

Knowledge and Practice of Nurses toward Standard Precautions of Infection Control in Government Hospitals of Sana'a City, Yemen

Gawad M. A. Alwabr^{1*}, Khalid A. S. Al-Salehi²

¹Assistant Professor of Public Health and Environmental Safety, Department of Biomedical Engineering, Sana'a Community College, Sana'a, Yemen;

²M.Sc. in Biomedical Engineering, Department of Biomedical Engineering, Faculty of Science and Technology, Airlangga University, Surabaya, Indonesia
Email: alwabr2000@yahoo.com

Abstract

Background: Hospital-associated infections are infections that occur during a patient's hospital stay or after they have been discharged from the hospital. Health care workers, particularly nurses, are regularly exposed to infectious illnesses while doing their duties. The goal of this study was to determine the level of awareness and practice of standard infection control precautions among nurses in the government hospitals of Sana'a City, Yemen. **Materials and Methods:** A cross-sectional study was undertaken with nurses from five government hospitals in Sana'a, Yemen. A convenience sample of 232 nurses from different institutions was used. This study used a self-administered questionnaire method. Statistical Package for the Social Sciences version 21 was used to analyze the data collected. The outcomes of the investigation were analyzed using descriptive statistics. $P = 0.05$ was considered statistically significant when the Chi-square test, t -test, and one-way ANOVA were used. **Results:** The study results revealed a statistically significant difference between nurses' knowledge and practice of standard infection control procedures ($P = 0.037$). The percentage of nurses who practiced safety precautions (53%) was significantly lower than the average percentage of assessed knowledge (81.4%). Only 48 (20.7%) of the respondents practiced a good level of standard infection control procedures, despite the fact that less than half of the respondents, 106 (45.7%), had a very good knowledge level (>80%). Significant statistically differences were identified between knowledge and gender ($P = 0.028$), as well as the practice of working experience and the name of the hospital ($P = 0.047$ and 0.001 , respectively). **Conclusion:** The nurses in the study had strong knowledge but poor practice when it came to standard infection control precautions. The majority of the barriers to utilizing basic infection control precautions were insufficient stocks of safety devices and the lack of infection control procedures in hospitals.

Keywords: Standard Precautions, Infection Control, Knowledge, Practice, Nurse, Sana'a, Yemen

1. Introduction

An infection acquired during or after a patient's stay in the hospital is referred to as a hospital-related infection^{1,2}. Health care workers, particularly nurses, are frequently exposed to these infections while performing their duties as nurses, it is an illness that thrives in the hospital environment^{3,4}.

Infectious agents are spread through direct or indirect contact with blood, bodily fluids, mucosal membranes, respiratory secretions, and inhalation⁵. Using standard precautions, hospitals can prevent hospital-acquired infections on a regular basis⁶. The primary technique for hospital-associated infection management, which is seen as a successful means of protecting health care workers, patients, and the public, is standard precautions, which

*Author for correspondence

are rules relating to acceptable hygiene practice for health-care personnel⁷⁻¹¹. As a result, it is the responsibility of each hospital to protect its employees from potential dangers by following standard precautions practices¹².

In Yemen, a prior study found that just 26% of nurses had good practices on infection control measures in private hospitals in the city of Sana'a¹³. According to another survey done in Sana'a health-care centers, only 7.2% of nurses had a good understanding of infection control procedures¹⁴.

The ongoing conflict in Yemen has damaged infrastructure and created an ideal environment for infectious disease transmission^{15,16}. During the current conflict, epidemics such as cholera, diphtheria, measles, meningitis, dengue fever, and malaria have surged dramatically¹⁷. Although Yemen had not previously had a severe diphtheria outbreak, during 2017 and 2018, there were roughly 2087 diphtheria cases and 116 deaths¹⁸. Meningitis outbreaks were reported in six governorates in 2017, with 2854 probable cases and 60 deaths. In 2016, there were a total of 144 confirmed measles cases and 3417 suspected measles cases reported¹⁷.

To minimize infection transmission among hospital personnel, it is important to be aware of hospital-related infections and to be committed to infection control practices in hospitals¹⁹. The goal of this study was to determine the levels of knowledge and practice among nurses at selected government hospitals in Sana'a, Yemen, regarding standard infection control precautions.

2. Materials and Methods

A cross-sectional study was done among nurses working in five government hospitals in Sana'a City, Yemen, from January to March 2018. Nurses from all departments of the hospitals of Al-Thawra, Republican, Al-Sabeen, Model Police, and 48th were included. A convenience sample of 232 nurses from the participating institutions was used.

This study used a self-administered questionnaire method. Researchers created a four-part questionnaire based on the World Health Organization infection control guidelines to assess nurses' knowledge and practices regarding infection control standards²⁰, consisting of four parts. The demographic information includes age, sex, years of experience, degree of education, and the name of the hospital in the first section of the questionnaire. The second section consisted of nine closed-ended

questions with true, false, and do not know answers to assess the nurses' understanding of universal precautions for infection control. The third section consisted of nine questions about standard precautions (such as hand washing and wearing personal protective equipment), which were graded on a Likert scale from strongly disagree to strongly agree. The fourth section covered nine topics, such as training courses and factors affecting standard precautionary procedures.

Members of the infection control committees of the studied hospitals assessed the questionnaire's validity. The questionnaire was pretested on 35 nurses working in hospitals who were chosen at random to provide feedback. Cronbach alpha was used to measure the questionnaire's reliability, and the result was 0.84.

Before taking part in the study, participants gave their verbal consent. Before distributing of the questionnaires, researchers described the study's purpose to the participants in all of the hospitals that were chosen. A scoring system is used to evaluate the students' knowledge and practice in the disciplines they are studying. Each correct answer received 1 point, while incorrect answers received a 0. Each participant's total score, which ranged from 0 to 9, was translated to a percentage. The percentage score was calculated by the total scores achieved divided by total maximum scores and classified into five categories {weak (50%), below-average (50–59%), average (60–69%), good (70–79%), and very good (80–100)}.

The data were analyzed using the Statistical Package for the Social Sciences version 21. The questionnaires were sorted, tagged, and entered into the statistics system. For the dispersed quantitative data, means and standard deviations were used. The correlation between the variables was determined using the Chi-square test, *t*-test, and one-way ANOVA. The level of significance is defined as $P < 0.05$.

Ethical approval was granted by the Yemeni Ministry of Public Health and Population (No. 546, dated December 12, 2017).

3. Results

With a response rate of 92.8%, 232 people filled out the surveys and returned them. Table 1 shows the demographics of the sample under investigation which included 143 (61.6%) with a diploma, 81 (34.9%) with a bachelor's degree, and only eight (3.4%) with a master's

Table 1: Demographic data of the study sample (n=232)

Parameters	Characteristics	No.	%
Gender	Male	133	57.3
	Female	99	42.7
	Total	232	100.0
Age	<30 years	160	69.0
	≥30 years	72	31.0
	Total	232	100.0
Education	Diploma	143	61.6
	Bachelor	81	34.9
	Master	8	3.4
	Total	232	100.0
Experience	<2 years	50	21.6
	3–5 years	70	30.2
	>5 years	112	48.3
	Total	232	100.0
Hospital's name	Republican	50	21.6
	Al-Sabeen	48	20.7
	Al-Thawra	51	22.0
	48 th	42	18.1
	Model Police	41	17.7
	Total	232	100.0

degree. One hundred and sixty (69%) of the nurses were under the age of 30. In terms of work experience, 112 (48.3%) of nurses had more than 5 years of experience, 70 (30.2%) had 3–5 years, and 50 (21.6%) had <2 years.

Table 2 demonstrates that 81.4% of nurses have adequate knowledge of the correct practices of standard

Table 2: Assessment of knowledge and practices of nurses about standard infection control precautions (n=232)

Levels	Knowledge		Practices	
	No.	%	No.	%
Weak (<50%)	6	2.6	89	38.4
Below average (50–59%)	19	8.2	33	14.2
Average (60–69%)	34	14.7	28	12.1
Good (70–79%)	67	28.9	34	14.7
Very good (80–100%)	106	45.7	48	20.7
Total	232	100.0	232	100.0
	Mean=4.07		Mean=2.65	
	Std. deviation=1.079		Std. deviation=1.594	

precautions for infection control, but only 53% practice those standards correctly, indicating that information alone may not have an impact on nurses' practice.

In terms of standard infection control procedures, 106 (45.7%) of the respondents had very good knowledge, 67 (28.9%) had good knowledge, 34 (14.7%) had average knowledge, 19 (8.2%) had below-average knowledge, and 6 (2.6%) had weak knowledge.

Only 48 (20.7%) of nurses had very good infection control practices, while 34 (14.7%) had good practices, 28 (12.1%) had medium practices, 33 (14.2%) had below-average practices, and 89 (38.4%) had poor practices.

Table 3 shows the relationship between demographic data and mean scores on nurses' knowledge and practices about standard infection control precautions. It demonstrates that mean knowledge scores and gender ($P = 0.028$), as well as work experience and hospital name ($F = 3.099$ and $F = 5.662$ at $P = 0.047$ and 0.001 , respectively), are substantially linked. However, there was no significant relationship between mean knowledge scores and (age, education, work experience, and the name of the hospital). Furthermore, there was no significant link between mean practices scores and gender, age, and education.

As shown in Table 4, more than half of nurses, 138 (59.5%), attended infection control courses at least once, with 62 (44.9%) attending training courses at their hospitals. Eighty-eight (63.8%) said that their hospitals

Table 3: The relationship between the sample's demographic data and their knowledge and practices about standard infection control procedures (n=232)

Socio-demographic characteristics	Knowledge level					Practice				
	No.	Mean	SD	F	Sig.	No.	Mean	SD	F	Sig.
Gender										
Male	133	4.20	0.998	1.666	0.028	133	2.76	1.577	0.182	0.230
Female	99	3.89	1.160			99	2.51	1.612		
Age group (years)										
<30	160	4.14	1.008	4.376	0.116	160	2.79	1.623	3.115	0.051
>30	72	3.90	1.212			72	2.35	1.493		
Education										
Diploma	143	4.01	1.081	0.927	0.397	143	2.66	1.588	0.038	0.962
Bachelor	81	4.12	1.100			81	2.62	1.625		
Master	8	4.50	0.756			8	2.75	1.581		
Experience (years)										
<2	50	3.92	1.243	0.623	0.537	50	2.92	1.627	3.099	0.047
3-5	70	4.13	1.006			70	2.89	1.575		
>5	112	4.10	1.048			112	2.38	1.561		
Hospital's name										
Republican	50	3.96	1.160	0.583	0.675	50	2.54	1.555	5.662	0.001
Al-Sabeen	48	4.23	0.951			48	3.00	1.650		
Al-Thawra	51	3.98	1.049			51	2.24	1.380		
48 th	42	4.02	1.239			42	3.43	1.625		
Model Police	41	4.17	0.998			41	2.10	1.446		

were responsible for the training, 104 (44.8%) said that their hospitals did not have an infection control protocol, and 68 (29.3%) said that they did not know if an infection control protocol was available at their hospitals.

The majority of the nurses, 176 (75.9%), said that there were safety boxes in the hospitals, and 93 (52.8%) of them could point to the location of the safety boxes in the medication trolley, 60 (34.1%) of them could point to

Table 4: Nurses' responses on items related to standard infection control precautions (n=232)

Characteristics	No.	%
Training course		
Yes	138	59.5
No	94	40.5
Total	232	100.0
Kind of the training		
General courses	29	21.0
Courses in the university	26	18.8
Seminar	21	15.2
Training courses in the hospital	62	44.9
Total	138	100.0
Responsible for the training		
The hospital	88	63.8
International organization	9	6.5
Local organization	15	10.9
Other	26	18.8
Total	138	100.0
Is there an infection control protocol in the hospital		
Yes	60	25.9
No	104	44.8
Do not know	68	29.3
Total	232	100.0

(Contd...)

Table 4: (Continued)

Characteristics	No.	%
Is there safety boxes in the hospital		
Yes	176	75.9
No	56	24.1
Total	232	100.0
Location of the safety boxes		
In all medical operation rooms	60	34.1
In patient's rooms	22	12.5
In medication trolley	93	52.8
Other places	1	.6
Total	176	100.0
Vaccination		
Yes	112	48.3
No	120	51.7
Total	232	100.0
Wearing the safety devices		
Yes	154	66.4
No	78	33.6
Total	232	100.0
Causes of did not wear the safety devices		
Not available	57	73.1
Neglect	7	9.0
Forget to wear	4	5.1
Congestion of patients (overcrowding)	10	12.8
Total	78	100.0

the location of the safety boxes in all medical operation rooms, and 22 (12.5%) of them could point to the location of the safety boxes in patients' rooms.

Hepatitis B vaccination was not required for 120 (51.7%) of nurses. Seventy-eight (33.6%) nurses do not use safety devices when performing procedures or handling patients, with the majority of them, 57 (73.1%), blaming the lack of safety devices in hospitals, while 10 (12.8%) blamed the inappropriate hospital environment, and only 4 (5.1%) admitted to forgetting to use safety devices (Table 4).

4. Discussion

According to the findings, the majority of nurses (74.6%) had sufficient understanding of standard infection control procedures, but 64.7% had poor practices. The percentage of people who used standard infection control precautions (53%) was much lower than the percentage of people who knew about them (81.4%). The lack of practice of standard infection control precautions among nurses might be related to the fact that knowledge does not influence practice among nurses; this could be due to a lack of sufficient information during training sessions or a lack of safety supplies in the hospitals analyzed.

This outcome differs from what has been found in earlier investigations. According to a 2015 survey conducted at hospitals in Sana'a, Yemen, 63.8% of nurses had poor knowledge⁴. According to a survey conducted in Saudi Arabia, 45.8% of nurses' knowledge was deemed adequate²¹. According to a study conducted in Iran, 43% of participants had poor knowledge and 42% had average practices when it came to hospital infection²².

The gender of nurses was found to be substantially associated with their knowledge ($P = 0.028$) but not with their practice ($P = 0.230$) of standard infection control precautions in this study. This finding is in line with the findings of earlier research. In an Iranian study, there was a significant correlation between knowledge and sex ($p = 0.02$)²². A study conducted in Palestine which found a statistically significant difference between gender and knowledge ($P = 0.041$)³. However, it contradicts the findings of earlier research. According to a study conducted in Yemen, there is no link between the gender of nurses and their knowledge of standard infection control practices⁴. There was no significant association between gender and knowledge of the study sample in

an Iranian study, but a significant relationship between gender and practice ($P = 0.014$) was found²³.

There was no correlation between nurses' age and their knowledge and practices ($P = 0.116$ and 0.051 , respectively) in this study. This could be due to a lack of ongoing training for nurses at all phases of their careers.

This outcome was consistent with the findings of prior investigations. According to a study conducted in Yemen, there is no link between the age of nurses and their knowledge of standard measures and nosocomial infection⁴. According to a study conducted in Iran, there is no correlation between knowledge and age ($P > 0.05$)²². According to a study conducted in Palestine, there is no significant difference in age-related knowledge and practices ($P = 0.082$ and 0.220 , respectively)³. However, the findings of a study conducted in Poland that found a significant relationship between nurses' age and their knowledge of nosocomial infection ($P = 0.001$) are incompatible²⁴. This could be ascribed to the disparity in education, culture, and ongoing training, as well as adherence to rules and laws, between developing country societies and European countries like Poland.

In terms of educational levels, the findings of this study revealed that there is no link between a nurse's educational level and their knowledge ($P = 0.657$) or practices ($P = 0.657$). This finding could be explained by the fact that standard infection control precautions are not fully covered in the curriculum of all nursing academic degrees.

This result was in line with the findings of a few earlier investigations. According to a study conducted in Yemen, there is no link between nurses' educational level and their awareness of nosocomial infection measures⁴. According to a study conducted in Iran, there is no significant association between knowledge and educational level ($P > 0.05$)²². However, the findings of this study contradicted those of a prior study conducted in Palestine, which found a statistically significant difference between knowledge and education level ($P = 0.012$)³. This could be due to the fact that the curriculum in Palestine has placed a greater emphasis on infection control material in advanced academic degrees, or that significant efforts have been made to train nurses in hospitals in infection control.

In this study, there is no significant association between knowledge and years of experience ($P = 0.537$), but there is a significant association between practices and years of

experience ($P = 0.047$), referring to inadequate training of nurses about standard infection control precautions during previous years of working, which means that nurses' knowledge did not have an adequate effect on years of experience, whereas practices had an impact on years of experience, which may give rise to the conclusion that nurses' knowledge did not have an adequate effect on years of experience. This outcome was consistent with the findings of prior investigations. According to a study conducted in Yemen, there is no link between nursing experience and awareness of standard measures and nosocomial infection⁴. According to a study conducted in Iran, there is no link between knowledge and work experience ($P > 0.05$)²². However, this contradicts the findings of a prior study conducted in Iran, which found a correlation between nurses' knowledge and experience ($P = 0.05$)²³.

In terms of hospital names, the findings revealed that there is no link between the names of hospitals and their nurses' knowledge ($P = 0.657$) but a substantial link between the names of hospitals and their nurses' practices ($P = 0.001$). This could be because nurses in some hospitals have a more positive attitude toward the implementation of standard infection control precautions than nurses in other hospitals. This could possibly be due to decision-makers in those hospitals having positive attitudes toward infection control, as evidenced through training courses and the supply of tools and technology to implement standard infection control precautions. This finding contradicts a prior study conducted in Yemen, which found a substantial link between hospital names and nurse knowledge⁴.

In terms of nurse training, the study found that 138 (59.5%) of nurses took part in a course on conventional infection control precautions, with the majority of them (62 (44.9%)) taking the course as part of their job. Despite the fact that the majority of nurses attended infection control training courses, the results of this study revealed that standard infection control precautions are still low, which could be attributed to the fact that the training courses implemented did not focus enough on infection control practices.

According to this study, one-third of nurses do not utilize safety equipment at work, with the majority of them citing the lack of safety equipment in hospitals as the reason. The lack of safety equipment in hospitals has resulted in a decrease in the use of conventional infection control procedures by nurses.

There are some limitations to our study that should be addressed in the future research. The study was limited to government hospitals and nurses and determined self-reported practices, but more research is needed to understand how nurses are transferring these practices into actual clinical practice.

5. Conclusion

Based on the findings of this study, it can be concluded that the nurses in this study had good knowledge but inadequate practices in terms of standard infection control procedures. Gender influences knowledge of infection control standard precautions, while the name of the hospital and the experience of the nurses influence infection control standard precautions practices.

The majority of the barriers to utilizing basic infection control precautions were insufficient stocks of safety equipment and the lack of infection control guidelines in hospitals. To address this issue, the hospital's administration should create specific protocols and rules for the use of standard precautions and infection control measures, train nurses in their application, and guarantee that all protective supplies are available at all times within the hospital.

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7. Transparency Declaration

There are no conflicts of interest among the authors that are relevant to this article.

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