

# Knowledge and Attitude of Nurses towards Infection Control Practices during Hajj Season at Tertiary Care Hospital in City of Makkah

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**Abstract** Infection prevention and control is required to prevent the transmission of communicable diseases in all health care settings. Every health care worker plays a vital part in helping to minimize the risk of health care-associated infections. **Aim of the study:** This study aimed to determine the level of knowledge, skills and attitude of nurses towards infection control practices during Hajj at Tertiary Care Hospital in Makkah. **Research design:** Quantitative descriptive cross-sectional correlational research design. **Setting:** The study was conducted at one of the tertiary care hospitals in Makkah. **Sample:** A convenient sample of (82) nurses assigned in different units. **Tools of data collection:** In the collection of data, validated self-made questionnaire was uploaded thru "Monkey Survey" and sent to the participants and data were analyzed using Kruder Richardson for the level of knowledge, and Cronbach alpha for the level of skills and attitude with its reliability testing. **Result:** The study revealed that nurses had a very good knowledge and having very positive attitude, which is a good indicator that infection control practices at tertiary care hospital in Makkah have been observed. **Conclusion and Recommendations:** Nurses are expected to actively participate in training or seminars related to infection control practices to acquire more knowledge, develop their skills and improve their attitude in handling with hospital wastes particularly sharps, and proper segregation of linen with commitment to follow the "5 Moments of Hand Hygiene" and appropriate use of PPE.

**Keywords:** infection, infection control, practice, health care associated infections, nurses

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## 1. Introduction

Recently, the obvious growing in health care-associated infections (HAIs) is considered one of the most significant challenge faced by health care system around the world [1]. HAIs, previously known as "nosocomial" or "hospital" infections, refer to infections that occur 48 hours after admission to a hospital. [2]. According to the last statistics of World Health Organization WHO's report the prevalence of HAIs is 15% worldwide [3]; 6% in Europe [4] and 5.7% to 19.1% in developing and East Mediterranean countries [5]. The studies showed that around 80% of the HAIs are represented in the urinary tract, surgical wounds, respiratory system, and bloodstream [5].

HAIs has been found to cause delay in the improvement of patient's condition, increase length of hospitalization, increase health care costs, and increase suffering of patients' families as result of HAIs complications [6,7]. As a purposeful step to minimise the incidence of HAIs, the Control and Prevention [8] created standard

precautions to follow by the health care workers to protect them against HAIs. According to CDC, standard precautions refer to the basic principles of controlling infections to protect health care team members against HAIs. They include; hand washing, personal protective equipment, managing sharp objects, safe handling of suspected contaminated equipment or surfaces as well as safe injection practice [9,10]. Health care workers have to adhere to these standards as long as they deal with patient in any situations.

The risk of acquiring HAIs can reach the healthcare worker as they deal directly with patients during their daily clinical duties. For instance, during their daily routine they can get blood borne pathogens such as hepatitis B, hepatitis C and HIV from needle stick injuries or the direct exposure to human secretions and blood [11]. To reduce the HAIs while taking care of the patient health care worker should follow best practices and comply to infection prevention and control guidelines [12].

Nurses spend more time with patients compared to other health care providers and make up the largest percentage of hospital staff and this puts them at greater

risk of developing HIAs [13]. One of the main causes of hospital acquired infections spread around the world the lack of knowledge [5]. different levels of knowledge have been reported in the single studies among nurses with regard to standard precautions, including poor [14], moderate and adequate [15]. Knowledge and attitude can be a vital element in infection control practices as suggested by many studies [16].

During the Hajj season, many Muslims from around the world come to the holy city of Makkah to perform the rituals of Hajj, during this busy period, many hospitalizations occur. This causes high pressure on hospitals and health care providers, including nursing, and this may negatively affect infection control practices, so studies like this may help to understand this phenomenon.

To date, only a few studies conducted on this topic and none of them has been conducted during hajj session. This research study aimed to determine the level of knowledge and attitude of nurses towards infection control practices during Hajj at Tertiary Care Hospital in Makkah.

## 2. Significance of the Study

Findings of this study are deemed beneficial to the following:

### 2.1. Hospital Administrators

Results serve as a basis and guide for the hospital to assess the level of knowledge and attitude of the staff nurses in infection control practices. This gives the hospital management an overview of determinants for possible quality improvements in effective handling of sharps, wastes, linen and proper hand hygiene with appropriate use of PPE to reduce the incidence of healthcare-associated infections.

### 2.2. Nursing Service

The results of the study serve as a basis and a tool for nursing administration to evaluate the level of knowledge and attitude of the staff nurses in infection control practices. This provides the Nursing Services Department to set comprehensive and strategic plans to improve safe and quality patient care based on standard infection control practices.

### 2.3. Nursing Education

Findings of the study serve as a tool for Nursing Education and Training Department to expound the programs intended for infection control practices.

### 2.4. Nurses

Findings of study help nurses check their knowledge and attitude on infection control practices thus increasing nurse's awareness about effective handling of sharps, wastes, linen and proper hand hygiene with appropriate use of PPE to reduce the incidence of healthcare-associated infections.

### 2.5. Patients

Being primary recipients of care, findings of the study lead to the provision of quality nursing care and safety to long-term care based on compliance to hand hygiene, appropriate use of PPE and effective sharp, waste, and linen management.

### 2.6. Future Researchers

Findings of the study serve as baseline data for further studies regarding Infection Control Practices.

### 2.7. Aim of the study

This research study aimed to determine the level of knowledge, and attitude of nurses working at Tertiary Care Hospital during Hajj season in the Holy City of Makkah.

### 2.8. Research questions

1. What is the level of knowledge and attitude of nurses towards infection control practices in terms of the following?
2. Is there a significant difference between the profile of the respondents and their level of knowledge and attitude towards infection control practices?
3. Is there a significant relationship between the level of knowledge and attitude of nurses and infection control practices?

## 3. Subjects and Methods

### 3.1. Research Design

The design of the study is a Quantitative descriptive cross-sectional correlational research design.

### 3.2. Setting

The study was conducted at one of the tertiary care hospitals in Makkah. It has its proposition of having 500 to gradually increasing 1500 beds capacity based on the strategic plan and scope of service. The current operational bed of KAMC is 379 with an average in-patient's census of 250 a day. KAMC provides various services related to Oncology, Cardiology and Cardiac Surgery, Surgical/Invasive (General and Specialized), Procedural, Diagnostics and Imaging, Critical Care, ambulatory Care, Rehabilitation, Research, Home Healthcare, Health Education and Promotion.

### 3.3. Sample

A convenient sample of (82) nurses assigned in different units as the participants of the study.

### 3.4. Instrumentation

A self-made questionnaire served as the main instrument used in data gathering the level of knowledge

and attitude of staff nurses towards infection control practices. The researcher made a comprehensive review of the literature available to find indicators of the variables in Infection Control Practices and 90% of the formulated questionnaires were taken from Infection Control Manual of the Tertiary Care Hospital in Makkah. A draft of the questionnaire was discussed among the research team for a review then the team members' suggestions were incorporated. The questionnaires were divided into four parts. Part 1 of the questionnaire consisted of the staff demographic profile as to gender, area of assignment, length of service, years of experience, and training or seminars attended. Part 2 of the questionnaire dealt with the level of knowledge of nurses on Infection Control Practices. It is a 25- item multiple types of questions interpreted as follows, excellent, very good, good, and fair. Items number 1-5 covered questions regarding Sharp Management, items 6-10 for Waste Management, items 11-15 for Linen Management, items 16-20 for Hand Hygiene and items 21-25 for PPE. Part 3 of the tool measured the level of attitude of nurses on Infection Control practices. It is a 25-item question using a Likert-type 4-point scale as follows, (1) Negative, (2) Somewhat Positive, (3) Positive and (4) Very Positive.

### 3.5. Validity and Reliability

The questionnaires had been subjected for validation, face, and construct by three experts in the field of research and infection control. The questionnaires were subjected to pilot study and reliability testing using 30 nurses as participants of the study that were excluded in final data collection. For the level of knowledge, Kruder Richardson 20 was done with 0.939 reliability, while for the level of attitude, Cronbach alpha was used with 0.980 and 0.989 reliability respectively.

### 3.6. Ethical Consideration

Before conducting the study, ethical approval was obtained from KAMC Intuitional Review Board (IRB). The participants were fully informed about the nature of research, its purposes and potential risks and benefits. The participants were informed that they have the power of free choice to voluntarily consent to or decline participation in the study. an informed consent was taken from the selected KAMC nurses as participants of the study. Research participants have the right to privacy and confidentiality, consistent with respect for human dignity, particularly when anticipated results have negative implications on them. Therefore, being the researcher, confidentiality was observed.

### 3.7. Data Collection Procedure

Self-made questionnaires were made that serve as the main instrument used in data gathering with a clear explanation to the participants that their participations are voluntary that they may withdraw anytime without penalty. Data were collected during Hajj season started on August 02, 2019. The researcher distributed self-made questionnaires to the participants without any nominative information and maintained the anonymity of the participants until the final report.

### 3.8. Statistical Analysis

The filled-up questionnaires were collected and coded in the Excel program. Data were analyzed and presented in the table forms and graphs. Percentages were calculated for qualitative data, mean and standard deviations were calculated for quantitative data using the Statistical Package for Social Sciences (SPSS) program for statistical analysis, using Kruder Richardson for the level of knowledge, and Cronbach alpha for the level of skills and attitude with its reliability testing. knowledge, skills and attitude on focus charting Pearson-r was utilized.

## 4. Result

**Table 1:** As seen on the table, for the gender, more than half of the respondents are female 62.2%. Overall, 84% had a bachelor's degree. For the area of assignment, in rank 1 was the Emergency department 20.3%. For the length of service, the majority of the respondents have been in the profession for 9 to 12 years. For the year of hospital experience, 42.12 percent of the respondents already have 9 to 12 years of experience working in the hospital. Lastly, for the seminars attended, 81.7% had attended seminars relevant to infection control.

**Table 1. Sociodemographic characteristics of nurses towards infection control practices**

Variables	Participants (n= 82)
<b>Gender</b>	
Male	31 (37.8%)
Female	51 (62.2%)
<b>Area of Assignment</b>	
ICU	7 (8.9%)
CCU	6 (7.6%)
CICU	2 (2.5%)
NICU	3 (3.8%)
Surgical Ward	13 (16.5%)
Neuroscience	4 (5.1%)
Medical Ward	7 (8.9%)
Oncology Ward	3 (3.8%)
Hematology Ward	2 (2.5%)
Cardiac Ward	5 (6.3%)
Cardiac Surgery Ward	3 (3.8%)
Emergency Department	16 (20.3%)
Hemodialysis Unit	3 (3.8%)
Operating Theatre	5 (6.3%)
<b>Educational Attainment</b>	
Diploma	9 (11.1%)
Bachelor of Science in Nursing- RN	68 (84.0%)
Master's Degree	4 (4.9%)
<b>Length of Service</b>	
1 to 3 years	14 (17.3%)
4- 8 years	23 (28.4%)
9-12 years	26 (32.1%)
13-15 years	14 (17.3%)
16-19 years	1 (1.2%)
20 years above	3 (3.7%)
<b>Year of Hospital Experience</b>	
1 to 3 years	11 (13.4%)
4- 8 years	26 (31.7%)
9-12 years	35 (42.7%)
13-15 years	7 (8.5%)
16-19 years	1 (1.2%)
20 years above	2 (2.4%)
<b>Training/ Seminars attended on Infection Control</b>	
Yes	67 (81.7%)
No	15 (18.3%)

**Table 2. Level of knowledge among nurses towards infection control practices**

Variable	Level of knowledge
<b>Sharp Management</b>	
1. In situations where recapping is considered necessary, the one-handed recapping "Scoop" method can be used such as follows except one:	44 (53.7%)
2. Steps that can be taken to reduce injuries include the following except one:	61 (74.4%)
3. Preventing injuries is the most effective way to protect workers. A comprehensive sharps injury prevention program would include the following except one:	65 (79.3%)
4. Steps that can be taken to reduce injuries include using instruments to grasps needles or load/unload scalpels; avoiding hand-to-hand passage of sharps, separating sharps from other waste, not carry garbage or linen bags close to the body refers to:	48 (58.5%)
5. If you sustain a needle stick injury, take the following actions immediately:	72 (78.8%)
<b>Waste Management</b>	
6. All hazardous medical waste – except anatomical/pathological waste - shall be disposed of in:	58 (70.7%)
7. Anatomical/Pathological waste shall be kept in Red bags and kept in:	39 (47.6%)
8. In handling of Regular Waste, the following procedures are TRUE except one:	60 (73.2%)
9. In waste collection, the procedures should be followed except one:	64 (78%)
10. The Criteria for Waste storage Room are the following except one:	62 (75.6%)
<b>Linen Management</b>	
11. In handling Clean Linen, the following procedures should be observed except:	63 (76.8%)
12. In handling Soiled Linen, the following procedures should be done except:	60 (73.2%)
13. For safe handling of soiled and clean linen, the following statements are true except one:	59 (72%)
14. Used or contaminated linen is a potential source of infection to the susceptible patient, as healthcare worker, in the following statements which inappropriate step in handling soiled linen.	45 (54.9%)
15. Which of the following statements is INCORRECT?	56 (68.3%)
<b>Hand Hygiene</b>	
16. Under what circumstances should you decontaminate your hands?	40 (48.8%)
17. Which of the following is/are considered good practice to prevent cross contamination leading to healthcare-associated infections.	54 (65.9%)
18. How long should it take you to wash your hands?	52 (63.4%)
19. Under what circumstances should you use alcohol-based hand rub for routinely decontaminating hands?	40 (48.8%)
20. Hand washing techniques are the following except:	51 (62.2%)
<b>Personal Protective Equipment (PPE)</b>	
21. Which of the following statements on the use of PPE is INCORRECT?	53 (64.6%)
22. Removing and disposing of PPE correctly is important to minimize the risk of cross- contamination. What one of the following orders is correct?	15 (18.3%)
23. Which of the following statements is INCORRECT in using gloves?	51 (62.2%)
24. Which of the following statements is INCORRECT related to the use of gown?	51 (62.2%)
25. The following statements are all TRUE in using N- 95 Mask except one:	46 (56.1%)

**Table 3. Level of knowledge among nurses towards infection control practices**

Level of Knowledge	SM (F)	SM (%)	WM (F)	WM (%)	LM (F)	LM (%)	HH (F)	HH (%)	PPE (F)	PPE (%)
Fair (<=2 out of 5)	17	20.7%	20	24.4%	22	26.8%	34	41.5%	33	40.2%
Good (3 out of 5)	21	25.6%	12	14.6%	6	7.3%	20	24.4%	8	9.8%
V. Good (4 out of 5)	20	24.4%	26	31.7%	16	19.5%	28	34.1%	28	34.1%
Excellent (5 out of 5)	24	29.3%	24	29.3%	38	46.3%	0	0	13	15.9%
<b>Total</b>	<b>82</b>	<b>100%</b>	<b>82</b>	<b>100%</b>	<b>82</b>	<b>100%</b>	<b>82</b>	<b>100%</b>	<b>82</b>	<b>100%</b>

Table 2 shows the level of knowledge towards infection control practices in different areas such as Sharp Management (SM), Waste Management (WM), Linen Management (LM), Hand Hygiene (HH) and Personal Protective Equipment (PPE).

Table 3 presents the frequency and percentage distribution of the respondents as to their level of knowledge in different areas such as Sharp Management (SM), Waste Management (WM), Linen Management (LM), Hand Hygiene (HH) and Personal Protective Equipment (PPE).

As seen on the table, most of the respondents in sharp management score 29.3% excellent, while in waste management 31.7% score very good, in linen management majority of participants 46.3% score excellent, on the other hand, most participants score fair in Hand hygiene and personal protective equipment 41.5% percent and 40.2 respectively.

Table 4 presents the frequency and percentage distribution of the respondents' overall knowledge of infection control.

**Table 4. Respondents' Overall Knowledge among nurses towards infection control practices:-**

Level of Knowledge	F	%
Fair (81 to 85)	16	19.5
Good (86 to 90)	18	22.0
Very Good (91 to 95)	48	58.5
Excellent (100)	0	0
<b>Total</b>	<b>82</b>	<b>100</b>

As gleaned from the table, 58.5 percent of the respondents obtained a "Very Good" rating on their knowledge assessment evaluation on infection control. 22.0 percent got an "good" rating; 19.5 percent got a "fair" rating.

Table 5 shows the level pf attitudes towards infection control practices in different areas such as Sharp Management (SM), Waste Management (WM), Linen Management (LM), Hand Hygiene (HH) and Personal Protective Equipment (PPE).

**Table 5. Level of attitudes among nurses towards infection control practices**

<b>Sharp Management</b>	
1. Sharps such as small quantities of broken glass, drug vials, used needles, razors, blades etc. must be carefully disposed of into approved sharps containers	3.35±0.83 4 (1-4)
2. Never dispose of sharps in containers used for storage of other wastes, or place used sharps containers in clinical waste bags	3.36±0.72 3 (1-4)
3. Ensure Sharp containers are free from protruding sharps and never insert fingers / hand past the level of the lid	3.46 4 (2-4)
4. Sharp containers should not be filled above the fill line. Replace when ¾ full and once full the container aperture is locked, tagged and identification label signed.	3.50 4 (1-4)
5. Do not re-sheathed or bent needles and avoid pass sharps from hand to hand.	3.57 4 (1-4)
<b>Waste Management</b>	
6. A system of double yellow bags should be utilized in bagging all infectious waste and highly infectious waste as microbiology cultures shall be collected in autoclave bags, autoclaved then disposed in yellow biohazard waste bags.	3.21±0.83 3 (1-4)
7. Nursing services are responsible for notifying housekeeping of the need to remove/replace any yellow plastic bags containing infectious waste.	3.35±0.69 3 (1-4)
8. To minimize the potential risk for accidental transmission of disease or injury, infectious waste waiting terminal processing shall be stored in an area accessible only to personnel involved in the disposal process.	3.33±0.79 3.50(1-4)
9. Full waste containers should be immediately replaced with empty containers or bags	3.38±0.78 4 (1-4)
10. Waste storage Room should be kept cool through AC and temperature monitored daily.	3.25±0.82 3(1-4)
<b>Linen Management</b>	
11. Hand hygiene shall be properly performed before handling clean linen and shall not be handled more than necessary in order to minimize contamination.	3.41±0.78 4 (1-4)
12. Any linen that is dropped shall be considered soiled and shall be collected from the utility rooms and placed in carts designated for soiled linen.	3.32±0.88 4(1-4)
13. Soiled linen shall be handled as little as possible and with minimum agitation in order to prevent gross microbial contamination of the air and of persons handling the linen.	3.43±0.77 4(1-4)
14. Bags containing soiled linen shall be tied before being dropped into linen utility room in order to prevent spillage.	3.41±0.77 4(1-4)
15. All linen that is contaminated with blood, excreta or other body fluids and linen of source isolation rooms shall be placed in yellow laundry bags, bags shall be tied securely before being dropped in red compartment of linen hamper or in compartment labeled with biohazard symbol.	3.31±0.90 4(1-4)
<b>Hand Hygiene</b>	
16. Hand wash or hand rub before patient contact i.e. between last object touched out of patient's zone and first touch of the patient.	3.36±0.81 4(1-4)
17. Hand wash or hand rub before aseptic procedure e.g. insertion of cannulas, catheters or drawing blood sample. Gloves shall be worn after hand hygiene and before doing the aseptic procedure.	3.48±0.71 4(1-4)
18. Hand wash or hand rub after risk of exposure to blood, body fluids, mucous membranes, non-intact skin or contaminated surfaces whether gloves were used or not. In case gloves were used, they shall be removed, discarded and hand hygiene performed.	3.46±0.73 4(1-4)
19. Hand wash or hand rub after patient contact and before leaving patient's zone i.e. between last touch with patient and first touch of patient's zone.	3.42±0.70 4(2-4)
20. Hand wash or hand rub after touching environmental surfaces and objects in close vicinity to the patient i.e. within patient's zone even if patient was not touched.	3.38±0.77 4(1-4)
<b>Personal Protective Equipment (PPE)</b>	
21. PPE shall be used according to the nature of anticipated patient interaction and potential risk of exposure to blood, body fluids, mucous membranes, non- intact skin or potentially contaminated aerosol.	3.36±0.79 4(1-4)
22. Staff shall avoid contamination of their exposed skin or clothing during removal of PPE.	3.42±0.68 4(1-4)
23. PPE shall be removed and discarded before leaving patient's room.	3.41±0.85 4(1-4)
24. Staff will not touch clean surfaces and items in the environment e.g. Telephone handle with contaminated gloves.	3.37±0.85 4(1-4)
25. Respirators ( N- 95 masks ) shall be used by staff in contact with patients suspected or known to have airborne diseases e.g. TB, Measles, Chickenpox, SARS or Avian Flu	3.47±0.65 4(2-4)

**Table 6. Level of attitudes among nurses towards infection control practices**

Level of Attitudes	SM (F)	SM (%)	WM (F)	WM (%)	LM (F)	LM (%)	HH (F)	HH (%)	PPE (F)	PPE (%)
Negative (<=2 out of 5)	0	0%	2	2.4%	1	1.2%	0	0%	1	1.2%
Somewhat Positive (3 out of 5)	5	6.1%	4	4.9%	8	9.8%	5	6.1%	4	4.9%
Positive (4 out of 5)	16	19.5%	23	28%	18	22%	19	23.2%	19	23.2%
Very Positive (5 out of 5)	61	74.4%	53	64.6%	55	67.1%	58	70.7%	58	70.7%
Total	82	100%	82	100%	82	100%	82	100%	82	100%



As seen on the table, most of the respondents in sharp management 74.4% score excellent, in waste management score 64.6% excellent, in linen management majority of participants 67.1% score excellent, in Hand hygiene and personal protective equipment most of the participants score excellent 70.7%.

**Table 7. Respondents' Overall Attitudes among nurses towards infection control practices**

Level of Attitudes	F	%
Negative (1.00 – 1.75)	1	1.2
Somewhat Positive (1.76 – 2.50)	3	3.7
Positive (2.51 – 3.26)	19	23.2
Very Positive (3.27- 4.00)	59	72
Total	82	100

Table 7 presents the frequency and percentage distribution of the respondents' overall attitude on infection control.

The table shows, 72 % of the respondents obtained a "very positive" rating on their Attitudes assessment evaluation on infection control. 23.2 percent got an "positive" rating; 3.7% got a "Somewhat Positive" rating and only 1.2 percent "Negative".

**Table 8. Relationship between the Demographic Profile and the Respondents' Level of Knowledge and Attitudes among nurses towards infection control practices at King Abdullah Medical City- Makkah**

Variables	Knowledge	Attitude
<b>Gender</b>		
Male	2.45 ± .80	3.58 ± .62
Female	2.35 ± .79	3.70 ± .60
	0.584	.425
<b>Educational attainment</b>		
Diploma	2.55 ± .72	3.77 ± .44
Bachelor of Science in Nursing- RN	2.39 ± .79	3.67 ± .63
Master's Degree	2 ± 1.15	3.25 ± .50
	0.520	0.285
<b>Length of Service</b>		
1 to 8 years	2.37 ± .75	3.75 ± .49
8 years or above	2.43 ± .81	3.56 ± .69
	0.327	0.560
<b>Year Hospital Experience</b>		
1 to 8 years	2.16 ± .86	3.62 ± .59
8 years or above	2.57 ± .69	3.68 ± .63
	<b>0.022</b>	.573
<b>Training/Seminars Attended</b>		
Yes	2.40 ± .77	3.64 ± .62
No	2.33 ± .89	3.73 ± .59
	0.574	.657

Table 8 shows the summary of the test of the relationship of the nurses' level of knowledge and attitude on infection control practices and their demographic profile.

As revealed by the table, there are no statistically significant differences between the respondents' demographic profile like gender, educational attainment, length of service, hospital experience and seminars attended and the nurses' knowledge and attitude on infection control practices. Only hospital experiences yielded a p-value of less than 0.05 which showed that

there are statistically significant differences between nurses' hospital experiences and their knowledge.

**Table 9. Correlation between the Nurses' Level of Knowledge and Attitudes**

	Total Attitudes	Total Knowledge
<b>Total Attitudes</b>		.135
<b>Significance ( 2-tailed )</b>	1	.228
<b>Total Knowledge</b>	.135	
<b>Significance ( 2-tailed )</b>	.228	1

As seen on the table, a weak positive correlation was seen between knowledge and attitude that is, 0.135, with p-value at 0.228.

## 5. Discussion

The aim of this study was to investigate the nurse's knowledge and attitude regarding infection control practices during the hajj season.

This study revealed that most of the respondents have in-depth knowledge and score Very Good on relevant practices on infection control. The result of this study is supported by recently published systematic review [17]. The result is also in line with other studies conducted in India [18] Ethiopia [19], Bahirdar city [20] and Zambia [21]. In contrast to our findings, a Saudi study conducted by Ghabrah, Madani [22] which investigate the nurses knowledge toward infection control practices during hajj season. The author found that nurses had good knowledge scores and conclude the need for an educational program for nurses to enhance their knowledge regarding infection control practices. It is a good indicator that most nurses are aware of the practices on infection control especially during hajj season where millions of Muslim visiting Makkah region and the admission to the hospitals at its peak. Knowledge, however, is different from application but awareness is a good start for nurses to apply their knowledge and develop skills out of those applications. It can be said that most nurses have in depth knowledge about the said areas, which was brought about by their academic background, experience and learning acquired while on practice.

In an individual level of knowledge, this study showed that most participants score fair in Hand hygiene 41.5% percent. This result is consistent with other studies which showed that the majority of nurses had low level of hand hygiene knowledge [23,24]. Inconsistent with our result [25,26] found that the majority of their studied nurses had a high level of hand hygiene knowledge. Nurses need to be provided with continuous educational programs that help to enhance their knowledge regarding hand hygiene. This also supported by the recommendation of the previous study conducted at hajj season which concluded that need of education [22].

In this study, the overall nurses' attitude on infection control practices was rated as Very Positive. This shows a clear indication that practices in infection control are viewed positively by the nurses thus its implementation is most likely be observed by the nurses themselves. This result is line with Saudi study which showed that nurses have a positive attitude toward infection control practices

[22]. in addition, this study is in line with a recent systematic review [17] where they found that the majority of studied reported a very high level of attitude among nurses. However, other study showed inconsistent result with our result which revealed poor attitude among nursing student [27].

In this study, there are no statistically significant differences between the respondents' demographic profile like gender, educational attainment, length of service, and seminars attended and the nurses' knowledge, Attitude on infection control practices. Implying that regardless of the parameters listed under each variable, no association can be established as to how the parameters can be used in predicting the nurse knowledge and attitude. This is in line with study conducted by [15]. However, only hospital experiences showed statistically significant differences with nurses' knowledge toward infection control practices. This result is consistent with other study [19,20,21]. The possible explanation could be that the more years of experience and practice that nurses had the more increased in their knowledge through contact with more experienced nurses and daily practices.

This study showed that there is a positive correlation, between level of knowledge and attitude. This result is in line with a study conducted by [27,28] who found that there is positive correlation between knowledge and attitude. However, inconsistent with our result Wahba [29] found no correlation between knowledge and attitude.

## 6. Conclusion

Respondents are having very good rating in terms of knowledge with positive attitude towards infection control practices. One variables hospital experience was found to affect the nurses' knowledge towards infection control practices. The level of knowledge of nurses correlates with attitude in the practice of infection control. Continuous education and proper orientation of all nurses on different Infection Control Practices thru Nursing Education and Training Department and Infection Control Department must be considered. A replication of this study with larger sample size should be done to assess the level of knowledge and attitude of nurses on infection control practices during Hajj season.

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