity, quality, and feasibility, a pilot test was conducted with 20 volunteer nurses.

The study protocol, questionnaire, and informed consent form were approved by the institution's ethical committee.

Statistical Analysis

Stepwise logistic and linear regression techniques were applied for multivariate analysis to assess whether specific predictors were significantly associated with three outcomes: knowledge of urinary and respiratory tract infections as the most common HAIs (Model 1), positive attitudes towards disinfection guidelines/protocols (Model 2), and adherence to antisepsis procedures for surgical wounds and hand hygiene before and after medication (Model 3). The following variables were included in all models: gender

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(male = 0, female = 1), age (continuous, in years), professional role (ordinary nurses = 0, head nurses = 1), education level (primary/secondary school = 1, three-year registered nurse diploma = 2, baccalaureate/graduate degree = 3), years of experience (continuous, in years), type of ward (medical = 0, surgical = 1), hospital bed count (continuous), participation in infection control committee activities (no = 0, yes = 1), attendance at workshops/seminars or continuing education about disinfection (no = 0, yes = 1), and need for additional information on disinfection (no = 0, yes = 1). Additional variables for Models 1 and 3 included perceived risk of disease transmission during work (continuous), and for Model 2, knowledge about the risks of inappropriate disinfection (no = 0, yes = 1). Model 3 also included knowledge of surgical wound infections being frequent HAIs, and positive attitudes towards disinfection protocols.

Predictors associated with the outcomes at a univariate level with a p-value ≤ 0.25 were considered for entry into multivariate models. A significance level of 0.2 was set for variable entry, and 0.4 for retention in the model. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to assess associations between predictors and outcomes. Statistical significance was determined at $p \leq 0.05$. All analyses were performed using Stata 10.0 statistical software (24).

Results

All hospitals in the study reported having a committee dedicated to the control of healthcare-associated infections (HAIs). These hospitals shared similar features, including the availability of qualified nurses for infection control and the presence of established guidelines for hygiene and disinfection protocols. A total of 540 potential participants were approached, with 533 consenting to participate, resulting in a response rate of 98.7%. The demographic and professional characteristics of the respondents revealed that most were female (56.4%), with an average age of 45 years (range: 20-68 years). The mean number of years in practice was 19 (ranging from 6 months to 42 years), and over half of the participants worked in surgical departments (55.2%).

The survey responses regarding HAIs are shown in Table 1. A significant proportion of nurses (ranging from 77.8% to 96.9%) correctly acknowledged that improper disinfection procedures increase the likelihood of healthcare workers (HCWs) acquiring or transmitting HAIs. However, less than a third (30%) identified urinary and respiratory tract infections as the two most common HAIs. the multivariate logistic and linear regression models that analyzed the relationship between various variables and the outcomes of interest. Nurses with higher educational qualifications were more likely to recognize urinary and respiratory tract infections as the most frequent HAIs (OR = 2.02; 95% CI 1.23-3.32)

Table 1. Knowledge Regarding Hais and Disinfection Practices Among 533 Nurses Who Participated in the Survey

Question	**No. (n) (%)**
Most common HAIs	
Urinary tract	305 (57.6%)
Respiratory tract	279 (52.3%)
Surgical wound	267 (50.1%)
Skin infections	172 (32.3%)
Sepsis	147 (27.6%)
Vascular catheter	145 (27.2%)
Endocarditis	23 (4.3%)
Encephalitis	19 (3.6%)

Statement						
Statement	**Agree No. (n)**	**Agree (%)**	**Uncertain No. (n)**	**Uncertain (%)**	**Disagree No. (n)**	**Disagree (%)**
Improper disinfection increases HAI risk for hospitalized patients	514	96.4%	10	1.9%	9	1.7%

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Alcohol-based hand rubs should be used before handling IV devices or inserting urethral catheters	485	90.8%	19	3.6%	29	5.6%
Disinfectants should be applied for the recommended contact time	464	87.0%	39	7.3%	30	5.7%
Improper disinfection increases HAI transmission risk among patients	429	80.5%	34	6.4%	70	13.1%
Improper disinfection increases HAI transmission risk for HCWs	416	78.0%	54	10.1%	63	11.9%
Improper disinfection increases HAI acquisition risk for HCWs	413	77.6%	50	9.4%	70	13.0%

HAIs = Healthcare-associated infections, HCWs = Healthcare workers

Regarding the acquisition and transmission of HAIs, nurses expressed greater concern about the risk of acquiring infections, with a mean score of 6.6 on a scale from 1 to 10, compared to the risk of transmitting infections to patients, which had a mean score of 4.4. Despite most nurses reporting that they performed disinfection procedures, adherence to correct protocols varied. For example, only 62.6% appropriately disinfected surgical wounds, while 86.5% performed hand hygiene before invasive procedures. The most common method for hand hygiene was using antiseptic soap or alcohol-based products (54.9% for proper hand hygiene with soap and water, and 40.1% for alcohol-based products).

The multivariate logistic regression revealed that nurses with higher educational levels and a greater perception of risk for transmitting infectious diseases were more likely to adhere to correct disinfection practices (OR = 1.68; 95% CI 1.06-2.66)

When asked about preferred educational sources, about 75% of respondents indicated that they had received training on disinfection procedures. The most preferred method of acquiring information was through workshops and continuing education courses (71.8%), followed by guidelines/procedures (26.9%), and medical journals (23.2%). A significant portion of the respondents (82%) expressed interest in enhancing their knowledge about disinfection practices.

Discussion

The survey results revealed notable insights regarding the knowledge, attitudes, and practices related to healthcare-associated infections (HAIs) and disinfection procedures among nurses in various hospitals. Overall, the findings indicate several areas for improvement, especially in terms of the understanding of the most common HAIs and adherence to disinfection protocols.

A key concern was the inadequate knowledge of nurses regarding HAIs, particularly urinary and respiratory tract infections, with only about 30% correctly identifying them as the most prevalent. Nurses with higher education were significantly more likely to recognize these infections (OR = 2.02; 95% CI 1.23-3.32), which suggests that enhanced educational backgrounds correlate with a deeper understanding of infection prevention. Previous studies have similarly demonstrated that more experienced healthcare workers exhibit a higher level of knowledge regarding evidence-based infection control practices (25, 26). These findings emphasize the need for continuous education on HAIs, with workshops and seminars being potential

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solutions. Most nurses expressed a preference for such educational formats, indicating a strong willingness to improve their knowledge and practices related to disinfection.

The positive attitudes toward disinfection guidelines were overwhelming, with a mean score of 9.1 on a scale from 1 to 10. Nurses, regardless of their job position or knowledge level, consistently showed support for standardized protocols, reflecting an understanding of their importance in infection prevention. Notably, factors such as being female, having fewer years of practice, and requiring additional information about disinfection contributed to a more favorable attitude toward these guidelines.

However, when examining actual behaviors, it was concerning to find that adherence to correct disinfection practices was inconsistent. For example, only 62.6% of nurses correctly disinfected surgical wounds, and while hand hygiene was reported by 86.5% of participants before invasive procedures, only a fraction (57.5%) performed hand hygiene correctly, including the use of antiseptic products. This disparity between knowledge and practice is troubling since hand hygiene is a primary strategy for preventing HAIs (27, 28). Notably, nurses with a positive attitude towards disinfection protocols were more likely to follow proper procedures, highlighting the role of attitudes in promoting best practices. However, even those with a positive attitude did not always translate this into optimal behavior, suggesting the need for more effective implementation strategies.

Several limitations in the study design should be acknowledged. First, the cross-sectional nature of the study prevents the determination of causal relationships between the various variables. Furthermore, reliance on self-reported data may introduce bias, particularly in behavior reporting, as social desirability could influence responses. The absence of direct observational data also limits the accuracy of the reported behaviors. Despite these limitations, the survey provided crucial insights into the state of knowledge, attitudes, and behaviors regarding disinfection in healthcare settings.

Conclusion

In conclusion, the survey highlights a significant gap in nurses' knowledge of common HAIs and proper disinfection practices. Despite a strong positive attitude toward disinfection guidelines, adherence to appropriate procedures remains inconsistent. These findings underscore the need for ongoing education and training programs aimed at improving knowledge and compliance with infection control protocols. Addressing these gaps will be vital for enhancing patient safety and reducing the incidence of HAIs across healthcare settings.

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