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Knowledge, Attitude and Practice Regarding CAUTI and its Preventive Measures among the Staff Nurses

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ABSTRACT:
Catheter-associated urinary tract infection (CAUTI) is recognized as the most common healthcare-associated infection worldwide, accounting for approximately 36–40% of all nosocomial infections. Its prevention relies largely on appropriate practices and infection control measures by healthcare personnel, particularly nurses, who play an important role in the management of urinary catheters. The present study aimed to assess nurses' knowledge, attitude, and practice regarding CAUTI and its preventive measures; to determine the relationship among these variables; and to identify any association between knowledge, attitude, and practice with selected demographic factors. A cross-sectional descriptive research design was used, and a total of 47 staff nurses were selected through a convenience sampling technique. Data were collected using a self-administered questionnaire to assess knowledge, a five-point Likert scale to measure attitude, and a CAUTI bundle checklist to evaluate practice. The findings revealed that the majority of staff nurses (70.2%) had moderately adequate knowledge, 21.3% had highly adequate knowledge, and 8.5% had inadequate knowledge. With regard to attitude, 63.8% of nurses demonstrated a moderately favourable attitude and 36.2% had a highly favourable attitude. In terms of practice, 51.1% of nurses had moderately adequate practice and 48.9% had highly adequate practice. The study found no significant correlation among knowledge, attitude, and practice, and no significant association with selected demographic variables. The findings suggest that although nurses possess moderate to high levels of knowledge, attitude, and practice regarding CAUTI prevention, there remains a need to strengthen the translation of knowledge into practice. Continuous education and targeted training programs are recommended to bridge existing gaps and promote effective CAUTI prevention measures among nursing staff.

KEYWORDS: Catheter-associated urinary tract infection, nurses, knowledge, attitude, practice, infection prevention

INTRODUCTION

Healthcare-associated infections (HAIs) remain a major global concern, contributing to increased morbidity, mortality, and prolonged hospital stays. Among these, catheter-associated urinary tract

infection (CAUTI) is the most common, accounting for approximately 36–40% of all nosocomial infections in hospitals[1]. Urinary catheterization is a vital clinical procedure, particularly in critical care settings; however, improper insertion or poor maintenance practices contribute to nearly 70–80% of hospital-acquired urinary tract infections[2]. According to the Centers for Disease Control and Prevention (CDC), CAUTI occurs when an indwelling urinary catheter has been in place for more than two calendar days, with the day of insertion counted as day one[3]. The most significant risk factor for developing CAUTI is prolonged catheterization; therefore, catheters should be used only when clinically indicated and removed as soon as they are no longer required[4].

CAUTI is largely preventable through adherence to evidence-based infection control practices. Nurses, being primarily responsible for the insertion, care, and maintenance of urinary catheters, play a pivotal role in prevention. Their knowledge, attitude, and practice directly influence infection outcomes and patient safety. Despite the availability of preventive guidelines, CAUTI continues to pose a significant challenge in healthcare settings, particularly in developing countries.

Globally, CAUTI affects approximately 150 million people each year[5], with the prevalence of hospital-associated urinary tract infections (HAUTIs) ranging between 1.4% and 5.1%, most of which are catheter-related[6]. The CDC reported 20,237 cases of CAUTI across U.S. general acute care hospitals in 2022[3]. Low- and middle-income countries such as India bear a disproportionately higher burden, with incidence densities of 8.8 per 1,000 catheter days compared to 4.1 per 1,000 in high-income countries[7]. Surveillance data from India (September 2022) reported CAUTI rates ranging between 1.7–2.8 per 1,000 patient days and 8.3–12.1 per 1,000 catheter days[8]. A recent study from Northeast India found a CAUTI rate of 9.4 per 1,000 urinary catheter days, with an overall magnitude of 14.67%[9]. Similarly, data from the Hospital Infection Control (HIC) Department at one of the tertiary hospital in Northeast, India showed CAUTI incidences of 7.2% in 2021, 26% in 2022, 15.4% in 2023, and 1.01% from January to March 2024.

Despite technological advances and the implementation of evidence-based interventions such as the CAUTI bundle, infection rates remain concerning. Therefore, this study aims to assess nurses' knowledge, attitude, and practice regarding CAUTI and its preventive measures, to explore the relationship among these variables, and to identify areas needing improvement to strengthen infection prevention and enhance patient safety.

MATERIALS AND METHODS:

Research design:

A cross-sectional descriptive research design was used to assess the knowledge, attitude and practice regarding CAUTI and its preventive measure among the staff nurses

Setting of the study:

The study was conducted in the selected wards of a tertiary hospital in Northeast, India

Population:

The population consisted of staff nurses working in selected wards at a tertiary hospital in Northeast, india

Sample:

The subjects consisted of staff nurses working in selected ward at a tertiary hospital in Northeast, India who met the inclusion criteria and gave their consent to participate

Sample size:

The sample size was calculated using the results of a cross-sectional study to assess the Knowledge, Attitude and Practice on Prevention of Catheter-associated Urinary Tract Infection (P. Balu et al (2021)[10]. With 95% confidence interval (practice) (1.96), margin of error 5% and 95.8% prevalence rate, the required sample size for the study is 63. However, during data collection, the investigators were unable to reach the calculated sample size and could only gather 47 participants. This limitation arose because not all staff nurses meeting the inclusion criteria were involved in providing CAUTI care, and there were fewer patients with catheters during the study period.

Sampling technique:

Convenience sampling technique was used to select the participants.

Sampling criteria:

Inclusion criteria:

- Staff nurses with clinical experience of 6 months and above.
- Staff nurses working in ICU, Medicine ward, Surgical ward, Private ward, Special ward, ICCU, Oncology Ward, Labour and Gynae Ward.
- Staff nurses who are willing to participate in the study.
- Staff nurses who are on duty at the time of data collection.

Exclusion criteria:

- Staff nurses who have working experiences less than 6 months
- Staff nurses on long leave during data the time of collection.
- Staff nurses working in Paediatric ward, Emergency and Operation theatre.
- Staff nurses with ANM qualification and apprentice.

Date collection instrument:

The instruments consist of 4 parts.

Part 1: Demographic variable:

Demographic variables consist of age, gender, qualification, total working experience and has/had attended in-service classes/trainings on CAUTI and its preventive measures, worked as HIC linked nurse.

Part 2: **Knowledge Questionnaires**:

Knowledge questionnaires consisted of 10 self-structured and self-administered multiple-choice questions with 4 options each. A score of 1 was given for each correct response and 0 for every incorrect response.

Scores	Interpretation
>75%	Highly adequate knowledge
74.9%-50%	Moderately Adequate knowledge
<49.9%	Inadequate knowledge

Part 3: Attitude Questionnaires:
A total of 10 self-structured statements were used to assess the attitude regarding CAUTI and its preventive measures among the staff nurses. 5 point Likert scale with strongly disagree having the lowest score and strongly agree with the highest score.

Response categories	Score
Strongly disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

Scores	Interpretation
>75%	Favourable attitude
74.9%-50%	Neutral attitude
<49.9%	Non-favourable attitude

Part 4: Practice Questionnaires:
Direct observation technique using CAUTI Bundle checklist was used to assess the Practice regarding prevention of CAUTI, 1 point was given for each action completed and 0 point was given if action was not done.

Scores	Interpretation
>75%	Highly Adequate practice
74.9%-50%	Moderately Adequate practice
<49.9%	Inadequate practice

Validity and reliability:
The tool was validated by obtaining Content Validity Index (CVI) from four experts. Four ratings scale i.e. highly relevant, quite relevant, somewhat relevant, and not relevant. Content validity was calculated using content validity index (CVI). The total CVI for the Knowledge questionnaires was 0.97 and attitude questionnaire was 0.92.

Date collection procedure:
The subjects were identified based on inclusion and exclusion criteria. Staff nurses' practices on CAUTI preventive measures were observed using a CAUTI bundle checklist. Participants were then approached, informed consent was obtained, and questionnaires were distributed.

Ethical consideration:
The study was conducted after obtaining approval and ethical clearance from the Research Committee of the College of Nursing and the Institutional Ethics Committee, prior to initiating the pilot and main studies. Formal written permission to conduct the study was secured from the Medical Superintendent and Nursing Superintendent. In addition, verbal permission was obtained from the Nursing Supervisors of the selected wards. General consent for direct observation of staff nurses' practices was granted by

the Nursing Superintendent. Informed written consent was obtained from the participating staff nurses after explaining the purpose of the study, the voluntary nature of participation, potential benefits, and their right to withdraw at any stage. Confidentiality and anonymity of the participants were strictly maintained throughout the data collection process.

Data analysis:

Description of demographic variables of the staff nurses was represented using frequencies and percentages.

Pearson's correlation was used to test the relationship between the Knowledge, Attitude and practice regarding CAUTI and its preventive measures among the staff nurses. Chi square test and Fisher's Exact test was used to identify the association between the knowledge, attitude, practice with their selected demographic variables. Tables and figures were used to represent the analysed data.

RESULT AND DISCUSSION:

The results of the analysis are presented in the following order:

Section A: Demographic variables of the staff nurses under study

Variables	Number	Percentage (%)
Age		
21-25 years	24	51%
26-30years	13	27.7%
>30 years	10	21.3%
Gender		
Male	0	0%
Female	47	100%
Qualification		
GNM	26	55.3%
BSC(N)	18	38.3%
PBBSC(N)	3	6.4%
Total working Experience		
6 months-2 years	23	48.93%
2 years-6years	16	34.04%
7years-10 years	3	6.38%
>10 years	5	10.63%
Attended in-service classes/training on CAUTI and its preventive measures		
Yes	40	85.1%
No	7	14.9%
Have/had ever worked as a HIC linked nurse		
Yes	11	23.4%
No	36	76.6%

Table 1: Distribution of staff nurses on their selected demographic variables (N=47)

Table 1: shows that out of 47 participants the majority 24 (51.1%) belongs to 21-25 years of age, 47 (100%) of them were female and 26 (55.3%) were GNM, 23 (48.9%) had 6 months-2 years of experience, 40 (85.1%) had attended in-service classes on CAUTI and its preventive measures, 36 (76.6%) had not worked as HIC linked nurse.

A study conducted by **Ivy Mong, Vimala Ramoo, Shasheela Ponnampalavanar et al** (2021) also had similar findings where 278 (83.7%) were female participants, 83.01% participants had diploma qualification, 81.84% had a nursing experience of 5 years and below and 83.22% participants received education/training related to CAUTI[1].

Section B: Knowledge, Attitude and Practice regarding CAUTI and its preventive measures

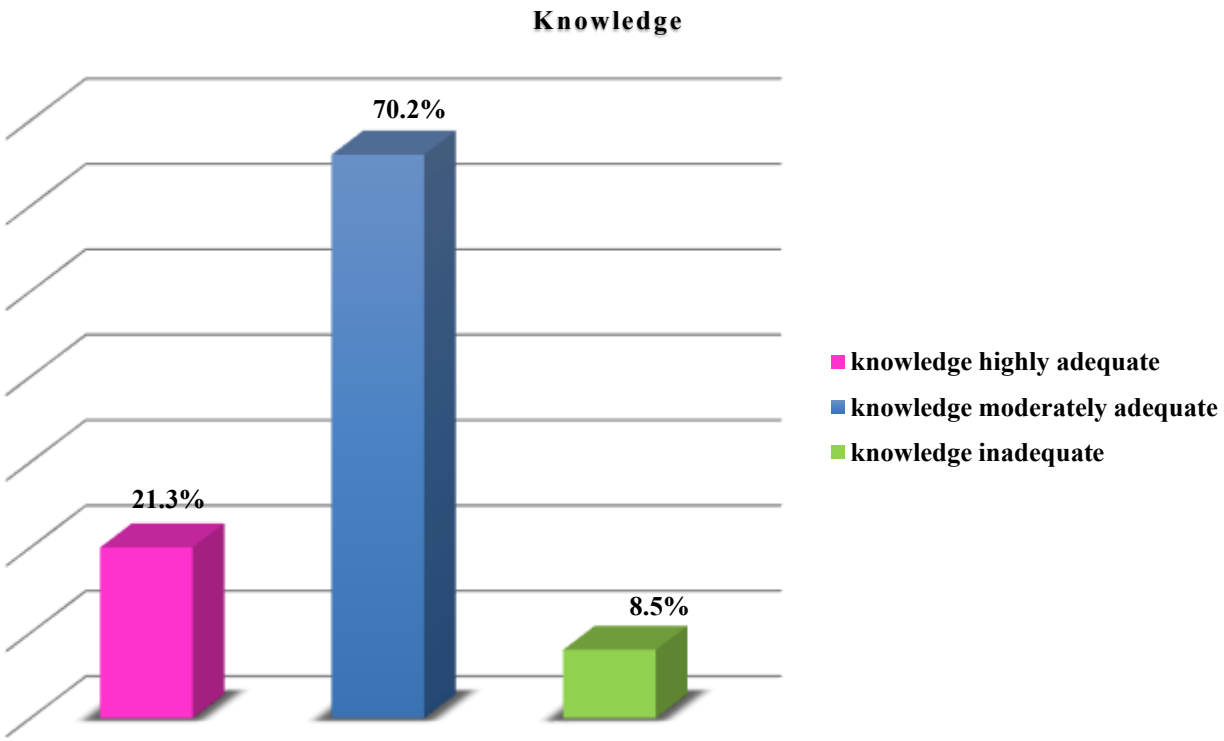
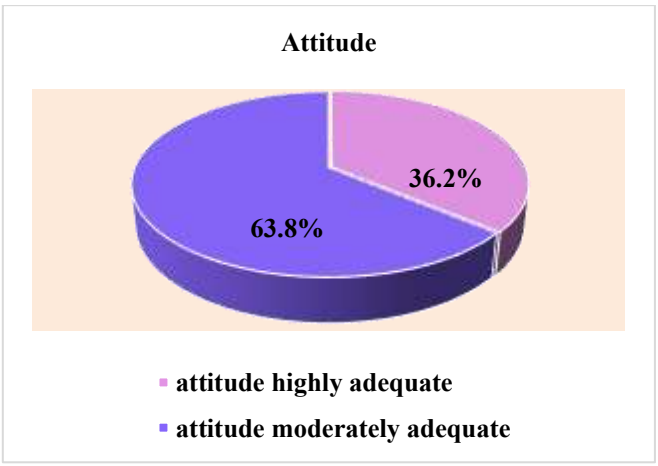


Figure 3: Distribution of scores based on knowledge regarding CAUTI and its Preventive measures. (N=47)



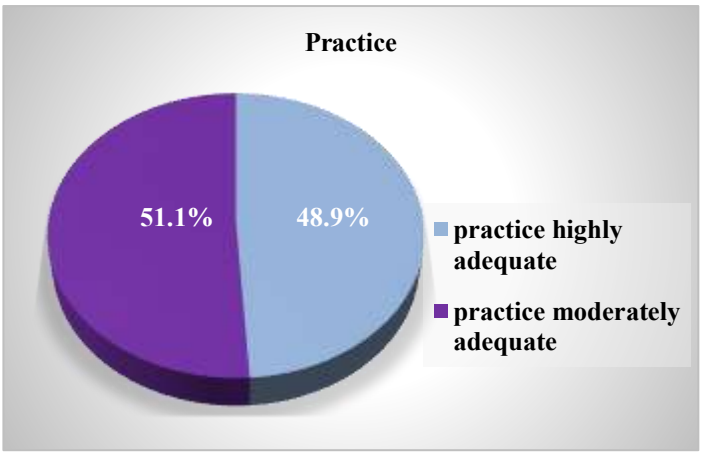


Figure 4: Distribution of scores based on attitude & Practice regarding CAUTI and its preventive measures. (N=47)

Knowledge, attitude, and practice regarding CAUTI and its prevention were assessed using a self-structured questionnaire (10 knowledge items, 10 attitude statements, and a CAUTI bundle checklist). Among 47 staff nurses, 10 (21.3%) had highly adequate knowledge, 33 (70.2%) had moderately adequate knowledge, and 4 (8.5%) had inadequate knowledge. In terms of attitude, 30 (63.8%) showed a highly favourable attitude, while 17 (36.2%) had a moderately favourable attitude. For practice, 23 (48.9%) demonstrated highly adequate practice and 24 (51.1%) moderately adequate practice. Although many nurses had attended in-service training on CAUTI, the higher proporof moderate levels in knowledge, attitude, and practice suggests a need for more comprehensive and ongoing training.

Similar results were reports by Rashmi K.C. and Binita Dhakal (2021), with 59.37% having modewrately adequate knowledge, 41.88% a positivie attitude and 64.38% good practice[11]. In contrast, Ruah Sohail et al. (2024) found lower knowledge levels (29.3% low, 43.55 moderate and 16.3% high) and poorer practice (52.25 poor and 375 good)[12].

Section E: Relationship between Knowledge, Attitude and Practice

Variables	Pearson correlation	p-Value	Remarks
Attitude and knowledge	-.039	0.795	Not statistically significant
Attitude and practice	0.076	0.611	Not statistically significant
Knowledge and practice	0.187	0.208	Not statistically significant

Table 2: Relationship between Knowledge, Attitude and Practice

Table 2: reveals that there is no relationship between Knowledge, Attitude and practice regarding CAUTI and its preventive measures among the staff nurses. The findings of the present study showed no significant relationship between knowledge, attitude and practice regarding CAUTI and its preventive measures. The relatively small sample size (47 participants) may have limited the statistical power to detect correlations.

In contrast, a cross-sectional study by Pandian Balu et al. (2021) among 95 healthcare professionals in a tertiary care hospital in Chennai reported a significant correlation between attitude and practice[10]. Unlike

their findings, the current study did not demonstrate any significant association among knowledge, attitude and practice, leading to the non-acceptance of the first hypothesis (H1), which proposed a significant relationship at $p < 0.05$.

Section F: Association between knowledge, Attitude and Practice regarding CAUTI and its preventive measures among staff nurses with their selected demographic variables.

Table 3: Association between knowledge regarding CAUTI and its preventive measures among staff nurses with their selected demographic variables. (N=47)

Demographic variables		**Levels of knowledge**			**Total**	**Fisher's Exact test**	**p value**
		Inadequate	Moderate adequate	Highly adequate			
Age	21-25yrs	2	19	3	24	1.572	0.899
	26-30yrs	1	9	3	13		
	>30yrs	1	7	2	10		
Qualification	ANM	0	0	0	0	2.146	0.720
	GNM	3	18	6	27		
	BSC(N)	1	14	2	17		
	PBBSC(N)	0	3	0	3		
Total working experience	<6 months	0	0	0	0	5.653	0.409
	6mo - 2yrs	3	16	3	22		
	2 – 6yrs	1	12	3	16		
	7 – 10yrs	0	2	1	3		
	>10yrs	0	5	1	6		
Attended in-service classes/training on CAUTI and its preventive measures	Yes	3	30	7	40	1.409	0.503
	No	1	5	1	7		
Worked as HIC linked nurse	Yes	1	8	2	11	0.310	1.000
	no	3	27	6	36		

*p value <0.05 is considered statistically significant

Table 4: Association between attitude regarding CAUTI and its preventive measures among staff nurses with their selected demographic variables. (N=47)

Demographic variables		Levels of attitude			Total	Fisher's test	p value
		Non-Favourable	Neutral	Favourable			
Age	21-25yrs	0	14	10	24	0.852	0.721
	26-30yrs	0	8	5	13		
	>30yrs	0	8	2	10		
Qualification	ANM	0	0	0	0	0.295	1.00
	GNM	0	18	9	27		
	BSC(N)	0	9	8	17		
	PBBSC(N)	0	2	1	3		
Total working experience	<6 months	0	0	0	0	1.588	0.793
	6mo - 2yrs	0	14	9	25		
	2 – 6yrs	0	9	7	16		
	7 – 10yrs	0	3	0	3		
	>10yrs	0	2	3	5		
Attended in-service classes/training on CAUTI and its preventive measures	Yes	0	24	16	40	0.692	0.692
	No	0	4	3	7		
Worked as HIC linked nurse	Yes	0	6	5	11	0.493	0.493
	no	0	22	14	36		

*p value <0.05 is considered statistically significant

Table 5: Association between practice regarding CAUTI and its preventive measures among staff nurses with their selected demographic variables. (N=47)

Demographic variables		Levels of practice			Total	Fisher's test	p value
		Inadequate	Moderate adequate	Highly adequate			
Age	21-25yrs	0	13	12	25	0.675	0.800
	26-30yrs	0	8	5	13		
	>30yrs	0	4	5	9		
Qualification	ANM	0	0	0	0	3.697	0.139
	GNM	0	11	16	27		
	BSC(N)	0	10	7	17		
	PBBSC(N)	0	2	1	3		
Total working experience	<6 months	0	0	0	0	0.741	1.00
	6mo - 2yrs	0	12	14	26		

	2 – 6yrs	0	8	8	16		
	7 – 10yrs	0	1	2	3		
	>10yrs	0	2	3	5		
Attended in-service classes/training on CAUTI and its preventive measures	Yes	0	19	21	40	0.416	0.416
	No	0	5	2	7		
Worked as HIC linked nurse	Yes	0	3	8	11	3.253	0.093
	no	0	21	15	36		

*p value <0.05 is considered statistically significant

The current study did not find any association between knowledge, attitude and practice (KAP) regarding CAUTI and selected demographic variables such as age, qualification, total work experience, in-service training, or serving as an HIC link nurse. This lack of significant association suggests that demographic factors may not be the primary determinants of KAP; unexamined variables such as institutional policies, workload, or resource availability may have played a larger role.

These findings align with a study by Jacqueline Mukakamanzi (2017), which similarly reported no influence of demographic characteristics on KAP ($p > 0.05$)[13]. However, a study by Tilahun Teshager et al. (2022) reported contrasting results, showing a significant association between professional work experience and nurses' knowledge on CAUTI prevention ($p = 0.031$)[14].

Based on the present results, no significant association was observed between KAP regarding CAUTI and the selected demographic variables. Therefore, the second hypothesis (H2), which proposed a significant association at $p < 0.05$, is not accepted.

IMPLICATIONS OF THE STUDY:

The findings indicate that despite most nurses attending in-service training, a large proportion still demonstrated only moderate knowledge, attitude, and practice regarding CAUTI prevention, highlighting the need for more effective and continuous educational strategies. Regular refresher sessions and competency assessments to be incorporated into routine nursing practice to strengthen adherence to CAUTI prevention protocols.

Health care facilities to enforce policies that mandate ongoing training, monitor staff performance, and ensure consistent adherence to infection prevention standards.

Additional studies are needed to explore the factors that influence CAUTI-related knowledge, attitudes, and practices, develop targeted interventions, and investigate why demographic variables showed no significant association with KAP levels in this study.

CONCLUSION:

The study findings revealed that although a large proportion of staff nurses had attended in-service training on CAUTI prevention, most demonstrated only moderately adequate levels of knowledge, attitude, and practice. No significant association or correlation was identified between these variables and the nurses' demographic characteristics. Overall, while nurses displayed moderate to high awareness of CAUTI prevention, the results indicate a continued need for strengthening practical application.

Ongoing education and further research are recommended to address existing gaps and support more effective CAUTI prevention among nursing staff.

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