

Assess Nurses' Knowledge and Practice In Relation to Infection Prevention and Related Factors at Saudi Arabia, 2024

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ABSTRACT

Background: Nurses are front line of protecting themselves and patients from infection. Hospital-acquired infections (HAIs) contribute to increased length of hospital stay, higher mortality and higher health-care costs. Infection, prevention, and control (IPC) practices are essential to protect patients and staff within healthcare facilities. HCPs play a pivotal role in preventing these infections through their knowledge and compliance to infection control practices.

The study aimed: To Assess nurses' knowledge and practice in relation to infection prevention and related factors.

Materials and Methods: A cross-sectional study was conducted at hospital in Makkah, Saudi Arabia from January to March 2024. A convenience sample from nurses of 219 participated in the present study. A structured self-administered questionnaire was used to collect data. A Multivariable logistic regression model was fitted to identify factors associated with the knowledge and practice of HCPs regarding infection prevention.

Result: This study displays that the overall knowledge and practice of nurses regarding infection prevention are 59.4% (95% CI: 53.0–65.8) and 53% (95% CI: 46.6–59.4), respectively. Educational level of diploma [AOR: 0.8, 95% CI: 0.67–0.83], years of work experience ≤ 10 [AOR: 1.7, 95% CI: 1.3–9.28], and being trained in infection prevention [AOR: 2.5 (2.3–8.0)] were found to be factors that affect the knowledge of nurses about infection prevention. Moreover, ≤ 10 years of work experience [AOR = 1.5, 95% CI: 1.2–10.1] and being trained in infection prevention [AOR = 2.2, 95% CI: 1.94–13.5] were found to be factors that affect the practice of nurses regarding infection prevention.

Conclusions: The majority of nurses was competent and followed best practices. Nonetheless, a sizable fraction of nurses lacked sufficient infection prevention training and expertise. Years of work experience and the level of infection prevention training were linked to the nurses' knowledge and practice. Furthermore, another predictor of HCP expertise was their educational background. As a result, hospital healthcare personnel should follow the national infection prevention guidelines. Nurses should receive infection prevention training from the policy designers to advance their understanding and proficiency in this field.

Keywords: Knowledge, Practice, Infection prevention and related factors.

INTRODUCTION

The term "healthcare associated infections" (HAI) refers to illnesses that are caused directly on by operations or tests performed in medical facilities. HAI can be avoided, and healthcare professionals can lower the risk by using appropriate infection control procedures ⁽¹⁾. Despite improvements in medical treatment and technology, the prevalence of HAIs is increasing worldwide ⁽²⁾. The World Health Organization (WHO) reports that the prevalence of healthcare-associated infections (HAIs) in hospital settings varies from 5.7% to 19.1% worldwide ⁽³⁾. According to recent studies, the prevalence of HAIs is 6.5% in Europe ⁽⁴⁾ and 3.2% in the USA ⁽⁵⁾. Compared to high-income nations, the burden of HAIs is noticeably greater in low-resource countries ⁽⁶⁻⁸⁾.

The colonization of bodily tissue by bacteria and other microbes is known as infection⁽⁹⁾. Over 400 million people worldwide suffer from chronic hepatitis B virus (HBV) infection as a result of the failure to avoid infection, and up to one million people may die from an HBV-related illness each year⁽¹⁰⁾. Nurses can infect patients, patients can infect nurses. A significant issue facing the global healthcare delivery system is healthcare-acquired infections, or HAI⁽¹¹⁾. Nurses may have been exposed to percutaneous wounds on the job, which could have resulted in 16,000 HCP, 66,000 HBV, and 1,000 HIV infections, according to the global estimate of the burden of disease attributable to contaminated sharps injuries among nurses⁽¹²⁾.

Patient features like age, underlying disease, comorbidities, and weakened host defenses are linked to the overall HCAI predisposing variables. In order to protect patients and nurses from the spread of infectious illnesses in healthcare settings, infection prevention and control (IPC), is an essential and ongoing necessity⁽¹³⁾. Globally, 71.1 million persons had viremia infections, and the prevalence of HCV was 1% across 100 countries⁽¹⁴⁾. To prevent the transmission of infectious illnesses, a comprehensive global health system has been put in place to protect against known and unknown dangers. The system is comprised of multiple formal and informal networks of organizations that span the public, for-profit, and non-profit sectors; operate at different regional scales (e.g., local, national, regional, or global); and collaborate with diverse stakeholders⁽⁹⁾.

Previous research has attempted to evaluate nurses' knowledge and practices about infection prevention and related factors⁽¹⁵⁻¹⁷⁾, but little attention has been paid to the knowledge and practices of nurses in particular, who bear the brunt of healthcare-related tasks. Moreover, the burden of inadequate treatment and inefficient infection management in resource-constrained environments is less well understood⁽¹⁸⁻²⁰⁾. Consequently, the present study aims to assess healthcare providers' knowledge and practice in relation to infection prevention and related factors.

METHODS AND MATERIALS

A cross-sectional study was conducted at hospital in Makkah, Saudi Arabia from January to March 2024. A convenience sample from nurses of 219 participated in the present study. This study was available to all nurses who worked in hospital, provided healthcare services, and had at least one of the four potential contacts—patients, medical equipment, linens, and high-risk wastes. Nurses who were ill and unable to answer the questions, or who were on maternity or annual leave at the time the data were gathered, were not included in the study. The dependent variables studied were the knowledge and practice of nurses in relation to infection prevention. The independent variables were sex, job category, and educational level, year of work experience, working hours, work shift, status of training, marital status, duration status, and level of hospital previously worked in and currently working in.

Nurses' knowledge of infection prevention was assessed by 18 questions "yes or no". A scoring system was utilized in which the respondents' correct and incorrect answers provided for the questions were allocated "1 and 0" points, respectively. Knowledge scores were summed up to give a total knowledge score for each respondent. There were two types of responses based on the total score for the knowledge questions, which ranged from 0 to 18. Respondents who scored the mean and above were knowledgeable and those who scored below the mean were not knowledgeable^(21, 22).

The nurses' practice regarding infection prevention was measured by 15 items to which the responses were "yes" or "no." Similar methods were used to analyze the practice: a score of 1 was given for good practice and a score of 0 for poor practice. Hence, the range of the overall score for infection prevention practice was from 0 to 15. Respondents who scored mean and above were classified as good practice and those who scored below the mean were classified as poor practice^(21, 22).

The data collection tool was a three-part questionnaire involving socio-demographic variables, knowledge, and practice related variables on infection prevention and control. Data were gathered using a pre-tested, structured self-administered questionnaire. The data collection tool was developed by reviewing relevant literature^(21, 23, and 24) and by adapting the content from related studies^(21, 22). The instrument for collecting data was initially written in English; it was then translated into Arabic and, finally, back into English to ensure uniformity.

Preliminary testing was conducted on 10% of the sample as a whole to improve the instruments' reliability on characteristics shared by the target population, and the appropriate adjustments were made. The completeness and consistency of the questionnaires were examined. Supervisors reviewed the data gathering procedure every day, and based on the results, the proper action was taken. The internal consistency of the knowledge and practice sections' items was shown by alpha Cronbach values of 0.79 and 0.83, respectively.

SPSS version 28 was used to enter the data. Both descriptive and analytical elements were included in the analysis. Texts, frequency, and cross-tabulation were used to present the descriptive analysis. To evaluate the relationship between the dependent and independent variables, a binary logistic regression model was fitted. To estimate the independent variables of infection prevention knowledge and practice, variables with a $p < 0.2$ were then entered into a multivariable logistic regression to control for confounding. A statistically significant result was defined as $p < 0.05$ at a 95% confidence interval. The model fitness was good, as indicated by the Hosmer Lemeshow test, which tested the relevant model goodness-of-fit and found that it was 91.8%. Ultimately, the

multivariable analysis's noteworthy results were interpreted.

RESULT

Table (1) shows that the mean (SD) age of the nurses was 36.02 ± 14.56 . The duration of training was 4.2 ± 4.3 . The majority, 56.2% (123), was female, 37.9% belonged to the age group 41+ years, 81.7% had a bachelor's degree, and 59.4% were staff nurses by profession. Moreover, 58% and 70.3% of the nurses were married. Approximately one-third (29.7%) and three-quarters (75.8%) of participants had work experience of > 10 years and were working on day shifts, respectively.

Table 1: Socio-demographic characteristics of study participants ($n=219$).

Variables	Frequency	Percentage(%)
Age(in years)		
20–25	24	11
26–30	52	23.7
31–40	60	27.4
41+	83	37.9
Sex		
Male	96	43.8
Female	123	56.2
Educational level		
Diploma	29	13.2
Bachelor	178	81.3
Masters and above	12	5.5
Job category		
Supervisor nurse	27	12.3
In charge nurse	62	28.3
Staff nurse	130	59.4
Marital status		
Never married	127	58
Married	70	32
Divorced	22	10
Work experience (in years)		
≤10	154	70.3
>10	65	29.7
Work shift		
Day	166	75.8
Night	53	24.2
Trained in infection prevention		
Yes	27	12.3
No	192	87.7
Duration of training (in days)		
1-5	16	7.3
>5	11	5
Currently working in		
OPD	73	33.3
Triage	14	6.4
Ward	132	60.3

Table (2) revealed that the overall knowledge of nurses about infection prevention was 59.4% (95% CI: 53.0–65.8). Approximately 82.6% of nurses knew about safety precautions for infection prevention and 87.7% were aware of the recommended guidelines for hand hygiene. Similarly, 86.8% and 13.2% of the study participants were aware of the IPC team and had undertaken infection prevention-related training in the past 12 months.

Moreover, **table (2)** revealed that 83.6% and 65.8% of nurses were aware of the availability of infection prevention guidelines in their working area and the availability of personal protective equipment (PPE) at all times, respectively. Likewise, 86.6%, 14.2%, and 18.3% of nurses were aware that disinfection prevents HAI, used chemical sterilization techniques for all equipment, and employed physical sterilization (heat and radiation) techniques for all equipment used, respectively. Similarly, 77.2%, 90.0%, and 85.8% of the study participants believed that all microorganisms, including spores, are destroyed by autoclaving, all equipment must be decontaminated before sterilization, and protective clothing minimizes HAI, respectively.

Table 2: Knowledge of the nurses in relation to infection prevention (n = 219).

Variables	Frequency	Percentage(%)
Knowing about safety precautions		
Yes	181	82.6
No	38	17.4
Presence IPC team		
Yes	190	86.8
No	29	13.2
Trained in infection prevention in the past 12 months		
Yes	29	13.2
No	190	86.8
Availability of infection prevention guidelines in the work area		
Yes	183	83.6
No	36	16.4
Availability of PPE at all times		
Yes	144	65.8
No	75	34.2
Availability of water for 24h		
Yes	106	48.4
No	113	51.6
Knowing the impact of HCAI on clinical outcomes		
Yes	184	84
No	35	16
Knowing disinfection prevents hospital-acquired infection		
Yes	194	88.6
No	25	11.4
Chemical sterilization technique used for all equipment		
Yes	31	14.2
No	188	85.8
Believe that all microorganisms including spores are destroyed by autoclaving		
Yes	169	77.2
No	50	22.8
All equipment needs decontamination before sterilization		
Yes	199	90.9
No	20	9.1

Variables	Frequency	Percentage(%)
Protective clothing minimizes hospital-acquired infection		
Yes	188	85.8
No	31	14.2
Proper handling of working equipment decreases the risk of contamination		
Yes	202	92.2
No	17	7.8
Vaccinated for HBV		
Yes	19	8.7
No	200	91.3
Presence of a system for reporting accidental exposure to blood and body fluids		
Yes	179	81.7
No	40	18.3
Know to take PEP while exposed to body fluid or needle-stick injuries of HIV-infected patients		
Yes	193	88.1
No	26	11.9

Table (3) revealed that 53% (95% CI: 46.6–59.4) of nurses were found to have good practice. Moreover, approximately three-quarters (76.7%) of nurses responded that they wash their hands with soap and water after taking a sample and 182 (83.1%) responded that they wash their hands immediately after contact with body fluids and contaminated items. Furthermore, 166 (75.8 %), 206 (94.1%), and 182 (83.2%) nurses reported that they discard sharp materials in a safety box, wear goggles to protect their eyes during procedures, and wear a mask during sputum sample collection and processing, respectively.

On the contrary, 84 (38.4 %) and 26 (11.9%) of nurses reported that they recap needles before disposal and do not wear gowns properly for every procedure, respectively. Wearing an apron, covering wounds and cuts on the skin before starting work, being vaccinated against common pathogens, and eating or drinking in the work area were 48.4%, 68.5%, 17.8%, and 48.8%, respectively. However, 49 (22.4%), 168 (76.7%), and 180 (82.2%) of the study participants responded that they had been exposed to needle-stick injury, soak contaminated medical equipment in 0.5% chlorine solution, and separate wastes infectious and noninfectious, respectively (**Table 3**).

Table 3: Practice of the nurses in relation to infection prevention ($n= 219$).

Variables	Frequency	Percentage(%)
Washing hands with soap and water after taking a sample		
Yes	168	76.7
No	51	23.3
Washing hands immediately after coming into contact with blood, body fluids or contaminated items		
Yes	182	83.1
No	37	16.9
Discard sharp materials in a safety box		
Yes	166	75.8
No	53	24.2
Discard needles in the sharps bin		
Yes	168	76.7
No	51	23.3

Variables	Frequency	Percentage(%)
Wear goggles to protect your eyes during procedures that generate a spray of blood or body fluids		
Yes	206	94.1
No	13	5.9
Wear a mask during sputum sample collection and processing		
Yes	182	83.1
No	37	16.9
Recap needles before disposal		
Yes	84	38.4
No	135	61.6
Wear a gown properly for every procedure		
Yes	193	88.1
No	26	11.9
Wear anapron when blood or body fluids plas his expected		
Yes	106	48.4
No	113	51.6
Cover wounds and cuts on the skin before starting work		
Yes	150	68.5
No	69	31.5
Vaccinated for common pathogens		
Yes	39	17.8
No	180	82.2
Eat or drink in your work area		
Yes	85	38.8
No	134	61.2
Exposure to needle-stick injury		
Yes	49	22.4
Variables	Frequency	Percentage (%)
No	170	77.6
Soak contaminated medical equipment in 0.5% chlorine solution		
For10min	168	76.7
For1h	39	17.8
For24h	12	5.5
Separation of waste into infectious and non-infectious		
Yes	180	82.2
No	39	17.8

Factors associated with knowledge of nurses about infection prevention

Table (4) revealed that bi-variable analysis, age, sex, educational level, years of work experience, work shift, and ever having been trained on infection prevention were the predictor variables associated with the knowledge of nurses about infection prevention. However, only education level, years of work experience, and status of training on infection prevention were factors associated with the knowledge of nurses about infection prevention in the multivariable logistics regression analysis.

Nurses with an educational level of diploma were 20% less knowledgeable than nurses with a master's or above [AOR = 0.8, 95% CI: 1.7–8.3, $P = 0.04$]. Moreover, nurses with ≤ 10 years of work experience were 1.7 times more likely to be knowledgeable compared to nurses with >10 years of work experience [AOR = 1.7, 95% CI:

1.3–9.3, $P = 0.002$]. Similarly, HCP who had ever been trained on infection prevention were 2.5 times more knowledgeable than those who had never [AOR = 2.5, 95% CI: 2.3–8.0, $P = 0.03$] (**Table 4**).

Table 4: Factors associated with knowledge of the nurses in relation to infection prevention ($n = 219$).

Variables	Knowledge of infection prevention		COR(95%CI)	AOR (95%CI)	P-value
	Yes	No			
Age(inyears)					
20–25	20	4	4.37(1.24–9.53)*	4.0(0.86–9.35)1.6 (0.9–6.0)	0.3
26–30	3	22	1.5(0.6–8.0)	1.8 (0.9–6.0)	1.08
31–40	50	10	1.65(0.7–10.0)	1	0.5
41+	43	40	1		
Sex					
Male	69	58	2.3(1.56–3.99)*	2.2 (0.52–7.87)	1.4
Female	54	151	1	1	
Educational level					
Diploma	20	9	0.56(0.6–0.93)*	0.8 (0.67–0.83)**	0.04
BSc	96	82	0.72(0.77–14.0)	0.8 (0.75–12.0)	0.9
MSc and above	10	2	1	1	
Work experience(in years)					
≤10	36	54	1.89(1.8–12.0)*	1.7 (1.3–9.28)**	0.002
>10	69	60	1	1	
Work shift					
Dayshift	100	54	0.67(0.7–0.89)*	0.9 (0.09–11.0)	1.6
Nightshift	16	49	1	1	
Trained in infection prevention					
Yes	100	66	2.1(1.5–10.3)*	2.5 (2.3–8.0)**	0.03
No	16	37	1	1	

AOR, Adjusted Odds Ratio; COR, Crude Odds Ratio; CI, Confidence Interval, * $p < 0.2$, ** $p < 0.05$

Table (5) revealed that bi-variable logistics regression analysis, sex, education level, years of work experience, work shift, and status of training on infection prevention were factors that were significantly associated with nurses' practice regarding infection prevention, whereas only years of work experience and status of training on infection prevention were significantly associated with the infection prevention practice of nurses in the multivariable analysis.

Nurses with work experience of ≤10 years had 1.5 good than nurses who had a work experience of >10 years [AOR = 1.5, 95% CI: 1.2–10.1, $P = 0.003$]. Moreover, nurses who had been trained on infection prevention had 2.2 times better practice than those who had not [AOR = 2.2, 95% CI: 1.94–13.5, $P = 0.04$] (**Table 5**).

Table 5: Factors associated with the practice of the nurses in relation to infection prevention ($n = 219$).

Variables	Practice regarding infection prevention		COR(95%CI)	AOR (95%CI)	P-Value
	Yes	No			
Sex					
Male	69	58	1.22 (1.56–3.99)*	1.0(0.2–1.57)	1.3.
Female	54	151	1	1	
Educational level					
Diploma	20	9	1.6 (1.3–1.92)*	0.9(0.73–6.34)	1.9.

Variables	Practice regarding infection prevention		COR(95%CI)	AOR (95%CI)	P-Value
	Yes	No			
BSc	96	82	0.72 (0.77–14.0)	0.6(0.5–11.0)	2.2.
MSc and above	10	2	1	1	
Work experience (in years)					
<10	100	54	1.57 (1.4–15.00)*	1.5(1.2–10.1)**	0.003
>10	69	60	1	1	
Work shift					
Dayshift	100	167	0.5 (0.3–0.69)*	0.7(0.2–2.3)	3.4.
Nightshift	16	49	1	1	
Trained in infection prevention					
Yes	100	66	1.6 (1.5–12.1)*	2.2(1.94–13.5)**	0.04
No	16	37	1	1	

AOR, Adjusted Odds Ratio; COR, Crude Odds Ratio; CI, Confidence Interval, * $p < 0.2$, ** $p < 0.05$

DISCUSSION

According to this research, 59.4% (95% CI: 53.0–65.8) of nurses knew how to prevent infections. According to this survey, 53% (95% CI: 46.6–59.4) of nurses had strong infection prevention practices, while a sizable part of hospital responders (40.6%) had insufficient understanding about infection prevention. The knowledge of nurses about infection prevention in the present study was higher than similar studies conducted by Teshageret al., (2015) ⁽²⁵⁾, Geberemariam, (2018) ⁽²⁶⁾ and Doyloet al., (2019) ⁽²⁷⁾, which reported that 40.7%, 46.3%, and 47.7% of the nurses were knowledgeable, respectively, but lower compared with a similar study, where the overall knowledge of nurses about infection prevention was 99.3% ⁽¹⁶⁾, 65.9% ⁽²⁸⁾, 84.7% ⁽²⁹⁾, and 74.5% ⁽³⁰⁾.

This discrepancy may result from variations in the training that nurses receive and their prior experience. Differences in sample size, study setting, socioeconomic background, and the use of various data gathering methods could all be reasons for this discrepancy. However, this finding is similar to studies conducted by Chitimwango, (2017) ⁽³¹⁾ and Jemal et al., (2019) ⁽³²⁾, where the overall knowledge of nurses was reported to be 48.4% and 48.88%, respectively.

Furthermore, in the current study, the practice of nurses in relation to infection prevention was higher compared with study conducted by Tadesse et al., (2020) ⁽³³⁾, which reported that the overall practice of nurses in relation to infection prevention was 39.9%. However, this is less than studies in Addis Ababa, Dessie, Nigeria, Yemen, and Saudi Arabia, where the percentage of nurses practicing infection prevention was 66.1%, 77%, 77.9%, 71%, and 92.1%, respectively ^(34–37). The time difference and the inadequate provision of personal protective equipment (PPE), including disinfectants, in the research areas could be the causes of this disparity.

The current study additionally evaluated the variables that influence nurses' infection prevention practices and knowledge. The results show that the level of education, years of work experience, and infection prevention training status were related to nurses' understanding of infection prevention. Additionally, compared to nurses with a master's degree or higher, those with a diploma had less knowledge. This study was supported by the study conducted by Desta et al., (2018) ⁽¹⁶⁾, which showed that nurses with an educational level of BSc or above were two times more likely to be knowledgeable than those with Diplomas. This could be attributed to the possibility that more educated nurses have better access to knowledge about infection prevention.

The present research demonstrates an indirect relationship between years of work experience and HCP expertise. Compared to nurses with more years of work experience, those with fewer years were more likely to be knowledgeable. This could be because of the remembering effect, which states that health care professionals with less job experience may remember courses they took in school more readily than those with more work experience.

Moreover, nurses who had ever been trained on infection prevention were more knowledgeable than nurses who had never. This finding is consistent with the study conducted by Desta et al., (2018) ⁽¹⁶⁾, nurses who hadn't received infection prevention training were 75% less likely to be knowledgeable about infection prevention than those who had received training on infection prevention. This consistency might be due to the similarity of the health facility setup. This implies that training increases the chances of Nurses accessing up-to-date information about infection prevention.

This study also demonstrated a significant relationship between nurses' infection prevention practices and their years of work experience and level of infection prevention training. Compared to nurses with more years of work

experience, those with fewer years were more likely to have good practices. This could be the result of nurses with more years of work experience becoming bored and neglecting to follow suggested protocols. This finding contrasts with the study done by Gulilat and Tiruneh (2014)⁽²²⁾, nurses with work experience of 10 years and above were four times more likely to practice infection prevention than those with less than 10 years of experience. This discrepancy may result from variations in the features of the medical facilities where the research was carried out. In a similar vein, nurses with infection prevention training demonstrated better practices than those without. This training may have improved nurses' standards of practice. This suggests that giving nurses ongoing training on infection prevention affects how well they apply their knowledge.

CONCLUSION

Most nurses had strong practice and were well-informed. Nonetheless, a sizable fraction of hospital respondents lacked sufficient infection prevention knowledge and practice. Additionally, the nurses' years of work experience and level of infection prevention training were linked to their knowledge and practice. Additionally, another predictor of nurses' knowledge was their educational attainment. It is advised that hospital nurses follow the national infection prevention protocol guidelines in light of the study's findings. To preserve or enhance nurses' knowledge and practice of infection prevention, policymakers should provide ongoing professional development as well as infection prevention education and training.

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