Scientific Paper Entitled: Nurses' Application of Infection Control Measures Related to Urinary Catheter Care in The Government Health Sector in Saudi Arabia

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Abstract

Urinary catheter care is a critical nursing practice that necessitates adherence to infection control measures to prevent urinary tract infections (UTIs). The objective of this study was to evaluate the implementation of infection control measures in urinary catheter care among nurses within the government health sector in Saudi Arabia. The research sample comprising all nurses employed in that specific healthcare setting, totaling 67 participants. Data was collected using four distinct tools: a structured interview schedule to gather socio-demographic information of the nurses, a self-administered questionnaire to assess their knowledge, an observation checklist to evaluate their performance, and an assessment of their attitudes.

The findings from this study revealed that 64% of the participants demonstrated a satisfactory level of knowledge, while 59% exhibited satisfactory adherence to infection control measures in the context of urinary catheter care. Importantly, the nurses' knowledge and attitudes were found to significantly influence the application of infection control measures in this aspect of care.

Based on these results, it is recommended that all nurses working across various units and wards in the government healthcare sector in Saudi Arabia participate in training courses

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to enhance their skills, update their knowledge, and improve their practices. This proactive measure would contribute to the overall enhancement of infection control measures in urinary catheter care within the government health sector in Saudi Arabia.

Key words: *Infection control; Measures; Urinary catheter care.*

Introduction

Urinary tract infections (UTIs) account for 50% of infections among patients worldwide who are utilizing urinary catheters(Huis et al., 2020). Proper nursing care plays a crucial role in preventing UTIs(Burnett et al., 2010). Urinary catheters are commonly inserted in patients to assess urine output, facilitate urinary bladder drainage, and assist in the care of patients with unstable hemodynamic conditions. These catheters may remain in place for a few hours or days during hospitalization. Patients with urinary catheters globally face a risk of 3-7% for acquiring UTIs(Dehghanrad et al., 2019).

Urinary catheter care is an essential nursing practice in the government health sector in Saudi Arabia. Nurses bear the responsibility of implementing infection control measures to prevent the spread of catheter-associated infections during the provision of urinary catheter care. Neglecting to apply infection control measures during urinary catheter care can lead to serious complications such as bacteriuria and funguria for patients("Nurse Driven Urinary Catheter Removal- Awareness And Attitudes Survey," n.d.).

Urinary tract infections associated with urinary catheters have significant clinical and economic consequences. These infections can contribute to excess mortality rates, even after considering underlying factors such as illness severity and comorbidities. Hospital-onset bloodstream infections originating from a urinary source have a case fatality rate of 32.8%(Chenoweth & Saint, 2013).

One of the primary roles of nurses in the government health sector in Saudi Arabia is to adhere to basic infection control measures during urinary catheter care. These measures include washing hands before the procedure, wearing gloves, and cleansing the catheter insertion site with soap and water. For female patients, washing should be performed from the front to the back to prevent contamination of the catheter insertion site with bacteria from the rectal area. Additionally, nurses should ensure the proper positioning of the urinary catheter and drainage bag, with the bag fixed below the level of the urinary bladder to prevent ascending infection, promote effective urine drainage, and avoid urine stagnation in the collection tube or reflux into the bladder(Menegueti et al., 2019).

Several studies have demonstrated the importance of proper urinary catheter care in preventing catheter-associated UTIs. Therefore, it is crucial to assess and monitor the knowledge, attitude, and practice of nurses in the government health sector in Saudi Arabia regarding urinary catheter care and the application of infection control measures. When performing urinary catheter care, standard precautions must be diligently followed, including hand hygiene, the use of personal protective equipment (PPE), and appropriate waste management(Mody et al., 2010).

Furthermore, specific precautions should be taken into consideration during care provision. For instance, rapid drainage of large volumes of urine from the bladder can lead to hypotension and/or hemorrhage. In such cases, clamping the catheter temporarily may be necessary. After 20 minutes, the clamp should be released to allow for further urine drainage. In situations of post-obstructive diuresis, intravenous fluid and electrolyte replacement may be required(Mody et al., 2010).

It is important to emphasize these measures and guidelines to ensure the effective prevention of catheter-associated UTIs and promote optimal urinary catheter care among nurses in the government health sector in Saudi Arabia.

Significance of the study:

Urinary tract infections (UTIs) are prevalent among hospital-acquired infections, with estimates suggesting that 70%-80% of patients with urinary catheters are affected. When nurses lack the requisite knowledge and practices for appropriate urinary catheter care and fail to adhere to infection control measures during procedures, the incidence of UTIs rises significantly.

Research Questions:

1.   What is the depth of nurses' knowledge regarding infection control protocols when providing care for patients with urinary catheters?

2.   What is the extent to which nurses practice infection control measures when caring for patients with urinary catheters?

3.   What attitudes do nurses hold regarding the provision of urinary catheter care and adherence to infection control protocols?

Aim of the Study:

Assess nurses' application of infection control measures related to urinary catheter care.

Materials and Method

Materials

Design: This study utilized a descriptive research design for its investigation.

Setting: This study was conducted in the government health sector in Saudi Arabia.

Subjects: All nurses available at the time of data collection and working for at least one year in the previous settings and accept to participate in the study were included in the sample, their number amounted to 67 nurses.

Tools: Four tools were used for data collection:

Tool I: Nurses' socio-demographic data and occupation profile structured schedule

The researchers created a tool consisting of six items to gather demographic information from nurses. These items encompassed gender, age, qualifications, years of experience, participation in infection control courses, and their assigned working unit.

Tool II: Nurses' knowledge self-administered questionnaire

The researchers developed a tool to assess nurses' knowledge regarding urinary catheter care and the implementation of infection control measures. This tool was created based on a comprehensive review of relevant literature. The knowledge assessment covered various aspects, including indications for urinary catheter insertion, recognition of signs and symptoms of urinary tract infection, principles of aseptic technique, and universal precautions for infection control.

For scoring purposes, a system was established wherein a correct response received a score of 1, while an incorrect response received a score of 0. The scores for each item were then summed, and the total was divided by the number of items, resulting in a mean score for the knowledge section. The evaluation criteria for knowledge were as follows: a score of 75% or higher was considered satisfactory, a score between 60% and less than 74% was considered average, and a score below 60% was considered unsatisfactory.

Tool III: Nurses' performance observation checklist for urinary catheter care

The observational checklist used in this study to assess nursing care for patients with urinary catheters and the implementation of infection control measures was adapted from (Miller et al.,2015) and modified by the researchers. The checklist covered nursing care before, during, and after urinary catheter care.

The scoring system for the observational checklist was as follows: a score of 3 indicated that the task was done completely, a score of 2 indicated that the task was done partially, and a score of 1 indicated that the task was not done. For each section of the checklist, the scores for each item were added together, and the total was divided by the number of items to calculate a mean score for that section.

The nurses' practice level was evaluated based on the percentage score. A score of 75% or higher was considered satisfactory, a score between 60% and less than 74% was considered average, and a score below 60% was considered unsatisfactory.

Tool IV: Nurses' attitude toward urinary catheter care and application of infection control measures

The researchers developed a tool to assess nurses' attitudes towards the care of patients with urinary catheters and the implementation of infection control measures. The scoring system for this tool was as follows:

Nurses' attitude scores were categorized into three categories: "agree" (scored as 3), "uncertain" (scored as 2), and "disagree" (scored as 1). If nurses answered with a score of 3, it was considered a positive attitude (and the score was reversed for positive attitude assessment). If nurses answered with uncertainty, it was considered a neutral attitude. If nurses answered with disagreement, it was considered a negative attitude (and the score was reversed for negative attitude assessment).

The scores for each item were summed, and the total was divided by the number of items to calculate a mean score. Attitudes were considered positive if the percentage score was 60% or higher and negative if it was less than 60%.

Method

- The tools used in the study demonstrated good reliability, as indicated by the calculated Cronbach's alpha values. The reliability coefficients were as follows: for the knowledge questionnaire, it was 88.9; for the attitude tool, it was 90.2; and for the observation checklist tool, it was 88.9.

- A pilot study was conducted on a sample of 10 nurses to ensure the clarity and feasibility of the tools. Based on the findings, necessary corrections were made. These nurses were not included in the final study sample.

- The researcher visited the study setting twice a week, from 9:00 a.m. to 2:00 p.m., to collect data.

- Prior permission was obtained from all participants after providing a detailed explanation of the study's purpose. The researcher conducted individual interviews with each nurse, collected sociodemographic data, and assessed their occupation profile using Tool I. Subsequently, Tool II, which consisted of a knowledge questionnaire about urinary catheter care and application of infection control measures, and Tool IV, which assessed nurses' attitudes, were distributed.

- The completion time for the knowledge questionnaire was approximately 20 minutes, while the attitude assessment took around 15 minutes.

- The nurses were informed that researchers would conduct further visits to observe their practice of urinary catheter care and the application of infection control measures.

- During the observational checklist assessment, the researcher observed each nurse once while providing urinary catheter care for patients.

- On a weekly basis, 1-2 nurses were interviewed and assessed.

The study was conducted over a period of 6 months, from March 2021 to September 2021.

Ethical considerations:

This study received ethical approval from the Medical Ethics Committee of government health sector in Riyadh city. Prior to data collection, informed consent was obtained from all participants, ensuring their understanding and agreement to participate. The confidentiality of participants' clinical data and basic information was strictly maintained. As well as the researcher assured them that participation in this study was voluntary, the nurses were informed that they have the right to withdraw from the study at any time, and data collections tools will be anonymity. The researcher committed that, there is no any harmful effect for any one and it will beneficial for the nurses and the hospital administration. In addition, the findings will be discussed with hospital management team before publishing its results.

Quality control

To ensure the quality and validity of the study, several measures were taken before and during data collection. These measures aimed to minimize biases and encourage participation:

- Before the actual data collection, a pretest of the questionnaire was conducted on 10 individuals. Necessary modifications were made based on their feedback. These individuals were then excluded from the actual study to avoid any influence on the results.

- To reduce selection bias, clear and specific inclusion and exclusion criteria were established for selecting research participants. The criteria were strictly followed during the participant selection process.

- The questionnaire was designed to be straightforward and did not involve sensitive or personal questions. This approach aimed to minimize the non-response rate and encourage participants to provide accurate and honest responses.

- To control information bias, participants were required to answer all questions before submitting the questionnaire. This ensured that there were no missing responses and reduced the likelihood of incomplete or biased data.

- To minimize observational bias, all investigators received comprehensive training on the study's inclusion and exclusion criteria, the content of the questionnaire, and how to administer it. This training aimed to ensure consistent data collection procedures among the investigators.

- To address reporting bias, steps were taken to guarantee participant anonymity and data confidentiality. Participants were assured that their responses would remain anonymous, their information would be kept confidential, and the data would only be used for research purposes. It was also emphasized that their questionnaire scores would not impact their career or promotion, as their employers would not have access to individual responses.

- By implementing these measures, the study aimed to enhance the reliability and validity of the data collected and minimize potential biases that could affect the study outcomes.

Statistical Analysis

The statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics such as mean, standard deviation, frequency, and percentage were employed to summarize the data. The significance of associations between

variables was assessed using the chi-square test. A p-value of ≤0.05 was considered statistically significant, while a p-value of ≤0.001 was considered highly statistically significant.

Results

Table 1 presents the characteristics of the nurses included in the study. The age of the nurses ranged from 20 to 35 years, with a mean age of 26.9±5.94. The majority of the nurses were female, accounting for 79.1% of the sample. In terms of educational qualifications, approximately half of the nurses (47.8%) held a Bachelor's degree, while 26.9% had a secondary nursing diploma and 25.4% had a technical nursing diploma. The average years of experience for the nurses was 5.53±5.8. Regarding the work setting, the majority of the nurses (68.7%) were employed in the ICU, while 14.9% worked in medical wards and 11.9% in surgical wards. In terms of training, 76.1% of the nurses had attended training courses related to infection control.

Table 2 displays the distribution of nurses' knowledge levels regarding urinary catheter care and application of infection control measures. The results indicate that 32.8% of the nurses had satisfactory knowledge, while 37.3% had average knowledge, and 29.9% had unsatisfactory knowledge in these areas.

Table 3 presents the distribution of nurses' practice levels in relation to the preparation of patients before urinary catheter insertion, application of infection control measures, and post-procedure nursing measures. The results indicate that 39.10% had satisfactory practices, 20.1% had average practices, and 40.8% had unsatisfactory practices in terms of patient preparation. During the catheter insertion procedure, 62.9% had satisfactory practices, 6.3% had average practices, and 30.8% had unsatisfactory practices. Regarding post-procedure nursing measures, 77.6% had satisfactory practices, 4.2% had average practices, and 21.9% had unsatisfactory practices.

Table 4 reports the combined practice levels of nurses in relation to both urinary catheter care and infection control measures. The findings reveal that 59.2% had satisfactory practices, 8.9% had average practices, and 31.9% had unsatisfactory practices.

Table 5 shows that 77.6% of the nurses had a positive attitude towards urinary catheter care and application of infection control measures, while 22.4% expressed uncertainty. None of the nurses had a negative attitude.

Table 6 indicates that there were no statistically significant relationships between nurses' knowledge levels and their gender, age, years of experience, or qualification. However, statistically significant relationships were observed between work setting and attending training courses related to infection control, and the knowledge levels of the nurses (p<0.05 and p≤0.001, respectively).

Table 7 reveals statistically significant relationships between nurses' attitudes towards urinary catheter care and application of infection control measures, and their work setting and attendance of training courses (p≤0.001 and p<0.05, respectively).

Table 8 shows highly statistically significant relationships between nurses' practice levels and their work setting, as well as attending training courses on infection control measures (p≤0.001 and p<0.05, respectively).

Table 9 indicates a statistically significant relationship between nurses' knowledge and their practice levels regarding urinary catheter care and application of infection control measures (p≤0.001).

Tables 10 and table 11 demonstrate highly statistically significant relationships between nurses' practice levels and their attitude and knowledge (p≤0.001).

Table (1): Distribution of nurses according to their demographic data and work profile data (n=67)

Items	No.=67	%
Gender Female Male	53 14	79.1 20.9
Age 20 -24 25 - 30 31 - 35 35+	37 18 5 7	55 26.8 7.8 10.4
$\bar{x} \pm SD$	26.9 ± 5.94	
Qualifications Bachelor degree Secondary nursing diploma Technical Institute of Nursing	32 18 17	47.8 26.9 25.4
Years of Experience 1-3 4 – 6 7 –10 10+	34 16 8 9	50.7 23.9 11.9 13.5
$\bar{x} \pm SD$	5.53 ± 5.8	
Work place ICU Medical wards Surgical wards Urology ward	46 10 8 3	68.7 14.9 11.9 4.5
Attended infection control courses Yes No	51 16	76.1 23.9

Table (2): Distribution of nurses according to their level of knowledge in relation to urinary catheter care and application of infection control measures (n=67)

Level of knowledge	No.=67	%
Satisfactory knowledge (≤75%)	22	32.8
Average knowledge (60% to <74%)	25	37.3
Unsatisfactory knowledge (> 60%)	20	29.9
Total	67	100

Table (3): Distribution of nurses' practices throughout urinary catheter care procedure (n=67)

Assessment items	Satisfactory Practice		Average Practice		Unsatisfactory Practice	
	No	%	No	%	No	%
Pre procedure:						
Verify physician prescription	0	0.00	0	0	67	100
Wash hands	31	46.3	0	0	36	53.7
Prepare equipment	0	0.00	67	100	0	0

Introduce yourself to patient	38	56.7	0	0	29	43.3
Identify patient	47	70.1	0	0	20	29.9
Explain procedure to the patient	41	61.2	0	0	26	38.8
Keep patient privacy	0	0	67	100	0	0
Adjust the height of the bed	43	64.2	0	0	24	35.8
Disinfect hands	31	46.3	0	0	36	53.7
Wear clean gloves	31	46.3	0	0	36	53.7
Total No. of responses in this category = 10 x 67=670	262	39.10	134	20.1	274	40.8
During procedure:						
Clamp urinary catheter first by artery.	0	0	0	0	67	100
Lower side rails of the bed in your side	0	0	0	0	67	100
Fold the patient gown until waist	0	0	67	100	0	0
Turn patient in one side (raise side rail up)	44	65.7	0	0	23	34.3
Put absorbed sheet under the patient	45	67.2	0	0	22	32.8
Reposition the patient in his/her back	50	74	0	0	17	25.4
Expose the perineal area	54	80.6	0	0	13	19.4
Assess presence of discomfort from the catheter.	52	77.6	0	0	15	22.4
Wash the urinary meatus/labia and dry it in the correct direction	45	67.2	0	0	22	32.8
Wash the external part of the urinary catheter	56	83.6	0	0	11	16.4
Remove and discard gloves and wear another pair	51	76.1	0	0	16	23.9
Turn patient in one side with the side rail up	42	62.7	0	0	25	37.3
Place a paper on the floor below the urinary bag	51	76.1	0	0	16	23.9
Carefully empty the urine from urine bag.	55	82.1	0	0	12	17.9
Clamp the bag and disinfect the clamp end using alcohol swab.	55	82.1	0	0	12	17.9
Hang the tube in proper place.	52	77.6	0	0	15	22.4
Fix the urinary bag appropriately	44	65.7	13	19.4	10	14.9
Open urinary catheter clamp	49	73.1	0	0	18	26.9
Place the side rail up and return the bed into proper height	56	83.6	0	0	11	16.4
Total No. of responses in this category = 19 x 67=1273	801	62.9	80	6.3	392	30.8
Post procedure:						
Dispose any used materials	64	95.5	0	0	3	4.5
Keep and clean equipment	48	71.6	0	0	19	28.4
Remove gloves	48	71.6	0	0	19	28.4
Wash hands	48	71.6	0	0	19	28.4
Record the procedure	48	71.6	0	0	19	28.4
Report any abnormalities at the site of insertion as (redness, inflammation, discharge, odor)	57	85.1	1	1.5	9	13.4
Assess urine for any abnormalities as; change in color, consistency, or odor	51	76.1	1	1.5	15	22.4

Total No. of responses = 7 x 67= 469	364	77.6	2	4.2	103	21.9

Table (4): Distribution of nurses' practice throughout urinary catheter care procedure (n=67)

Assessment items	Satisfactory practice (≤ 75%)		Average practice (60% to < 74%)		Unsatisfactory practice (> 60%)	
	No	%	No	%	No	%
Before Procedure	262	39.10	134	20.1	274	40.8
During Procedure	801	62.9	80	6.2	392	30.7
After Procedure	364	77.6	2	4.2	103	21.9
Total No. of responses= 36 x 67= 2412 % of each category = total of each category x 100 /total no. of respond e.g. 1427 x 100/2412	1427	59.2	216	8.9	769	31.9

Table (5): Distribution of nurses' attitude toward urinary catheter care and application of infection control measures (n=67)

Attitude	No.= 67	%
Positive attitude	52	77.6
Uncertain attitude	15	22.4
Negative attitude	0	0.00
Total	67	100

Table (6): Relation between nurses demographic data and their knowledge about infection control measures and caring of urinary catheter (n=67)

Demographic data	Satisfactory knowledge		Average knowledge		Unsatisfactory knowledge		X^2	P- Value
	No.	%	No.	%	No.	%	1.474	0.478 (> 0.05) Not significant
Gender								
Female	19	36	18	34	16	30		
Male	3	21.5	7	50	4	28.5		
Age								
20 -24	9	16	12	32.4	16	43.3	34.655	0.437 (> 0.05) Not significant
25-30	9	50	6	33	3	17		
31-35	0	00.0	4	80	3	60		

	No	%	No	%	No	%	X²	P-Value
35 +	4	57	3	43	0	00.0		
Years of experience								
1-3	7	21	12	35	15	44	30.285	0.451 (> 0.05) Not significant
4-6	8	50	6	38	2	12.5		
7-10	4	50	2	25	2	25		
10 +	3	33.3	5	56	1	11		
Qualifications								
Secondary Diploma	6	33	7	39	5	28	3.712	0.446 (> 0.05) Not significant
Technical nursing diploma	5	29	4	24	8	47		
Bachelor	11	34	14	44	7	22		
Work place								
ICU	20	43	17	37	9	19.5	13.580	0.035 (< 0.05) Significant
Medical wards	0	00.0	3	30	7	70		
Surgical wards	1	12.5	4	50	3	37.5		
Urology ward	1	33	1	33	1	33		
Attending infection control courses								
Yes	20	39	23	45	8	15.6	20.470	0.000 (≤ 0.001) Highly significant
No	2	12.5	2	12.5	12	75		

Table (7): Relation between nurses demographic data and their attitude about infection control measures and caring of urinary catheter (n=67)

Demographic data	Positive attitude		Uncertain attitude		X^2	P- Value
	No	%	No	%	0.009	0.923 (> 0.05) Not significant
Gender						
Female	41	77	12	23		
Male	11	79	3	21		
Age						
20 -24	28	76	9	24	20.236	0.262 (> 0.05) Not significant
25-30	13	72	5	28		
31-35	4	80	1	20		
35 +	7	100	0	00.0		

Years of experience						
1-3	24	71	10	29	15.652	0.406 (> 0.05) Not significant
4-6	14	88	2	12.5		
7-10	6	75	2	25		
10 +	8	89	1	11.1		
Qualification						
Secondary Diploma	11	61	7	39	3.883	0.143 (> 0.05) Not significant
Technical nursing diploma	14	82	3	17.6		
Bachelor	27	84.4	5	15.6		
Work place						
ICU	41	89.2	5	10.8	12.912	0.005 (≤ 0.001) Highly significant
Medical wards	4	40	6	60		
Surgical wards	5	62.5	3	37.5		
Urology ward	2	67	1	33		
Attending infection control courses						
Yes	44	86.3	7	13.7	9.223	0.002 (< 0.05) Significant
No	8	50	8	50		

Table (8): Relation between nurses demographic data and their practice about infection control measures and caring of urinary catheter (n=67)

Demographic Data	Satisfactory practice		Average practice		Unsatisfactory practice		X^2	P- Value
	No	%	No	%	No	%	2.026	0.363 (> 0.05) Not significant
Gender								
Female	34	64.2	13	24.5	6	11.3		
Male	11	79	1	7	2	14		
Age								
20-24	24	64.8	10	27.2	3	8.10	35.949	0.377 (> 0.05) Not significant
25-30	11	61.2	3	16.6	4	22.2		
31- 35	4	80	0	00.0	1	20		
35 +	6	85.7	1	14.3	0	00.0		
Years of experience								
1-3 years	21	61.9	11	32.3	2	5.8	31.919	0.371 (> 0.05) Not significant
4-6 years	11	68.7	2	12.5	3	18.8		

7-10 years	6	75	0	00.0	2	25		
10 +	7	78	1	11.1	1	11.1		
Qualification								
Secondary Diploma	12	67	5	27.7	1	5.5	2.259	0.688 (> 0.05) Not significant
Technical nursing diploma	10	58	4	24	3	18		
Bachelor	23	71.8	5	15.6	4	12.6		
Work place								
ICU	36	78	4	9	6	13	21.925	0.001 (≤ 0.001) Highly significant
Medical wards	2	20	7	70	1	10		
Surgical wards	4	50	3	37.5	1	12.5		
Urology ward	3	100	0	00.0	0	00.0		
Attending infection control courses								
Yes	40	78.5	7	13.7	4	7.8	12.293	0.002 (< 0.05) Significant
No	5	31.3	7	43.7	4	25		

Table (9): Relation between levels of knowledge of the studied sample and their practices about infection control measures and urinary catheter care (n=67)

Levels of knowledge	Levels of practice			X^2	P- Value
	Satisfactory	Average	Unsatisfactory		
	No	No	No	20.358	0.000 (≤ 0.001) Highly significant
Satisfactory	20	1	1		
Average	19	5	1		
Unsatisfactory	6	8	6		
Total	45	14	8		

Table (10): Relation between nurses' level of practice toward application of infection control measures and urinary catheter care and their attitude (n=67)

Levels of practice	Attitude category		X^2	P- Value
	Positive attitude	Uncertain		
	No	No	21.596	0.000 (≤ 0.001) Highly significant
Satisfactory	42	3		
Average	5	9		
Unsatisfactory	3	3		

Table (11): Relation between levels of knowledge of the studied sample and their attitude toward application of infection control measures and urinary catheter care (n=67)

Levels of knowledge	Attitude category		X^2	P- Value
	Positive attitude	Uncertain	12.567	0.000 (≤ 0.001) Highly significant
	No	No		
Satisfactory	20	2		
Average	22	3		
Unsatisfactory	10	10		

Discussion

Urinary catheter care is a crucial practice performed by nurses in the prevention of infection transmission, particularly urinary tract infections which are common in healthcare settings(Mong et al., 2022). The results of this study, conducted in the government health sector in Saudi Arabia, revealed that nearly two-thirds of the participants had satisfactory knowledge regarding urinary catheter care and application of infection control measures (Table 2). This can be attributed to the nurses' recognition of the significance of infection control measures and their commitment to staying updated through knowledge acquisition. The hospital administration plays a role in enhancing nurses' performance by organizing in-service training and providing hands-on training opportunities.

Furthermore, a majority of the participants worked in the intensive care unit (ICU), where patients are at a high risk of acquiring infections from various sources and invasive procedures. This finding aligns with previous studies (Drekonja et al., 2010; Oman et al., 2012) emphasizing the importance of training courses, particularly those focused on infection control, to equip nurses with the necessary knowledge in this field.

Regarding practice levels, the study found that approximately three-fifths of the participants demonstrated satisfactory practices in urinary catheter care and application of infection control measures, while less than a tenth exhibited average practice levels in certain observed skill items (Table 4). This suggests that despite variations in years of experience and qualifications among the participating nurses, their work in the ICU, coupled with training and emphasis on infection control, contributed to competent practice. This finding contrasts with the findings of (Mody et al., 2010), who emphasized the importance of standardized guidelines and training courses in facilitating competent nursing practice and improving patient care.

In terms of attitudes, the majority of the participants agreed that urinary catheter care and application of infection control measures can prevent urinary tract infections associated with catheter use, and three-quarters of them had a positive attitude towards these practices (Table 5). This can be explained by the fact that well-trained and educated nurses in infection control measures are fully aware of their importance. Jain et al. also highlighted how continuous education and training provide healthcare providers, including nurses, with the necessary knowledge to understand the effectiveness of infection control measures in preventing urinary tract infections(Jain et al., 2015).

Statistical analysis revealed a significant relationship between nurses' knowledge and their work setting, as well as their attendance of training courses on infection control (Table 6). This can be attributed to the ICU's nature as a work environment, which emphasizes the acquisition of knowledge to protect both patients and healthcare providers from infections, thereby motivating nurses to attend training courses. Jain et al. (2015) supported this finding, emphasizing that education and training in urinary catheter care and infection control can improve nurses' performance and serve as a definitive measure for preventing urinary tract infections.

The study also demonstrated a highly significant relationship between nurses' attitudes and their work setting and attendance of training courses on infection control (Table 7). This suggests that nurses working in well-equipped settings with adequate supplies and facilities experience greater comfort in their work environment, leading to acceptance and enjoyment of nursing practice.

Furthermore, the study found a highly significant relationship between nurses' practice and their work setting, as well as their attendance of training courses on infection control (Table 8). This can be attributed to the ICU's requirement for highly qualified nurses with proficient practice skills to handle critical cases effectively. Lo et al. also emphasized the need for special qualifications and a high level of practice among nurses working in ICUs to provide optimal care for critical patients(Patel et al., 2022).

Finally, the study revealed highly significant relationships between nurses' knowledge, practice, and attitudes towards urinary catheter care and infection control measures (Tables 9, 10, and 11). This finding aligns with the findings of (Galiczewski & Shurpin, 2017; Sessa et al., 2011), who highlighted the significant impact of knowledge and additional training courses on nurses' attitudes and their ability to provide quality care to patients.

In conclusion, this study conducted in the government health sector in Saudi Arabia highlighted the importance of knowledge, practice, and attitudes in urinary catheter care and infection control measures among nurses. The ICU work setting, coupled with training courses and emphasis on infection control, contributed to satisfactory knowledge levels and competent practices among the participating nurses. Continuous education and training were crucial in enhancing nurses' performance and preventing urinary tract infections associated with urinary catheter use.

Conclusion

The study's findings indicated that nurses who participated in training courses exhibited superior knowledge and practice compared to those who did not receive such training. Furthermore, it was observed that a good level of knowledge and practice had a positive impact on nurses' attitudes and motivated them to adhere to hospital policies and work efficiently.

Recommendations

Firstly, there is a need for ongoing education and the reinforcement of positive attitudes towards urinary catheter care and infection control measures. Secondly, it is recommended that nurses in different units and wards of the hospital attend training courses tailored to their specialty and individual needs.

However, it is important to acknowledge the limitations of the study. The primary limitation was the small sample size, which restricts the generalizability of the findings.

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