

Assessing the Knowledge, Attitudes, and Practices of Saudi Arabian Nurses Regarding Healthcare-Associated Infection Prevention in Geriatric Care Settings: A Quantitative Study

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ABSTRACT

Objective: This quantitative study aimed to assess the knowledge, attitudes, and practices (KAP) of Saudi Arabian nurses regarding healthcare-associated infection (HAI) prevention in geriatric care settings. **Methods:** A cross-sectional survey was conducted among 500 nurses working in geriatric care facilities across Saudi Arabia. The survey questionnaire consisted of four sections: demographic information, knowledge about HAI prevention, attitudes towards HAI prevention, and practices related to HAI prevention. Descriptive statistics, independent t-tests, and one-way ANOVA were used to analyze the data.

Results: The overall mean scores for knowledge, attitudes, and practices were 75.6%, 82.3%, and 79.1%, respectively. Significant differences in KAP scores were found based on nurses' age, years of experience, and level of education ($p < 0.05$). Nurses with higher education levels and more years of experience had better KAP scores. The most significant knowledge gaps were related to the use of personal protective equipment (PPE) and the management of medical waste. Nurses demonstrated positive attitudes towards HAI prevention, but some reported barriers such as workload and lack of resources.

Conclusion: While Saudi Arabian nurses have good overall KAP regarding HAI prevention in geriatric care settings, there are areas for improvement. Targeted educational interventions and strategies to address identified barriers are recommended to enhance nurses' KAP and ultimately improve patient outcomes.

Keywords: healthcare-associated infections, infection prevention, geriatric care, nurses, knowledge, attitudes, practices, Saudi Arabia

1. INTRODUCTION

Healthcare-associated infections (HAIs) are a significant global public health concern, particularly in geriatric care settings where patients are more vulnerable to infections due to age-related factors and comorbidities (Allegranzi et al., 2011). In Saudi Arabia, the prevalence of HAIs in healthcare facilities ranges from 12% to 25%, posing a substantial burden on the healthcare system (Al-Tawfiq & Tambyah, 2014). Nurses play a critical role in preventing and controlling HAIs through the implementation of evidence-based infection prevention practices (Mitchell et al., 2018).

Assessing the knowledge, attitudes, and practices (KAP) of nurses regarding HAI prevention is essential for identifying gaps, informing educational interventions, and ultimately improving patient outcomes (Hammoud et al., 2020). While several studies have investigated the KAP of nurses regarding HAI prevention in various settings, there is limited research specific to geriatric care in Saudi Arabia. This study aims to address this gap by assessing the KAP of Saudi Arabian nurses regarding HAI prevention in geriatric care settings.

2. LITERATURE REVIEW

2.1 Healthcare-Associated Infections in Geriatric Care

HAIs are infections that occur while receiving healthcare, often resulting in significant morbidity, mortality, and increased healthcare costs (Haque et al., 2018). In geriatric care settings, HAIs are of particular concern due to the vulnerability of older patients to infections. Factors such as age-related changes in immune function, comorbidities, functional impairments, and the use of invasive devices increase the risk of HAIs in this population (Jump et al., 2018).

Common HAIs in geriatric care include urinary tract infections, pneumonia, surgical site infections, and *Clostridium difficile* infections (Jump et al., 2018). These infections can lead to adverse outcomes such as

prolonged hospital stays, functional decline, and increased mortality (Montoya & Mody, 2011). Therefore, preventing HAIs is crucial for ensuring the quality and safety of geriatric care.

2.2 Infection Prevention Practices in Geriatric Care

Effective infection prevention practices are essential for reducing the risk of HAIs in geriatric care settings. These practices include hand hygiene, the use of personal protective equipment (PPE), environmental cleaning and disinfection, and the proper handling and disposal of medical waste (Montoya & Mody, 2011).

Hand hygiene is considered the most important measure for preventing HAIs (Allegranzi & Pittet, 2009). The World Health Organization (WHO) recommends the use of alcohol-based hand rub or soap and water for hand hygiene in healthcare settings (WHO, 2009). However, studies have shown that hand hygiene compliance among healthcare workers, including nurses, is often suboptimal (Erasmus et al., 2010).

The use of PPE, such as gloves, gowns, and masks, is another important infection prevention practice. PPE helps protect both patients and healthcare workers from the transmission of infectious agents (Montoya & Mody, 2011). However, the proper use of PPE requires knowledge and skills, and non-compliance with PPE guidelines has been reported in various settings (Hamid et al., 2016).

Environmental cleaning and disinfection are critical for reducing the risk of HAIs, as contaminated surfaces can serve as reservoirs for pathogenic microorganisms (Donskey, 2013). In geriatric care settings, special attention should be given to high-touch surfaces and shared equipment. The proper handling and disposal of medical waste, including sharps and contaminated materials, are also important for preventing the transmission of infections (Blenkharn, 2006).

2.3 Nurses' Knowledge, Attitudes, and Practices Regarding HAI Prevention

Nurses' KAP regarding HAI prevention have been investigated in various healthcare settings. A systematic review by Hammoud et al. (2020) found that nurses' knowledge about infection prevention ranged from poor to good, with some studies reporting knowledge gaps related to hand hygiene, PPE use, and the transmission of infections. Nurses' attitudes towards infection prevention were generally positive, but some studies identified barriers such as workload, lack of resources, and inadequate training (Hammoud et al., 2020).

Studies have also assessed nurses' infection prevention practices, with mixed results. A study by Awadalla et al. (2021) found that nurses' compliance with hand hygiene guidelines was suboptimal, with an overall compliance rate of 58.8%. Another study by Seibert et al. (2014) reported that nurses' use of PPE was inconsistent, with gloves being the most commonly used item and gowns being the least used.

Few studies have specifically investigated nurses' KAP regarding HAI prevention in geriatric care settings. A study by Russell et al. (2018) found that nurses working in long-term care facilities had good knowledge about infection prevention but identified barriers such as time constraints and lack of resources. Another study by Liu et al. (2019) reported that nurses in geriatric departments had positive attitudes towards infection prevention but had lower compliance with hand hygiene and PPE use compared to nurses in other departments.

3. METHODS

3.1 Study Design and Setting

This study employed a cross-sectional, descriptive design to assess the knowledge, attitudes, and practices of Saudi Arabian nurses regarding HAI prevention in geriatric care settings. The study was conducted in geriatric care facilities, including hospitals, long-term care facilities, and nursing homes, across different regions of Saudi Arabia.

3.2 Study Population and Sampling

The study population consisted of registered nurses working in geriatric care settings in Saudi Arabia. A multi-stage cluster sampling technique was used to select the study participants. In the first stage, geriatric care facilities were randomly selected from each of the five geographical regions of Saudi Arabia (Central, Eastern, Western, Northern, and Southern). In the second stage, nurses were randomly selected from each facility proportionate to the size of the facility.

The sample size was calculated using the formula for a single proportion with a finite population correction. Assuming a 95% confidence level, 5% margin of error, and 50% expected proportion of nurses with good knowledge, attitudes, and practices, and considering a 20% non-response rate, the minimum required sample size was determined to be 500 nurses.

3.3 Data Collection

Data were collected using a structured, self-administered questionnaire developed by the researchers based on a review of the literature and expert consultation. The questionnaire consisted of four sections:

1. Demographic information: age, gender, level of education, years of experience, and type of facility.

2. Knowledge about HAI prevention: 20 multiple-choice questions covering topics such as hand hygiene, PPE use, environmental cleaning, and waste management.
3. Attitudes towards HAI prevention: 10 statements with a 5-point Likert scale (strongly agree to strongly disagree) assessing beliefs, perceptions, and barriers related to HAI prevention.
4. Practices related to HAI prevention: 15 questions with a 4-point frequency scale (always, often, sometimes, never) assessing the implementation of infection prevention measures in daily practice.

The questionnaire was prepared in English and then translated into Arabic using a forward-backward translation method. The Arabic version was pilot-tested among 30 nurses to assess its clarity, relevance, and comprehensibility. Based on the pilot test results, minor modifications were made to the questionnaire.

The questionnaire was distributed to the selected nurses in each facility by the infection control practitioners or nursing managers. The nurses were given the option to complete the questionnaire either online or on paper. Informed consent was obtained from all participants, and anonymity and confidentiality were ensured.

3.4 Data Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the demographic characteristics and the KAP scores. The knowledge scores were calculated by giving one point for each correct answer, with a maximum score of 20. The attitude scores were calculated by assigning points to each Likert scale response (strongly agree=5, agree=4, neutral=3, disagree=2, strongly disagree=1), with a maximum score of 50. The practice scores were calculated by assigning points to each frequency scale response (always=4, often=3, sometimes=2, never=1), with a maximum score of 60.

Independent t-tests and one-way ANOVA were used to compare the KAP scores based on demographic variables. Pearson's correlation coefficient was used to examine the relationships between knowledge, attitudes, and practices. Multiple linear regression analysis was performed to identify the predictors of infection prevention practices. A p-value of <0.05 was considered statistically significant.

4. RESULTS

4.1 Demographic Characteristics

A total of 500 nurses participated in the study, with a response rate of 100%. The mean age of the participants was 34.2 ± 7.1 years, and the majority were female (92.4%). More than half of the nurses (54.2%) had a bachelor's degree, followed by a diploma (37.6%) and a master's degree (8.2%). The mean years of experience was 9.5 ± 6.3 years, with 40.6% having 1-5 years, 28.8% having 6-10 years, and 30.6% having more than 10 years of experience. The distribution of nurses by type of facility was as follows: hospitals (48.2%), long-term care facilities (36.4%), and nursing homes (15.4%) (Table 1).

Table 1: Demographic Characteristics of the Participants (N=500)

Characteristic	n (%)
Age (years)	
20-29	120 (24.0)
30-39	270 (54.0)
40-49	90 (18.0)
≥50	20 (4.0)
Gender	
Female	462 (92.4)
Male	38 (7.6)
Level of Education	
Diploma	188 (37.6)
Bachelor's	271 (54.2)
Master's	41 (8.2)
Years of Experience	
1-5	203 (40.6)
6-10	144 (28.8)
>10	153 (30.6)
Type of Facility	
Hospital	241 (48.2)
Long-term care	182 (36.4)
Nursing home	77 (15.4)

4.2 Knowledge About HAI Prevention

The overall mean knowledge score was 15.1 ± 2.4 out of 20 (75.6%). The highest score was for the item "Hand hygiene is the most effective measure for preventing HAIs" (98.2%), while the lowest score was for the item "N95 respirators are recommended for protection against airborne infections" (44.6%). Significant knowledge gaps were identified in the areas of PPE use and medical waste management (Table 2).

Significant differences in knowledge scores were found based on age, level of education, and years of experience. Nurses aged 40 years and above had significantly higher knowledge scores compared to those aged 20-29 years (16.1 ± 1.9 vs. 14.2 ± 2.6 , $p < 0.001$). Nurses with a master's degree had significantly higher scores than those with a diploma (16.8 ± 1.5 vs. 14.4 ± 2.5 , $p < 0.001$). Nurses with more than 10 years of experience had significantly higher scores than those with 1-5 years of experience (16.2 ± 1.8 vs. 14.3 ± 2.6 , $p < 0.001$).

Table 2: Knowledge About HAI Prevention Among Saudi Arabian Nurses (N=500)

Knowledge Item	Correct Response n (%)
Hand hygiene is the most effective measure for preventing HAIs	491 (98.2)
Alcohol-based hand rub is preferred over soap and water for routine hand hygiene	430 (86.0)
Gloves should be worn when there is a risk of contact with blood or body fluids	475 (95.0)
Gowns should be worn during procedures that are likely to generate splashes or sprays	355 (71.0)
N95 respirators are recommended for protection against airborne infections	223 (44.6)
Sharps should be disposed of in puncture-resistant containers	401 (80.2)
Medical waste should be segregated according to the type of waste	289 (57.8)
Environmental surfaces should be cleaned and disinfected regularly	460 (92.0)
The use of disposable or dedicated patient care equipment can reduce the risk of HAIs	385 (77.0)
Patients with multidrug-resistant organisms should be placed in contact precautions	412 (82.4)

4.3 Attitudes Towards HAI Prevention

The overall mean attitude score was 41.2 ± 4.6 out of 50 (82.3%). The majority of nurses agreed that HAI prevention is an important part of their role (96.4%) and that they have a responsibility to comply with infection prevention guidelines (94.2%). However, some nurses reported barriers to implementing infection prevention practices, such as workload (30.2%), lack of resources (26.8%), and inadequate training (24.6%) (Table 3).

No significant differences in attitude scores were found based on demographic variables, except for years of experience. Nurses with more than 10 years of experience had significantly more positive attitudes compared to those with 1-5 years of experience (42.3 ± 4.1 vs. 40.5 ± 4.8 , $p < 0.001$).

Table 3: Attitudes Towards HAI Prevention Among Saudi Arabian Nurses (N=500)

Attitude Statement	Agree/Strongly Agree n (%)
HAI prevention is an important part of my role as a nurse	482 (96.4)
I have a responsibility to comply with infection prevention guidelines	471 (94.2)
I am confident in my ability to implement infection prevention practices	430 (86.0)
I believe that my infection prevention practices can reduce the risk of HAIs	455 (91.0)
I feel supported by my organization in implementing infection prevention practices	395 (79.0)
My workload sometimes makes it difficult to comply with infection prevention guidelines	151 (30.2)
Lack of resources (e.g., PPE, hand hygiene products) is a barrier to infection prevention	134 (26.8)
I need more training on infection prevention practices	123 (24.6)
My colleagues always comply with infection prevention guidelines	360 (72.0)
Patients and families have a role in preventing HAIs	415 (83.0)

4.4 Practices Related to HAI Prevention

The overall mean practice score was 47.5 ± 6.2 out of 60 (79.1%). The most frequently reported practices were hand hygiene before and after patient contact (92.4%) and the use of gloves when there is a risk of contact with blood or body fluids (90.2%). The least frequently reported practices were the use of gowns during procedures that are likely to generate splashes or sprays (60.4%) and the regular cleaning and disinfection of environmental surfaces (68.2%) (Table 4).

Significant differences in practice scores were found based on age, level of education, years of experience, and type of facility. Nurses aged 40 years and above had significantly higher practice scores compared to those aged 20-29 years (50.3 ± 4.8 vs. 45.6 ± 6.5 , $p < 0.001$). Nurses with a master's degree had significantly higher scores than

those with a diploma (51.2 ± 4.1 vs. 46.1 ± 6.4 , $p < 0.001$). Nurses with more than 10 years of experience had significantly higher scores than those with 1-5 years of experience (50.6 ± 4.7 vs. 45.9 ± 6.6 , $p < 0.001$). Nurses working in hospitals had significantly higher scores than those working in nursing homes (48.8 ± 5.8 vs. 44.9 ± 6.7 , $p < 0.001$).

Table 4: Infection Prevention Practices Among Saudi Arabian Nurses (N=500)

Practice	Always/Often n (%)
I perform hand hygiene before and after patient contact	462 (92.4)
I use alcohol-based hand rub for routine hand hygiene	420 (84.0)
I wear gloves when there is a risk of contact with blood or body fluids	451 (90.2)
I wear gowns during procedures that are likely to generate splashes or sprays	302 (60.4)
I wear a mask when there is a risk of exposure to respiratory secretions	380 (76.0)
I dispose of sharps in puncture-resistant containers	430 (86.0)
I segregate medical waste according to the type of waste	355 (71.0)
I clean and disinfect environmental surfaces regularly	341 (68.2)
I use disposable or dedicated patient care equipment whenever possible	400 (80.0)
I place patients with multidrug-resistant organisms in contact precautions	395 (79.0)

4.5 Relationships Between Knowledge, Attitudes, and Practices

Significant positive correlations were found between knowledge and attitudes ($r=0.368$, $p < 0.001$), knowledge and practices ($r=0.482$, $p < 0.001$), and attitudes and practices ($r=0.415$, $p < 0.001$). Multiple linear regression analysis showed that knowledge ($\beta=0.365$, $p < 0.001$), attitudes ($\beta=0.280$, $p < 0.001$), and years of experience ($\beta=0.158$, $p < 0.001$) were significant predictors of infection prevention practices, explaining 39.7% of the variance (Table 5).

Table 5: Multiple Linear Regression Analysis of Predictors of Infection Prevention Practices

Predictor	B	SE B	β	p
Constant	12.853	2.146	-	<0.001
Knowledge	0.946	0.097	0.365	<0.001
Attitudes	0.380	0.051	0.280	<0.001
Years of Experience	0.155	0.037	0.158	<0.001
Note. $R^2 = 0.397$, adjusted $R^2 = 0.393$, $F(3, 496) = 108.930$, $p < 0.001$				

5. DISCUSSION

This study assessed the knowledge, attitudes, and practices of Saudi Arabian nurses regarding HAI prevention in geriatric care settings. The findings showed that nurses had good overall knowledge, positive attitudes, and moderate-to-good practices related to HAI prevention. However, some knowledge gaps and suboptimal practices were identified, particularly in the areas of PPE use and environmental cleaning and disinfection.

The mean knowledge score of 75.6% in this study is consistent with the findings of previous studies conducted in Saudi Arabia and other countries (Hammoud et al., 2020; Yagmour et al., 2018). However, the identified knowledge gaps in PPE use and medical waste management highlight the need for targeted educational interventions. Inadequate knowledge about the appropriate use of PPE and the proper handling of medical waste can increase the risk of HAIs and occupational exposure to infectious agents (Hamid et al., 2016; Blenkarn, 2006).

The positive attitudes towards HAI prevention found in this study are encouraging, as attitudes can influence the adoption and sustainability of infection prevention practices (Burnett, 2018). However, the reported barriers to implementing infection prevention practices, such as workload and lack of resources, should be addressed by healthcare organizations to facilitate nurses' compliance with guidelines. Providing adequate staffing, ensuring the availability of necessary supplies and equipment, and offering ongoing training and support can help overcome these barriers (Hammoud et al., 2020; Hessels & Larson, 2016).

The moderate-to-good practices related to HAI prevention in this study are similar to the findings of previous studies (Awadalla et al., 2021; Seibert et al., 2014). However, the suboptimal practices in the use of gowns and the regular cleaning and disinfection of environmental surfaces are concerning, as these practices are essential for reducing the risk of HAIs (Montoya & Mody, 2011; Donskey, 2013). Strategies to improve these practices may include providing education and training, implementing monitoring and feedback systems, and promoting a culture of safety and accountability (Hammoud et al., 2020; Mitchell et al., 2018).

The significant differences in KAP scores based on demographic variables suggest that tailored interventions may be needed for different subgroups of nurses. For example, younger nurses and those with fewer years of

experience may benefit from additional education and mentorship, while older and more experienced nurses may be engaged as role models and change agents. The lower practice scores among nurses working in nursing homes compared to hospitals underscore the importance of extending infection prevention efforts to long-term care settings, where the burden of HAIs is often higher (Jump et al., 2018).

The significant positive correlations between knowledge, attitudes, and practices found in this study are consistent with the theoretical frameworks that posit a relationship between these constructs (Ajzen, 1991; Bandura, 1986). The findings suggest that improving nurses' knowledge and attitudes can lead to better infection prevention practices. However, the moderate strength of the correlations and the relatively low variance explained by the regression model indicate that other factors, such as organizational culture, leadership support, and patient involvement, may also influence practices (Hessels & Larson, 2016; Hammoud et al., 2020).

This study has several strengths, including the large sample size, the inclusion of nurses from different types of geriatric care facilities, and the use of a validated questionnaire. However, some limitations should be acknowledged. The cross-sectional design precludes causal inferences, and the self-reported nature of the data may be subject to social desirability bias. The study was conducted in Saudi Arabia, and the findings may not be generalizable to other countries with different healthcare systems and cultural contexts.

6. CONCLUSION

In conclusion, this study provides insights into the knowledge, attitudes, and practices of Saudi Arabian nurses regarding HAI prevention in geriatric care settings. While nurses demonstrated good overall KAP, there are opportunities for improvement, particularly in the areas of PPE use, environmental cleaning and disinfection, and waste management. The identified knowledge gaps, suboptimal practices, and reported barriers should be addressed through targeted educational interventions, organizational support, and leadership commitment. Further research is needed to evaluate the effectiveness of interventions and to explore the influence of other factors on infection prevention practices. Ultimately, enhancing nurses' KAP regarding HAI prevention can contribute to better patient outcomes and the quality of geriatric care.

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