

Knowledge, Attitudes, and Practice of Nurses Regarding Prevention of Catheter Associated Urinary Tract Infection (CAUTIs) at Tertiary Care Hospital Peshawar

Khalil Ahmad¹, Iqdar Ali², Ibrar Ullah Khan¹, Ubaid Ullah Khan¹, M Salman Khan¹, Hazrat Huzaifa¹, Hasnain Hamid¹, Muhammad Musharaf khan¹, Kaleem Ullah¹, Abdul Moiz¹

¹ Hayatabad Medical Institute, Department of Nursing, Peshawar, Pakistan

² Department of Nursing, Rabbani Institute of Health Sciences, Mingora, Swat, Pakistan

*Corresponding author: Iqdar Ali, Iqdar1988@gmail.com

"Cite this Article" Received: 12 March 2026; Accepted: 03 July 2026; Published: 28 July 2026

Author Contributions: Concept: KA, IUK; Design: KA, IUK; Data Collection: MSK, AM; Analysis: MMK, KU, UUK; Drafting: IA, HH, HHu. **Ethical Approval:** Government College University Faisalabad, Faisalabad, Pakistan. **Informed Consent:** Written informed consent was obtained from all participants; **Conflict of Interest:** The authors declare no conflict of interest. **Funding:** No external funding; **Data Availability:** Available from the corresponding author on reasonable request; **Acknowledgments:** NA

ABSTRACT

Background: Catheter-associated urinary tract infection is a common healthcare-associated infection that may be reduced through appropriate catheter insertion, maintenance, and timely removal. Nurses have a central role in implementing these preventive measures. **Objective:** To assess nurses' knowledge, attitudes, and self-reported practices regarding the prevention of catheter-associated urinary tract infection at Lady Reading Hospital, Peshawar. **Methods:** A descriptive cross-sectional study was conducted among 109 registered nurses working in intensive care, critical care, high-dependency, step-down, nephrology, and urology units. Participants were recruited through a census-based approach. Data were collected using an adapted structured questionnaire and analysed using IBM SPSS Statistics version 25.0. Categorical variables and KAP classifications were summarized as frequencies and percentages. **Results:** Among the participants, 60 (55.0%) had good knowledge, 43 (39.4%) had moderate knowledge, and 6 (5.5%) had poor knowledge. Positive attitudes were identified in 39 (35.8%), neutral attitudes in 37 (33.9%), and negative attitudes in 33 (30.3%). Good self-reported practice was observed in 59 (54.1%), fair practice in 17 (15.6%), and poor practice in 33 (30.3%). **Conclusion:** Knowledge and reported practice were favourable in slightly more than half of the nurses, but positive attitudes were less common. Structured education, standardized protocols, and practice monitoring may strengthen nurse-led CAUTI prevention. **Keywords:** Catheter-associated urinary tract infection; CAUTI prevention; nurses; knowledge; attitudes; catheter-care practices; infection prevention; patient safety.

INTRODUCTION

Healthcare-associated infections remain an important cause of preventable morbidity, prolonged hospitalization, antimicrobial use, and increased healthcare expenditure. Catheter-associated urinary tract infection (CAUTI) is a common device-associated infection that develops in patients with an indwelling urinary catheter or shortly after its removal. The risk of infection increases when catheterization is performed without an appropriate indication, insertion is undertaken without adequate aseptic precautions, the closed drainage system is disrupted, or the catheter remains in place longer than clinically necessary. Many CAUTIs are therefore considered preventable through appropriate catheter selection, aseptic insertion, maintenance of a closed drainage system, unobstructed urine flow, regular review of catheter necessity, and prompt removal when the indication no longer exists (1,2).

Nurses have a central role in CAUTI prevention because they are routinely involved in urinary catheter insertion, maintenance, monitoring, documentation, and removal. Their knowledge of catheter indications and infection-prevention procedures, attitudes toward patient safety, and adherence to

evidence-based catheter-care practices can influence the quality and consistency of preventive care. Previous studies have shown considerable variation in nurses' knowledge and practices regarding CAUTI prevention, with recurrent deficiencies involving hand hygiene, aseptic technique, maintenance of closed drainage systems, appropriate positioning of collection bags, and timely catheter removal (2,3). These findings indicate that awareness of preventive recommendations does not necessarily ensure their consistent implementation in clinical practice.

Knowledge, attitudes, and practices may be influenced by professional experience, educational preparation, previous infection-control training, workload, availability of written protocols, access to sterile supplies, and organizational support. Studies conducted in different healthcare settings have found that continuing education and structured training may improve nurses' understanding of catheter care and reinforce adherence to preventive procedures (1,4). However, differences in institutional resources, staffing, clinical workload, and infection-control systems limit the direct transferability of findings between hospitals and regions.

Evidence from Pakistan has also identified gaps in nurses' knowledge and preventive practices related to CAUTI. Research conducted in tertiary-care settings has emphasized the need for regular professional education, standardized catheter-care protocols, and stronger monitoring of infection-control practices (3,5). A previous study from public tertiary-care hospitals in Peshawar assessed nurses' knowledge of CAUTI, but locally available evidence remains limited regarding the combined distribution of knowledge, attitudes, and self-reported preventive practices among nurses working in units where urinary catheters are frequently managed (5). Updated institution-specific evidence is particularly important in critical care, high-dependency, nephrology, and urology settings, where catheter use is common and patients may be especially vulnerable to healthcare-associated infection.

Lady Reading Hospital is a major tertiary-care teaching hospital in Peshawar that manages a substantial number of patients requiring urinary catheterization. Assessing nurses working in catheter-intensive clinical units may help identify the proportions demonstrating good, moderate, or poor knowledge; positive, neutral, or negative attitudes; and good, fair, or poor reported practices. Such evidence can provide a baseline for planning context-specific infection-prevention education and clinical quality-improvement activities. Therefore, this study aimed to assess the knowledge, attitudes, and self-reported practices of registered nurses regarding the prevention of catheter-associated urinary tract infection at Lady Reading Hospital, Peshawar.

MATERIALS AND METHODS

A quantitative descriptive cross-sectional study was conducted among registered nurses providing direct care to patients with indwelling urinary catheters at Lady Reading Hospital, Peshawar, Khyber Pakhtunkhwa, Pakistan. The cross-sectional design was selected to assess nurses' knowledge, attitudes, and self-reported practices regarding CAUTI prevention at a single point in time without introducing an intervention or following participants longitudinally. The study was undertaken in clinical areas where urinary catheters were frequently managed, including the intensive care unit, critical care unit, high-dependency unit, step-down unit, nephrology department, and urology department.

The target population comprised registered nurses working in the selected units. Nurses were eligible when they were directly involved in clinical patient care, had at least one year of professional nursing experience, and provided written informed consent. Nurses working exclusively in administrative or other non-clinical roles, those with less than one year of professional experience, those who were on leave during data collection, and those who declined or did not provide written consent were excluded.

The accessible population was estimated to include approximately 150 nurses. A minimum sample of 109 participants was calculated using the Raosoft online sample-size calculator, based on a population of 150 nurses, a 95% confidence level, and a 5% margin of error. A census-based recruitment approach

was adopted in the selected units, whereby all accessible nurses meeting the eligibility criteria were invited to participate. Recruitment continued across the included departments, and 109 eligible nurses completed the survey and were included in the analysis.

Data were collected using a structured questionnaire adapted, with the original author's permission, from a previously validated instrument used to assess nurses' knowledge, attitudes, and practices regarding CAUTI prevention in Ethiopia (1). The source instrument had demonstrated acceptable internal consistency, with a reported Cronbach's alpha of 0.76. The questionnaire was reviewed and modified to ensure that its terminology and clinical content were appropriate to nursing practice at Lady Reading Hospital.

The questionnaire comprised five sections. The first section collected sociodemographic and professional information, including age, sex, nursing qualification, clinical experience, and current working unit. The second assessed institutional characteristics relevant to CAUTI prevention, including previous training, availability of clinical guidance, and access to necessary resources. The third section contained 10 multiple-choice or true-or-false items assessing knowledge of CAUTI and its prevention. The fourth consisted of eight attitude statements rated on a five-point Likert scale. The fifth contained 20 items assessing self-reported catheter-care practices. Domain scores were calculated according to the predefined scoring procedure of the adapted instrument and were categorized as poor, moderate, or good knowledge; negative, neutral, or positive attitude; and poor, fair, or good practice.

Before data collection, the research team was oriented to the study procedures, ethical requirements, informed-consent process, and standardized administration of the questionnaire. Eligible nurses were approached during suitable periods, including shift changes or scheduled breaks, to minimize interference with patient care. The purpose and procedures of the study were explained, and written informed consent was obtained before participation. Questionnaires were administered in person and completed individually in a quiet setting. Participants were allowed approximately 20–25 minutes to complete the instrument. Completed questionnaires were collected by the research team and reviewed for completeness before data entry. No personally identifying information was entered into the analytical dataset.

Data were entered and analysed using IBM SPSS Statistics version 25.0. Data cleaning included verification of coding, assessment of questionnaire completeness, and checking of category totals against the number of participants. Categorical variables were summarized using frequencies and percentages. Knowledge, attitude, and practice scores were classified according to the predefined categories of the adapted instrument and presented as frequencies and percentages. Because the available analysis was descriptive, no causal relationships or independent associations between participant characteristics and KAP outcomes were inferred.

The study was approved by the Ethical Committee of the Hayatabad Institute of Medical Sciences, Khyber Pakhtunkhwa, Pakistan, on 28 March 2025 (Ref. No. HIMS/PO/26/18). Administrative permission was also obtained from the relevant authority at Lady Reading Hospital before participant recruitment. Participation was voluntary, written informed consent was obtained from every participant, and respondents could decline or withdraw without penalty. Confidentiality and anonymity were maintained throughout data collection, data management, analysis, and reporting.

RESULTS

A total of 109 registered nurses completed the questionnaire and were included in the analysis. Most participants were aged 25–30 years (63.3%), female (90.8%), and qualified with a Bachelor of Science in Nursing degree (72.5%). Nearly half of the participants had between one and three years of professional experience (47.7%). The intensive care unit contributed the largest proportion of participants (36.7%),

followed by the critical care unit (21.1%). Previous training in the prevention of catheter-associated urinary tract infection had been received by 72.5% of the nurses.

Table 1. Sociodemographic and Professional Characteristics of Participants

Characteristic	Category	n (%)
Age, years	25–30	69 (63.3)
	31–35	29 (26.6)
	36–40	8 (7.3)
	>40	3 (2.8)
Sex	Male	10 (9.2)
	Female	99 (90.8)
Highest nursing qualification	Diploma in Nursing	30 (27.5)
	Bachelor of Science in Nursing	79 (72.5)
Current working unit	Intensive care unit	40 (36.7)
	Critical care unit	23 (21.1)
	High-dependency unit	9 (8.3)
	Step-down unit	8 (7.3)
	Nephrology department	15 (13.8)
	Urology department	14 (12.8)
Professional experience, years	1–3	52 (47.7)
	4–6	37 (33.9)
	>6	20 (18.3)
Previous training in CAUTI prevention	Yes	79 (72.5)
	No	30 (27.5)

Abbreviation: CAUTI, catheter-associated urinary tract infection. Percentages were calculated using 109 participants as the denominator.

The distribution of knowledge, attitudes, and self-reported practices regarding CAUTI prevention is presented in Table 2. Good knowledge was observed in 60 participants (55.0%), while 43 (39.4%) had moderate knowledge and 6 (5.5%) had poor knowledge. Thus, 94.4% of participants were classified as having either moderate or good knowledge.

Attitudes were more evenly distributed than knowledge. Positive attitudes were reported by 39 nurses (35.8%), whereas 37 (33.9%) had neutral attitudes and 33 (30.3%) had negative attitudes. Consequently, almost two-thirds of participants were classified as having either neutral or negative attitudes toward CAUTI prevention.

Good self-reported preventive practice was identified in 59 participants (54.1%). Fair practice was reported by 17 participants (15.6%), while 33 (30.3%) were classified as having poor practice. Overall, 69.7% of participants reported fair or good preventive practices, although nearly one-third remained in the poor-practice category.

Table 2. Knowledge, Attitudes, and Self-Reported Practices Regarding CAUTI Prevention

Domain	Classification	n (%)
Knowledge	Poor	6 (5.5)
	Moderate	43 (39.4)
	Good	60 (55.0)
Attitude	Negative	33 (30.3)
	Neutral	37 (33.9)
	Positive	39 (35.8)
Self-reported practice	Poor	33 (30.3)
	Fair	17 (15.6)
	Good	59 (54.1)

Abbreviation: CAUTI, catheter-associated urinary tract infection. Percentages were calculated using 109 participants as the denominator. Classifications were based on the predefined scoring criteria of the adapted questionnaire.

The most favourable distribution was observed for knowledge, for which only 5.5% of participants were classified in the poor category. In contrast, negative attitudes and poor practices were each observed in 30.3% of participants. Although good knowledge and good reported practice were present in slightly more than half of the sample, positive attitudes were reported by only approximately one-third. These findings demonstrate variation across the three KAP domains and indicate that favourable knowledge classifications did not uniformly correspond with positive attitudes or good reported practices.

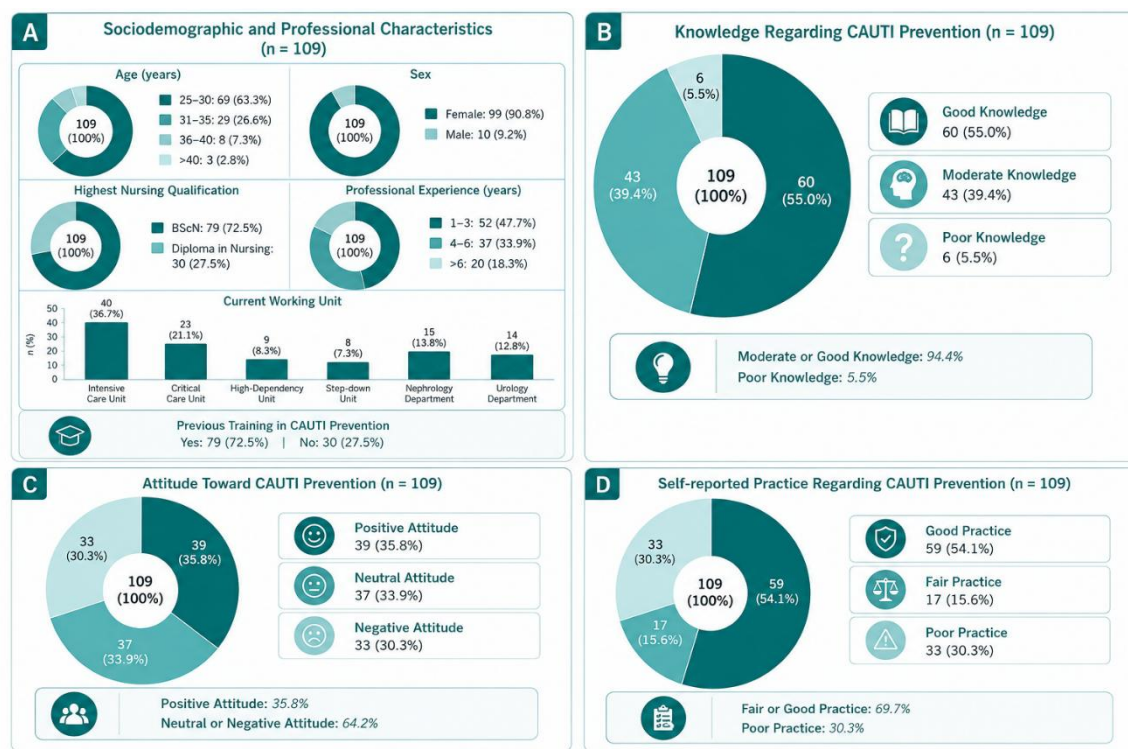


Figure 1 presents the sociodemographic and professional characteristics of the 109 participating nurses and summarizes their knowledge, attitudes, and self-reported practices regarding CAUTI prevention. Most participants were female, held a BSN qualification, had 1–3 years of professional experience, and had received previous CAUTI-prevention training; 55.0% demonstrated good knowledge, 35.8% had a positive attitude, and 54.1% reported good preventive practice.

DISCUSSION

This study assessed the knowledge, attitudes, and self-reported practices of registered nurses regarding the prevention of catheter-associated urinary tract infection at a tertiary-care hospital in Peshawar. Slightly more than half of the participants demonstrated good knowledge and good self-reported preventive practice. Attitudes were less favourable and more evenly distributed, with only approximately one-third of nurses demonstrating a positive attitude and almost two-thirds classified as having neutral or negative attitudes. These findings suggest that knowledge and reported practice were comparatively stronger than attitudes, although important deficiencies remained across all three domains.

Good knowledge was identified in 55.0% of participants, while 39.4% had moderate knowledge and 5.5% had poor knowledge. The predominance of moderate-to-good knowledge may reflect the clinical exposure of participants working in units where urinary catheterization is frequently performed. In addition, nearly three-quarters of the nurses reported previous training in CAUTI prevention, which may have increased their familiarity with infection-control principles. However, the descriptive design and absence of subgroup analysis prevented determination of whether previous training, professional experience, or clinical unit was statistically associated with knowledge level.

The knowledge distribution was broadly consistent with previous studies showing that many nurses possessed at least a basic understanding of CAUTI prevention, although complete and consistently applied knowledge remained uncommon. A study from Nepal similarly identified variation in nurses' knowledge of CAUTI prevention and emphasized the importance of continuing education and reinforcement of evidence-based catheter-care principles (6). Facility-based studies conducted in Ethiopia also demonstrated differences in nurses' knowledge according to professional and institutional characteristics, although variation in study instruments, scoring thresholds, hospital resources, and participant characteristics limits direct numerical comparison with the present findings (7,8). Research from tertiary-care hospitals in Pakistan has likewise reported deficiencies in nurses' understanding of catheter indications, maintenance procedures, and infection-prevention practices (3).

Despite relatively favourable knowledge levels, only 35.8% of participants demonstrated a positive attitude toward CAUTI prevention. Neutral attitudes were identified in 33.9%, while 30.3% had negative attitudes. This distribution indicates that knowledge of preventive measures did not uniformly correspond with favourable beliefs or perceptions regarding their importance and routine implementation. Attitudes toward infection prevention may be shaped by workplace culture, perceived workload, confidence in institutional systems, availability of resources, and the extent to which evidence-based procedures are reinforced by clinical leadership. However, these potential explanations were not directly tested in the present study and should therefore be interpreted cautiously.

Previous evidence has shown that healthcare professionals may recognize the importance of catheter-care principles without consistently demonstrating favourable attitudes toward their routine application. Tobin et al. reported gaps between nurses' knowledge and preventive behaviours in a tertiary-care setting, indicating that awareness alone may not ensure optimal catheter management (9). Al-Rawashdeh et al. also identified variation in healthcare professionals' understanding of catheter indications and CAUTI prevention, supporting the need to integrate knowledge with clear clinical expectations and institutional accountability (10). More broadly, research on infection-control practices has suggested that professional attitudes can influence adherence to preventive procedures, particularly when recommended behaviours require consistent performance during demanding clinical workloads (11).

Good self-reported preventive practice was observed in 54.1% of the nurses, while 15.6% demonstrated fair practice and 30.3% were classified as having poor practice. Although the proportion with good practice was slightly greater than half, nearly one-third remained in the poor-practice category. This finding is clinically important because urinary catheter management involves a series of interdependent procedures, and deficiencies at any stage may increase the risk of infection. Appropriate catheter indication, aseptic insertion, maintenance of a continuously closed drainage system, unobstructed urine flow, correct positioning of the collection bag, and prompt removal are all essential components of CAUTI prevention.

The practice findings were comparable with evidence from other resource-constrained hospital settings, where variable adherence to preventive procedures has been documented. Mukiri et al. identified limitations in nurses' knowledge of evidence-based CAUTI-prevention measures in referral hospitals in Kenya and emphasized the importance of targeted capacity building (12). Studies from Ethiopia have similarly reported that preventive practice may be affected by professional experience, training, access to guidelines, and institutional support (2,7). Nevertheless, the present study measured practice through self-report rather than direct clinical observation. The reported proportion of good practice may therefore be higher than actual bedside adherence because participants may have selected responses perceived as professionally desirable.

A notable pattern was the difference among the three KAP domains. Poor knowledge was reported by only 5.5% of participants, whereas negative attitudes and poor practices were each found in 30.3%. Although direct relationships among the individual domain scores were not analysed, the distributions

suggest that adequate knowledge at the group level did not necessarily translate into favourable attitudes or consistently good reported practice. Similar discrepancies between knowledge and clinical behaviour have been described in nursing and infection-control research, where education improves awareness but may have a smaller effect on sustained practice unless supported by supervision, reminders, accessible protocols, adequate supplies, and organizational reinforcement (13,14).

The findings have practical implications for nursing management and infection-prevention programmes. Educational activities should move beyond the transmission of factual information and place greater emphasis on behavioural application, professional responsibility, clinical decision-making, and the consequences of inappropriate catheter use. Regular competency-based training, structured orientation for nurses entering catheter-intensive units, accessible catheter-care protocols, periodic audit and feedback, and routine review of catheter necessity may help strengthen preventive practice. These measures should be implemented as quality-improvement strategies and evaluated using direct observations and clinical indicators rather than relying exclusively on self-reported behaviour.

The study had several strengths. It focused on nurses providing direct care in multiple catheter-intensive departments, including intensive care, critical care, high-dependency, step-down, nephrology, and urology units. It assessed knowledge, attitudes, and practices within the same sample and used an adapted questionnaire based on a previously validated instrument. The findings provide institution-specific baseline information that may assist nursing educators, infection-prevention teams, and hospital administrators in identifying domains requiring further attention.

Several limitations should be considered. The study was conducted at a single tertiary-care hospital, which limits the generalizability of the findings to nurses in other public, private, rural, or lower-level healthcare facilities. Its cross-sectional design provided a single-time assessment and could not establish temporal or causal relationships. Practices were self-reported and were not verified through direct observation, catheter-care audits, or review of CAUTI incidence. The study did not present item-level responses, making it impossible to identify which specific knowledge, attitude, or practice components were weakest. No inferential analyses were available to evaluate relationships between KAP outcomes and participant characteristics such as training, qualification, experience, or clinical unit. Finally, adaptation of the questionnaire to the local context may have affected measurement comparability, and the reliability of each domain was not reported for the present sample.

Future multicentre research should include nurses from different levels and types of healthcare institutions and should combine questionnaires with direct observational audits. Studies should report item-level results and evaluate whether training, clinical experience, staffing, guideline availability, and institutional resources are independently associated with KAP scores. Prospective quality-improvement studies could also assess whether structured catheter-care bundles, competency-based education, catheter-removal reminders, and audit-and-feedback systems improve observed practice and reduce laboratory-confirmed CAUTI rates.

CONCLUSION

Slightly more than half of the registered nurses demonstrated good knowledge and good self-reported practice regarding the prevention of catheter-associated urinary tract infection, while only approximately one-third demonstrated a positive attitude. A substantial proportion of participants had neutral or negative attitudes, and nearly one-third were classified as having poor preventive practice. These findings indicate that knowledge alone may not be sufficient to ensure favourable attitudes and consistent implementation of recommended catheter-care procedures. Institutionally supported education, competency reinforcement, standardized clinical protocols, and practice auditing should be considered to strengthen nurse-led CAUTI prevention, although their effectiveness requires evaluation through prospective studies and objective clinical outcomes.

REFERENCES

1. Dessie Z, Gela D, Yusuf NT. Knowledge, attitude, practice, and associated factors toward the prevention of catheter-associated urinary tract infection among nurses in Ethiopia: a cross-sectional study. *SAGE Open Nurs.* 2024;10.
2. Teshager T, Hussien H, Kefyalew M, Wondimneh F, Ketema I, Habte S. Knowledge, practice and associated factors of nurses toward prevention of catheter-associated urinary tract infection in intensive care units of public hospitals administered by the Federal Government in Addis Ababa, Ethiopia: a cross-sectional institutional study. *BMC Nurs.* 2022;21(1):1–10. doi:10.1186/s12912-022-00968-1.
3. Majid U, Jafar D, George K, Younus A, Khan A. Knowledge and practices of nurses regarding catheter-associated urinary tract infection in tertiary-care hospitals of Pakistan. In: *Advances in Health Sciences Research*. Atlantis Press; 2024. p. 286–294. doi:10.2991/978-94-6463-248-4_24.
4. Haza'a AA, Al-Jaradi A, Odhah MA. Knowledge of nurses toward prevention of catheter-associated urinary tract infection in public hospitals at Amran City, Yemen. *Open J Nurs.* 2021;11(11):933–946.
5. Muhammad A, Muslim S, Muhammad A, Arifullah. Nurses' knowledge regarding catheter-associated urinary tract infections in public tertiary-care hospitals, Peshawar, Pakistan. *i-manager's J Nurs.* 2020;10(2):52.
6. KC R, Dhakal B. Knowledge, attitude and practice on prevention of catheter-associated urinary tract infection among nurses of a tertiary-care hospital. *J Coll Med Sci.* 2021;17(1):61–68.
7. Zewdie A, Gebremariam T, Asfaw SN, Alemwork S, Bahir D. Knowledge and practice of nurses toward preventing catheter-related urinary tract infection and its associated factors at governmental referral hospitals of West Oromia, Ethiopia, 2022: a facility-based cross-sectional study. 2023. doi:10.21203/rs.3.rs-2534151/v1.
8. Nure M, Ifa M, Bedane J. Knowledge and practice of catheter-related urinary tract infection prevention and associated factors among nurses in public hospitals, West Shoa, Oromia, Ethiopia. 2022. doi:10.21203/rs.3.rs-1983637/v1.
9. Tobin EA, Nnadi C, Ogedegbe S, Okonofua M, Akpede N, Odigie G, et al. Prevention of catheter-associated urinary tract infections: assessment of knowledge and practices among nurses in a tertiary-care centre in Nigeria. *Int J Infect Dis.* 2020;101:274. doi:10.1016/j.ijid.2020.09.719.
10. Al-Rawashdeh S, Ayyad M, Qaddumi B, Ayaad O, Alkhatatbeh H, Abu Alhajjaa E, et al. Assessment of healthcare professionals' knowledge regarding catheterization indications and prevention of catheter-associated urinary tract infections: implications for health policy, practice, research, and medical education. *J Ren Inj Prev.* 2025.
11. Sessa A, Di Giuseppe G, Albano L, Angelillo IF. An investigation of nurses' knowledge, attitudes, and practices regarding disinfection procedures in Italy. *BMC Infect Dis.* 2011;11.
12. Mukiri J, et al. Nurses' knowledge of evidence-based preventive measures for catheter-associated urinary tract infections in Kiambu County referral hospitals, Kenya. *Afr J Health Sci.* 2024;37(3):1–10.
13. Ostaszkievicz J, Tomlinson E, Hunter K. The effects of education about urinary incontinence on nurses' and nursing assistants' knowledge, attitudes, continence-care practices, and patient outcomes: a systematic review. *J Wound Ostomy Continence Nurs.* 2020;47(4):365–380.

14. Gruda A, Sopjani I. The knowledge, attitudes and practices of nurses toward management of hospital-acquired infections in the University Clinical Center of Kosovo. *Mater Sociomed.* 2017;29(2):84.