ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENTOFEMERGENCYMEDICINE

KNOWLEDGE AND PRACTICEOF NURSES TOWARDS PREVENTION OF CATHETER-ASSOCIATED URINARY TRACT INFECTION WORKING IN INTENSIVE CARE UNIT OF FEDERALLY ADMINISTEREDHOSPITALSIN ADDIS ABABA, ETHIOPIA 2021.

BY; TILAHUN TESHAGER (BSc)

A RESEARCHTHESISIS SUBMITTED TO ADDIS ABABAUNIVERSITY COLLEGE OF HEALTH SCIENCE DEPARTMENT OF EMERGENCY MEDICINE IN PARTIALFULFILLMENT OF THE REQUIREMENT FOR MASTER OF SCIENCEEMERGENCY MEDICINE&CRITICAL CARE NURSING

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Thesis Title:

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ACRONYMS AND ABBREVIATIONS;

AIDS: Acquired immunodeficiency syndrome

APIC: Association for professionals in infection control and epidemiology

CAUTI:Catheter-associated urinary tract infection

CDC: Centers for disease control and prevention

ETB: Ethiopian total birr

HAI: Hospital-acquired infection

HAI/HCAI: Healthcare-associated infection

ICU: Intensive care unit

IUC: Indwelling urinary catheter

KP: Knowledge and practice

MOH: Ministry of health

SPSS: Statistical Package for Social sciences

TASH:TikurAnbessa specialized hospital

UC: Urinary catheter

UTI: Urinary tract infection

WHO: World health organization

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Abstract

Background:Urinary catheterization is one of the most common procedures performed in hospitals especially in intensive care units and the single highest risk factor for acquired UTIs.More than 75% of all acquired UTI are due to catheter use.Nurses are the primary healthcare providers who are responsible for inserting and maintaining urinary catheters. But most of the nurses had an inadequate level of knowledge and practice regarding the prevention of catheter-associated urinary tract infection.

Objective: This study aimedto assess the knowledge and practice of nurses towards the prevention of catheter-associated urinary tract infection (CAUTI)workingin the Intensive Care Unitoffederally administeredhospitals inAddisAbaba Ethiopia,2021 G.C.

Methods: A descriptive cross-sectional study wasconducted.A total of 184 nurses were participated by census sampling method. Data was collected by self-administered questionary.Data wereentered by using epi data 4.6.0 and was analyzed by SPSS version 26.0.Pearson chi-square and Fischer exact testswere performed to see the association between independent and dependent variables.A P< 0.05 was consideredstatistically significant.

Results; the study findings showed that more than half of nurses 116 (63.04%) had a poor level of knowledge while only 68 (36.96%) had a good level of knowledge and 96 (52.17%) of nurses had a good level of practice while88 (47.83%) had a poor level of practice. There was a statistical association between nurse's knowledge and experiences a (p-value=0.031).While there was no statistical association between nurse's knowledge and practicelevel and nurse's knowledge and practice with age, sex, level of education, marital status, training, and guidelines/protocols a (p-value>0.05).

Conclusion and Recommendation: results showed that nurses had a poor level of knowledge and practice for the prevention of catheter-associated urinary tract infection.Further studies withlarge sample sizesneed to investigate factors affecting nurse's knowledge and practice towards the prevention of catheter-associated urinary tract infection.

Keywords: Catheter-associated urinary tract infection (CAUTI), Knowledge, practice, nurse

1. INTRODUCTION

1.1. Background

Urinary tract infection (UTI) is an infection that affects any part of the urinary system, includingthe kidney, ureter, bladder, and urethra (1,2). Urinary catheterization is one of the most common procedures performed in hospitals especially in intensive care units and the single highest risk factor for acquired UTIs(3). According to NationalHealthcare Safety Network (NHSN) reports, that75% of UTIs are acquired due to the use of indwelling urinary catheters(4). During admitted patients in ICU, the inserted catheter remains each day the patients have a 3-7% increased risk for developing CAUTIs (5)

Catheter-associated urinary tract infection (CAUTI) is caused by manyorganisms, likeE.coli(21.4%),CandidaSpp(21%),Enterococcus(14.9%),PseudomonasAeruginosa(10%),KlebsiellaPneumonia(7.75%)andEnterobacter(4.15%)(6,7).CAUTI is acquired when the insertionof a urinary catheter into the urinary system unnecessarily andthe presence of a catheter for a long period in the bladder(8,9).

Virtually every urinary tract infection associated with a hospital-acquired catheter is caused by urinary catheter instrumentation (10), unnecessary use, poor catheter insertion technique, andremaining a catheter into the bladder long period which potentially invades the blood.And this infection is a product of a complex set of interrelated behaviors performed by many individuals(11).The risk factors associated with acquiring CAUTI were; female gender, patients with prolonged duration of catheterization, immune-compromised patients, patients with advanced age, prolonged ICU stay(12).

CAUTI can lead to different complications such as; prostatitis, epididymitis, bladder spasm, orchitis, in males and cystitis, pyelonephritis, urosepsis, endocarditis, endophthalmitis, meningitis,bloodstream infection, and straw color urine(13). These infection has been associated with increase morbidity, mortality, high financial cost, and length of stay in hospital(13,14).

Nurses are the primary healthcare providers who are responsible for inserting and maintaining urinary catheters, as well as the production of desired outcomes by which they follow the right action during catheter insertion and catheter cares by seeing guidelines, protocols, and

standards(15). Therefore, they should also have sufficient knowledge and practice for infection control through the use of urethral catheters and their procedure must be accompanied by the guidelines for infection control strategies in the healthcare environment (16).

In low and middle-income countries like Pakistan,most of thenurses had an inadequate level of knowledge and practice regarding the prevention of CAUTI(17).Similarly,in Egypt, the levelof nurse's knowledge and practice was poor to prevent CAUTI in ICU patients(3).

Guidelines for the prevention of catheter-associated UTIs recommend thatproper catheter use, aseptic insertion, goodmaintenance, and socio-adaptive factors like; cultural and behavioral change in health care units are vital in avoiding catheter-associated UTI(18,19).

Therefore,the aim of this study was to assess the level of knowledge and practice of nurses towards the prevention of CAUTI working inICU federally administered hospitalsin Addis Ababa, Ethiopia.

1.2. Statement of the problem

Hospital-acquired infections (HAI) or healthcare-associated infections constituting a majorhealthproblem worldwide; among them, the major one is Catheter-Associated Urinary Tract Infection (CAUTI) and it happens after the admission of the patient in the hospital due to the cause of other than that infection(20).According to the CDC in 2013, 99,000 deaths occur each year related to healthcare-associated infection, which is very high as compared to AIDS, cancer, and Car accident-related deaths(21). Similarly, in a 2015 report 75% of cases of patients had acquired catheter-associated urinary tract infections and major public health problems in terms of morbidity, mortality, increased length of stay, and high financial crises(22).

The association of infection control and epidemiologyin the united states(US) reported that CAUTI holds for25.6% of all healthcare-associated infections(3).And more than 70% of infectionsreported because of indwellingcatheters(23).According to the guideline of the CDC,catheterized patients have more than 80% of all urinary tract infections when compared to non-catheterized patients(24). And patients admitted in ICU have 52% develop catheter-associated infection (25). In developing countries,the rate of catheter-associated infectionranges from 9.9 to 35 per 1000 catheters per day (12).Similarly, in AfricaCAUTI is the most common healthcare-associatedinfection accounting for 80% of all hospital-acquired infections and is mostly related to the use ofurinary catheters frequently in ICU patients. Although, many preventive measuresand guidelines to prevent CAUTI present in different healthcare settings (26).

Nurses are part of health care team that plays unique role in the control of hospital acquired infections, but their knowledge and practice are poor for the prevention of this infection(22).Even though many efforts have been made for the prevention of CAUTI, the infection continue to rise counting for 32% in USA and most of the time due to inadequate knowledge about basic catheter care practices especially among nurses(27).

Indeveloping countries like India and the Philippines, the level of nurse's knowledge was poor which is 58.8% and 70% respectively(6,16). And according to the study done in Egyptby Algarni showed that the level of practice of nurses working in ICU on the prevention of CAUTI was poor

which was 83.94%(3). Similarly, most of nurses in Rwanda have inadequate knowledge 64.52% for the prevention of catheter-associated urinary tract infection(26).

As to the researcher's knowledge, there is no study done regarding theknowledge and practice of nurses towards the prevention of CAUTI in the study area. Thus, the researcher has the interest to conduct a study to assess the level of knowledge and practices of nurses towards the prevention of CAUTI amongnurses working in ICU.

1.3. Significance of the study

The problem of CAUTI affectsnot only individual patients but also the health care system as a whole. Nurses are the first health care providers for giving care to the patients andresponsible for providing assessment and management of patients as well asaseptic insertion of urinarycatheters, providing daily care, and appropriate catheter removal to prevent CAUTI.

This study will identify the gapsin the knowledge and practice of nurses in the prevention of CAUTI. After the study, the result will contribute to nursing educational needs, competencies, practices, continuing professional development, and increase the quality of care and enhancement of the critical patient outcomes via appropriate handling of an indwelling urinary catheter (IUC).

Moreover, this study will contribute as baseline data for other researchers who havethe interest to conduct further investigation on the area of prevention of CAUTI.Concerning management and administration, it is hoped that this study will help to inform the development of evidence-based guidelines, protocols, and checklists for the prevention of CAUTI in the country.

2. LITERATURE REVIEW

2.1. Introduction

Globally, urinary tract infections account for around 40 % of all infections acquired in the hospital every year; 80 % of these healthcare-associated urinary tract infections are related to inserting urethral catheters(5). The risk of catheter-associated urinary tract infection increases by 5% every day when the catheter remains in the bladder, while CAUTI is the most common infection, it is preventable if the nurses follow the recommended guideline for catheter indications and demonstrated catheter maintenance and care methods based on evidence(18). This chapter will discuss the different reviews of literature that identified socio-demographic variables,nurse's knowledgeand practice towards the prevention of CAUTI, institutional factors, and associated factors of nurses on prevention of CAUTI.

2.2. Knowledge of nurses towards the prevention of CAUTI

A study conducted by Purbia, et al among staff nurses working at Geetanajli ICU hospitalin India showed that 58.88% of nurseshave insufficient knowledge, 12.22% have adequate knowledge and 28.9% have averagedknowledge(6).A similar study wasdone by Prasanna at Nellore, India in 2015 on Knowledge regarding catheter care among 30 staff nurses revealed that 46.7% had good knowledge and 20% had poor knowledge and 33.3% had average knowledge (1). The findings of the study done in the Philippines at Iloilo city in 2014 reported that out of 30 staff nurses 70% had a low level of knowledge and 30% had a high level of knowledge. (15).

A cross-sectionalsurvey conducted at public hospitals in Lahore, Pakistan, reported that;the majority of participants 51.87%were having good knowledge of CAUTI prevention, while48.13% were having poor knowledge and 72.5% of respondents knew the proper methods for an indwelling urinary catheter used aseptic techniques and sterile equipment's(17).

A descriptive cross-sectional study was done in Iran among 145 nurses revealed that 43% (n=63) had poor knowledge, and 57% (n=82) of the nurses had good knowledge about the prevention ofCAUTI (28).

A similar study conducted in Libya reported that among the study participants on handwashing practice during catheter insertion was adequate knowledge (85.9%)(29). A cross-sectional survey done in Egyptrevealed that more than half of nurses (62.77%) had a low level of knowledge and (37.23%) of nurses had a high level of knowledge (3). And a similar study done in RwandaICU nursesshowed that the respondents' knowledgeof prevention of CAUTI 64.52% was notsatisfactory and 35.48% wassatisfactoryand 100% of nurses identified that the proper methods for IUC, 60.2% of respondents knew that the risk factors for developing CAUTI was prolonged time of catheterization, and 67.2% of respondents understood elderly patient and women were high risks for developing CAUTI(26). A study done in Kenya revealed that 71%) of nurses had adequate knowledge, while (29%) of nurses had inadequate knowledgefor the prevention of CAUTI(30).

2.3. The practice of nurses towards the prevention of CAUTI

A cross-sectional study conducted in Pakistan showed that around half49% of nurses had a goodlevel of practice. While the rest 51% of nurses had a poor level of practice on the prevention of CAUTI. However, 62.5% of participants secure indwelling catheters properly after insertion, 18.5% of nurses do not regularly empty the urinary bags(31).

A hospital-based study in India reported that the majority of respondents 85.4% had good practice of used aseptic technique to insert a catheter, 94.7% of nurses maintained closed drainage system, and 94.7% secured catheter appropriately after insertion(6)

A cross-sectional study donein the Philippines revealed that two-thirds (66.7%) of therespondents had a poor level ofpractice, while some (33.3%) of the nurses had poorpractices forthe prevention of CAUTI. Two-third (66.7%) of the respondents in using a single pack of lubricant jelly in their catheter insertions. Although emptying the collecting urine bag regularly had a good practice (100%), and almost all (96.7%) had a poor practice in cleaning the urethra with an antiseptic solution before inserting the catheter(16).

A study conducted in Iran showed that, out of 145 participants, 20% of the nurses had poor practice on handwashing before and after catheterization, and 80% had a good practice on handwashing in the prevention of CAUTI(28).

Astudy done in Zambia revealed that a higher number of participants n= 147 (75.4%) had a good practiceof handwashing before and after direct contact with the patients, while some participants n= 46 (23.6%) had a poor practiceof handwashing before and after direct contact with the patient(32).

A cross-sectional study conducted in Rwanda ICU nurses showed thatthe majority of nurses (79.9%) had a good practice, while 20.1% of nurses had a poor practice on the prevention of CAUTI, and almost all (98.1%) of the nurses had a good level of practice onmaintaining a closed system, majority of (94.3%) respondents keeping the catheter and collecting tubes free from kinking, (90%) respondents keeping the collecting bag below the bladder, almost all (98.1%) of respondents used aseptic technique to insert the catheter, (67.9%) of the respondents used alternative type of urinary catheters like condoms and adsorbentsto prevent CAUTI, and more than half (64.2%) of nurses had good practices on using single packed lubricant jelly (26).

A cross-sectional survey in Egypt revealed that regarding the levels of nurses' practices toward CAUTI prevention, it wasnoted that the majority of nurses (83.2%) had a good level of practice on handwashing before catheter insertion,nearly three quarters (73.7%) of nurses had correct practices in keeping the collecting bag below the bladder and tube free from kinking to maintain an unobstructed urine flow for the inserting catheter,more than half (56.9%) of nurses had good practices on the use of one collecting container for each patient in emptying the collecting bag of the indwelling catheter, and nearly three quarters (73%) of nurses had good practices on wearing of gown during any manipulation of the indwelling catheter’s collecting bag (3).

2.4. Socio-demographic variables

A cross-sectional study conducted in the Philippines at Iloilo city in 2014 among ICU nurses revealed that the majority of the respondents were young with a mean age of 25.20 years old. Specifically, it can be seen that nearly all (90%) of the respondents belonged to the age group 21 -29 years old. More than half (56.7%) were males, while the remaining (43.3%) were females, and more than three-fourths of (76.5%) were BSc nurses, while the remaining (23.3%) were MSc nurses. More than half (53.3%) were working experience greater than 24 months, with a mean

length of 25.367 months and a little more than a quarter (26.7%) had just 1 – 11 months of work experience, while the remainder (20%) had 12 – 23 months of clinical experience (16).

In a study conducted in Pakistan, at public hospitals in Lahore nearly two-thirds (64.4%) of the respondents were 18-20 years age group (17). A study done in Egypt showed that the mean age of nurses was 33.60 ± 6.11, and (32.8 % of nurses were less than 30 years old. Near two-thirds of nurses were female (55.6%), the rest (44.4%) were male, and 59.2 % were married. 62% of nurses had a bachelor's degree in nursing, 35% had a diploma, and only 3% had a master's more than half (53.3%) of respondents had 5-10 years of experience and 19.1% had less than five-year experience (3).

A study conducted in Rwanda reported that the majority of nurses (81%) were diploma, while (17%) were Bachler degrees, and the rest (2%) were master nurses. More than half of nurses (54.7%) had less than 5 years of experience, (35.9%) had 6- 10 years of experience, while the remaining (9.4%) had 11-15 years of experience in the nursing profession, greater than half of the respondents (55%) were female, while (45%) were male (26).

2.5. Institutional factors towards the prevention of CAUTI.

In a cross-sectional study conducted in Pakistan, at public hospitals in Lahore, more than half (54.4%) of the respondents applied guidelines/protocols for the prevention of CAUTI,and least (30.7%) of the respondents got training about catheterization(17). And a study done in India showed that more than three-fourths (85.2%) of the respondents have not got training about the prevention of catheter-associated urinary tract infection, while the rest (14.8%) of respondents have got training about catheterization

A study done in Egypt showed that the majority of nurses (91.2%) attended a training program on urinary catheter procedures while the rest of 8.8% had never attended (3). And a study conducted in Rwanda reported that the majority (79.2%) of respondents got training about catheterization (26).

A study conducted in Kenya revealed that (66.7%) of respondents had guidelines/protocols while (23.3%) of respondents had no guidelines/protocols and the majority (83.9%) of respondents have not got training, only (16.1%) of respondents have got training for the prevention of CAUTI(30).

2.6. Associated factors of nurses' Knowledge andPractice towards the prevention of CAUTI

A study conducted in Pakistan showed that the professionalexperiences of nurses were significantly associated with the knowledge level of nurses while age, educational level, and gender were not factors that affect the KP of nurses (33). A similar study showed that nurse's practice had a significant association with years of experience. (p-value < 0.05) but nurses' practice isnot affected by age, and qualification (p-value > 0.05)(31).

The study done in Iran revealed that there is a significant relationship between knowledge and gender (p = 0.02). however, age, marital status, employment, work experience, and education were not established a significant relationship with knowledge and practice (p>0.05)(28).

A study conducted in Libya reported that there was a statistically significant relationship (p = 0.000) betweennurse's knowledge and practice of handwashing and gender(29).

A study conducted in Egypt showed thatthe relation between nurses' knowledge and practice did not have a significant relationshipbetween gender, education level, years of nursing experience, and education or training program attended on urinary catheter procedures, and the nurses' knowledge of P > 0.05. While there was a significant relationship between nurses' knowledge and age with P = 0.05 (3).

The study done in Uganda revealed that there was nosignificant relationshipbetween demographic characteristics (age, sex, level of education, and professional practice) and knowledge and practice in nurses on CAUTI p> 0.05(26).

A study conducted in Kenya showed that significant relationships were observed between the nurses' knowledge and implementation of the CDC guidelines on CAUTI prevention (p =0.018), but training on the guidelines was not associated with the knowledge of nurses (p>0.05)(30).

2.7. Conceptual framework

The concept of this framework is adopted from different kinds ofliterature and modified accordingly to fit thisstudy(26). It shows the relationship of socio-demographic variables andinstitutional factorsfor knowledge and practice of nurses on the prevention of CAUTI ofICU nurses.

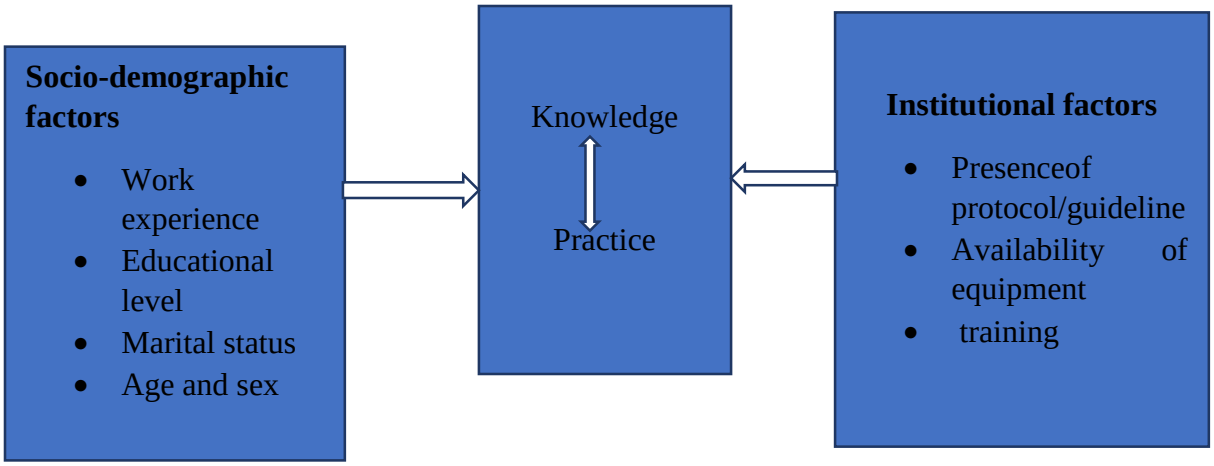

Figure 2. 1 Conceptual framework: reflects theKnowledge, Practice, and factors associatedwith the prevention of CAUTI among ICU nurses.

3. OBJECTIVES

3.1. General objective

The general objective of this study is to assess the knowledge and practice of nurses and associated factors toward the prevention of CAUTI working in theICU offederally administeredhospitals in Addis Ababa, Ethiopia 2021.

3.2. Specific objective

To assess the level of knowledge of nurses toward the prevention of CAUTI workingin the ICU offederally administeredhospitals in Addis Ababa, Ethiopia 2021.

To assess the level ofpractice ofnurses towards the prevention of CAUTI working in theICU of federally administered hospitals in Addis Ababa, Ethiopia 2021.

To identify factors influencing nurses' knowledge towards the prevention of CAUTI working in theICU offederally administeredhospitals in Addis Ababa, Ethiopia 2021.

To identify factors affecting nurses' practice towards the prevention of CAUTI working in the ICU of federally administered hospitals in Addis Ababa, Ethiopia 2021.

4. METHODS AND MATERIALS

4.1. Study area and period

This study was conducted in federally administered hospitals of Addis Ababa city in the intensive care unit (ICU). Addis Ababa is the capital city of Ethiopia which is located in the central part of Ethiopia at 9° 1′ 48″ north and 38° 44′ 24″ east a total population of over 4,794,000, with an annual rate of 4.4% growth (from central statistics agency of Ethiopia) and geographical coverage of 540 km2. Addis Ababa is the seat of the African Union and the united nation world economic commission for Africa(34). There are five federal hospitals in Addis Ababa city; which are TikurAnbessa specialized hospital,Alert specialized hospital, St.Paulo's specialized hospital(including Aabet trauma center), St. Petros referral hospital, and Amanuel referral hospital

TikurAnbessa specialized hospital is located in theLideta sub-city and has a total of780 nurses. Currently, 52 nurses are workingin ICU.The Alert specialized hospital is located in theKolfeKeranio sub-city, which has 390 nurses, 27 are currently working in ICU.St.Paulo's specialize hospital is located in theGulele sub-city, which has 1080 nurses (including Aabet trauma center), currently, 88 are working in ICU.St. Petros referral hospital is located in theGulele sub-city, which has 192 nurses, 37 workingin ICU, and Amanuel referral hospital is located at Addis ketema sub-city but has no ICU units.So, the total number of nurses working in the ICU at the federally administered hospitalsis**204.**

The study was conducted between March 15- April 15/04/ 2021.

4.2. Study design

An institutional-based cross-sectional study wasconducted.

4.3. Population

4.3.1. Source population

All nurses whowere working at the federally administeredhospital in Addis Ababa city, Ethiopia.

4.3.2. Study population

All nurses whowere working in ICUat federally administered hospital Addis Ababa city, Ethiopia.

4.3.3. Sample population

All nurses whowere working in ICU at federal hospital AddisAbaba city that fulfill the inclusion criteria, Addis Ababa Ethiopia.

4.4. Inclusion criteria and exclusion criteria

4.4.1. Inclusion criteria

- Nurses who wereworking in the ICU of the federally administeredhospitalsin Addis Ababa during the data collection periodand hadat least 6 months' experience.

4.4.2. Exclusion criteria

- Those nurses who were students, retired, on sick or maternity leave, and who were on annual leave and hadless than 6 months' work experience.

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4.5. Variable of the study

4.5.1. Dependent variables

Knowledge of nurses and

Practice of nurses

4.5.2. Independent variable

Socio-demographic variables:

Age

Sex

Educational status

Level of experience

Marital status

Working department

Institutional factors:

Ongoing training

Presence of guideline/protocol

Handwashing facility

4.6. Sample size determination

The actual sample size for the study was determined by using single population proportion formula for single proportion population, $ni = \frac{(Za/2)^2 \, p(1-p)}{(d)^2}$

Where ni = Initial estimated sample size

Z = Confidence level (alpha, α)

P = prevalence

d = marginal error

To determine the sample size the following assumption was used.

The proportion of Nurses who had adequate knowledge and good practice on prevention of CAUTI taken from a previous related study conducted at Rwanda hospital which is 35.5% & 79.9% respectively(26), A 95% confidence level, and margin of error (0.05).

$ni\ (1) = \frac{(1.96)^2 \times 0.355\ (1-0.355)}{(0.05)^2} = 351.8 \approx \mathbf{352}$

$ni\ (2) = \frac{(1.96)^2 \times 0.799\ (1-0.79)}{(0.05)^2} = 246.7 \approx \mathbf{247}$

Therefore, nurses who had adequate knowledge on prevention of CAUTI (p=35.5%) was given large sample size. But my study population is small **204**, so I was used all participants for my study.

4.7. Sampling techniques

A census sampling was used.

4.8. Operational definition and definition of terms

Knowledge- In this study knowledge refers to the level of understanding of nurses regarding the prevention of catheter-associated urinary tract infection(26).

Good knowledge–eight knowledge questions with a total score ranging from 0-8 pointswas usedto evaluate the level of knowledge onthe prevention of CAUTI in ICU Nurses (n=184) and those who scored 71%from knowledge question and above have adequate knowledge(30).

Poor knowledge - those who scored below 71%on knowledge items (with a total score

ranging from 0-8 points)(30).

Practice A well establish the method or performance of legal procedures regardingurinary catheterization(31).

Good practice - Is the performance of nurses based on standard principles related to prevention of CAUTI who scored 79.9% from practice question and above from eighteen questions with a total score ranging from 0-18 points(26).

Poor practice - below the standards and scored less than 79.9% for selected practice items(26).

Nurses: Nurses are those people which provide fundamental care to the sick person(31).

Nursing: Nursing is an art and science of providing care to sick and injured persons(31).

Indwelling Catheter: Indwelling Catheter is the specific material device to drain out urine directly from the urinary bladder by placement inside the bladder(31).

Acute care setting: an area where the provision of care for critically ill patients(31).

4.9. Data collection tool and technique

A self-administered questioner was used for data collection. Which was adopted with some modification from the literature(26).It wasincluding**part** I: socio-demographic variables such as; age, gender, educational level, years of experience. **Part II**: contain questions that can measure the level of knowledge of nurses, **part III**: had questions that can measure the practice of nurses for the prevention of CAUTI**, part VI**: had questions on institutional factors that affect catheter insertion.

Four trained BSc nurses and two MSc nurseswere recruitedfor data collector and supervisor respectively and wereparticipate throughout the data collection, training was given for one day by the principal investigator about the instrument and data collection procedures. The purpose of the study, consent form, confidentiality issue, and informed consent was explained and ensured to all of the study subjects. Data collectors were supervised at each site every day. The principal investigator and the supervisors collect the filled questionnaire and were acheck for missed values and completeness on daily basis.

4.10. Data quality assurance

To ensure the validity and reliability of the data collection tool, a pre-test was done on 5% of the total sample size calculated on ICU nurses working at Yekatit 12 hospital two weeks before the actual data collection period, and some modifications were done according to the results found.To test the reliability of the questionnaire, Cronbach alpha was calculated after a test-retest by administering the questionnaire to 10 participants and the value was 0.77 that is in acceptable range. The collected datawas checked for its clarity, understandability, and simplicity.The filled questionnaire was presented to the principal investigator and checked for its completeness to assure the quality of data. Both the Principal investigator and recruited supervisors were responsible for supportive supervision on the spot and for reviewing all filled questionnaires on daily basis.

4.11. Data processing and analysis

The collected data was cleaned and checked for completeness and consistency before data entry. Responsesin each question were coded for the simplicity of data entry. The coded data were

entered into Epidata 4.6.0 and SPSS version 26.0 statistical software wasused for data analysis. In the first step, thedescriptive analysis like; percentages, frequency distribution,measures of centraltendency, and standard deviationwascomputed. Descriptive and inferential statistics like Pearson chi-square and Fischer exact test were used for the data analysis and testing relationship among the independent versus dependent variables.Pearson chi-square was used when the expected frequency for each cell in the association was greater than five while Fisher's exact test was used when each cell in the association of variables had an expected frequency equal to or less than five.Since failure of passed logistic regression analysis. The $p < 0.05$ cutoff point was considered as statistically associated for all the independent variables. Then the result was presented with text, graphs,figures, and tables.

4.12. Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board of Addis Ababa University, College of health sciences, and departments of emergency medicine. Approval for the study area was applied from Addis Ababa University, College of health science. Informed consent wasobtained from participants who weresigned to fill the questionnaires were allowed to do so. A letter of permission was secured from administrative bodies of the hospitals to communicate with relevant bodies in the health institutions. All of the study participants were informed about the purpose of the study, about their right to participate or to terminate at any time if they want and respondents were ensured about the confidentiality of information obtained. The beneficence and anonymity of the participants were maintained throughout the study.

4.13. Dissemination of results

The findings of this study will be presented and submitted to the Department of emergencymedicine, College of Health Sciences, Addis Ababa University, as well as those federally administered hospitals. It will be presented in different seminars, conferences, workshops, and attempts will also be made for presentation in the National / International Science of the conference and publication in a peer-reviewed journal.

5. RESULTS

5.1. Socio-demographic characteristics

The total number of ICU nurses working in federally administered hospitals of Addis Ababa was 204. Only 184 nurses were participated in the study with 20 missing due to different reasons like maternity leave, sick leave, annual leave. Witha response rate of 90.2%(N=184).

Table 5.1; shows the demographic characteristics of respondents. The mean age of the participantswas29.07 and the standard deviation of ± 4.78. The majority of the respondent's113 (61.4%) age group were between 20-29 years old, while 61 (33.2) were 30-39 years old, the remaining 10 (5.4%) were above 40 years. More than half of the respondents were female 98 (53.3%) and the rest of the respondents were male 86 (46.7%).

Nearly three-fourths of the participants have 137 (74.5%) Bachler of Science (BSc) degrees, while 44 (23.9%) havea master of science and the rest 3 (1.6%) havea diploma. Half of the participants 92 (50%) have 1-5 years' experiencefollowed by 53 (28.8%) have 6-10 years' experience,16 (8.7%) have 11-15 years,14 (7.6%) have less than 1 years,6 (3.3%) of them have 16-20 years, andthose who haveabove 20 years' experience were 3 (1.6%).

More than half of the participants 95 (51.6%) were married, 83(45.1%) were single and the remaining 6 (3.3%) were divorced. Sixty-six (35.9%) of the participants were in pediatric ICU, 61 (33.1%) were in adult surgical ICU and the rest 57(31%) were in adult medical ICU.

Table 5.1: Socio-demographic characteristics of ICU Nurses working in federally administered hospitals (N= 184)

Variable	Frequency(percentage) F (%)
Sex	
Male	86 (46.7%)
Female	98 (53.3%)
Age (mean**= 29.07** and SD=± **4.78**)	
20-29 years	113 (61.4%)
30-39 years	61 (33.2%)
>40 years	10 (5.4%)
Level of education/Qualification	
Diploma	3(1.6%)
Degree in Bachler Science (BSc)	137 (74.5%)
Master of Science (MSc)	44 (23.9%)
Professional experience	
Less than 1 year	14 (7.6%)
1 to 5 years	92 (50%)
6 to 10 years	53 (28.8%)
More than 10 years	25 (13.6%)
Marital status	
Single	83 (45.1%)
Married	95 (51.6%)
Divorced	6 (3.3%)

Current working department	
Adult medical ICU	57 (31.0%)
Adult surgical ICU	61 (33.2%)
Pediatrics ICU	66 (35.8%)

5.2 Knowledge of ICU nurses on the prevention of CAUTI

To assess the knowledge of ICU nurses towards the prevention of CAUTI, eight multiple-choice questions (8 MCQs) were administered; where only one assertion was correct and given a score of 1 mark if chosen and 0 if not chosen.The respondents who have good knowledge when they answered 6-8 knowledge questions correctly, while the respondents have poor knowledge when they answered 0-5 knowledge questions correctly.

Figure 5.1; shows that the level of knowledge of ICU nurses towards the prevention of CAUTI, nearly two-thirds of the respondents 116 (63.04%) had a poor level of knowledge, the rest of the respondents 68 (36.96%) had a good level of knowledge.

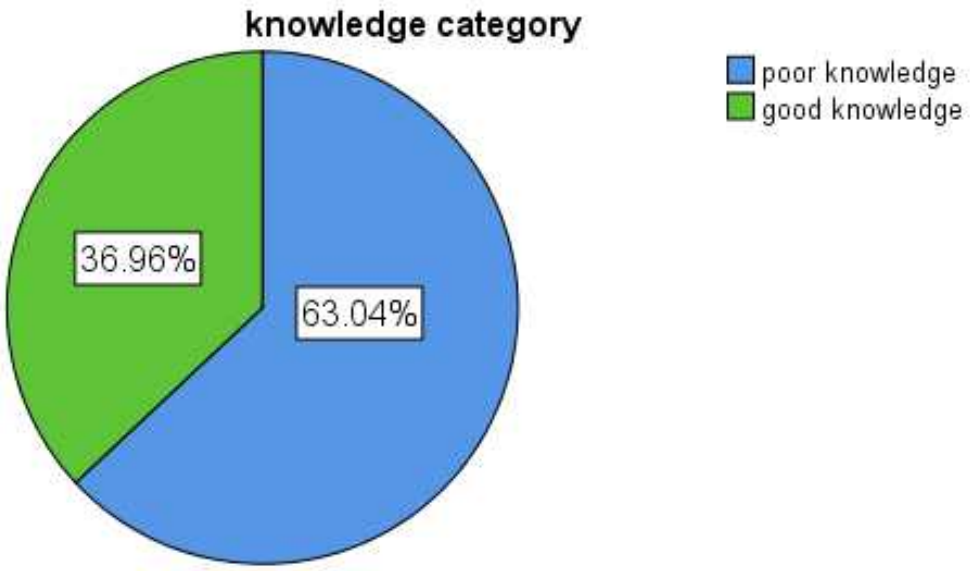

Figure 5.1; Levels of knowledge of ICU nurses toward the prevention CAUTI in federally administered hospitals (N=184)

Table 5.2; describesthe distribution and percentage of respondents based on their correct score to different knowledge questions of ICU nurses toward prevention of CAUTI. Most of the respondents 123 (71.7%) correctly answer urinary catheter insertion method using aseptic

technique with sterile equipment, similarly nearly two-thirds of the respondents 116 (63%) answeredan appropriate indication for indwelling urinary catheterization.

Two-thirds of the respondents 123 (66.8%)knew the CDC guidelines for the prevention of CAUTI which advise that the catheter should be removed within 24 hours in postoperative patients, additionally, 121(65.8%) respondents properly identify that when aurinary catheter was obstructed changing the catheter immediately must bethe next steps. More than half of the respondents 99 (53.8%) correctly identify that to prevent infections from urinary catheters changing the urinary catheters or drainage bags must be performed at routine and fixed intervals, while 107 (58.2%) of the respondentsidentify that prolonged time of catheterizationwas a risk factor for CAUTI.

More than two-thirds of respondents 124 (67.4%) knew that elderly patients of more than 65 years and women were at high risks for developing CAUTI and the majority of the participants 129 (70.1%) knew that hypertension was not a complication of CAUTI.

Table 5.2; Frequency distribution of respondents based on their correct score to different knowledge questions of ICU nurses toward prevention of CAUTI (N=184).

Knowledge variable	**Yes %**	**No %**
Which is not an appropriate indication for indwelling urinary catheterization?		
Inserting catheter for identifying the color of urine	116 (63%)	68 (37%)
Which one of the following is the proper method used for an indwelling urinary catheter?		
Using aseptic technique with sterile equipment	132 (71.7%)	52 (28.35)
Based on CDC 2015 Guidelines for the prevention of Catheter-associated urinary tract infection, operative patients who have been catheterized, it is advised to remove the catheter as soon as possible postoperatively, preferably within ……		
24 hours	123 (66.8%)	61(33.2%)
As a nurse in a critical care unit, you find that the indwelling urinary catheter is obstructed during your patient assessment, what will be the next steps?		
Change the catheter immediately	121 (65.8%)	63(34.2%)
One of the following is not a nursing achievement to prevent infections from urinary catheters?		
Changing the urinary catheters or drainage bags only at routine and fixed intervals	99 (53.8%)	85 (46.2%)
Which one among the following is a risk factor for CAUTI?		

Prolonged time of catheterization	107 (58.2%)	77 (41.8%)
Among the following category, which patient is at high risk for developing CAUTI?		
Elderly patients of more than 65 years and women	124 (67.4%)	60 (32.6%)
All the following are complications of CAUTI except		
Hypertension	129 (70.1%)	55 (29.9%)

5.3. The practice of ICU nurses towards the prevention of CAUTI

To assess the practice of ICU nurses towards the prevention of CAUTI, eighteen Yes/No questions (18 Yes/No) were administered; where a score of 1 mark foryes and 0 forno. The respondents who have good practice when they answered 15-18 practice questions correctly, while the respondents have poor practice when they answered 0-14 practice questions correctly.

Figure 5.3; shows the level of practice towards the prevention of CAUTI, more than half of the respondents 96 (52.17%) had a good level of practice, while 88 (47.83%) had a poor level of practice.

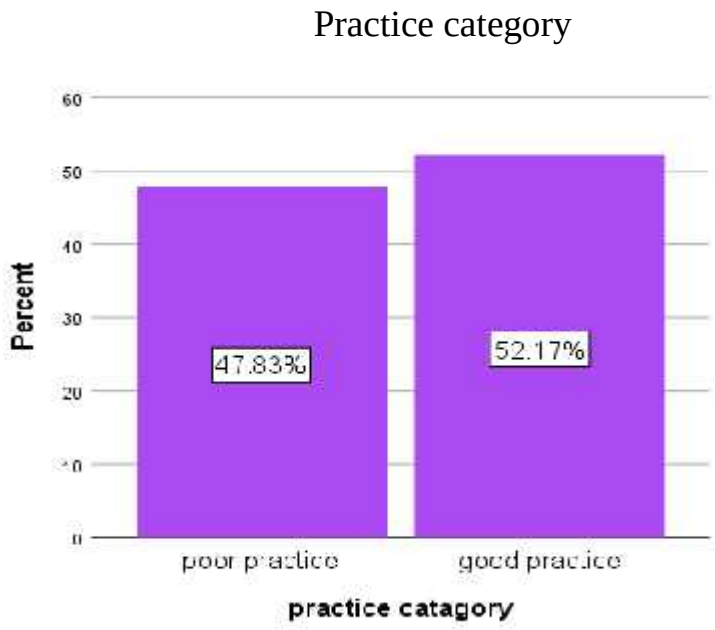

Figure 5.2; levels of practice of ICU nurses toward the Prevention CAUTI in federally administered hospitals (N=184).

Table 5.3; showsthe distribution and percentage of respondents based on their correct score to different practices question of ICU nurses toward the prevention of CAUTI. Around two-thirds of the respondents, 116 (63%) had done handwashing before catheter insertion while less than four-fifths of the respondents 145 (78.8%) had done handwashing before and after catheter insertion for CAUTI prevention.

The majority of the respondents 155 (84.2%) used an aseptic technique and 150 (81.5%) used sterile equipment like sterile gloves, drapes, sponges, and solution while doing catheterization. The majority of the respondents 158 (85.9%) always kept the collecting bag below the bladder, 152 (82.6%) kept the catheter and collecting tube free from kinking, and 130 (70.7%) maintained the closed system all the time while doing routine catheter care. However, nearly all the respondents 173 (94%) used a syringe on the catheter to deflate the balloon and 98 (53.3%) used to record the date while doing catheter removal.

Table 5.3; Frequency distribution of respondents based on their correct score to different practices question of ICU nurses toward the prevention of CAUTI (N=184).

Variables	Frequency (%)	
	Yes (%)	No (%)
when do you perform hand hygiene?		
Handwashing before and after catheter insertion	145 (78.8%)	39 (21.2%)
Handwashing before catheter manipulation	116 (63%)	68 (37%)
Hand washing after catheter insertion	150 (81.5%)	34(18.5%)
Do you use the following while doing catheterization?		
Use sterile equipment like sterile gloves, drape, sponges	168 (91.3%)	16 (8.7%)
Use an aseptic technique to insert the catheter	155 (84.2%)	29(15.8%)
Clean the urethra meatus with an antiseptic solution	135 (73.4%)	49 (26.6%)
Use a single packed lubricant jelly	126 (68.5%)	58 (31.5%)
Secure indwelling catheter properly after insertion to prevent movement and urethral traction	139 (75.5%)	45 (24.5%)
Being familiar with the use of catheter alternatives like condom or adsorbent pads	135 (73.4%)	49 (26.6%)
Do you do the following while routine catheter care?		
Keep the catheter and collecting tube free from kinking	152 (82.6%)	32 (17.4%)
Always keep the collecting bag below the bladder	158 (85.9%)	26 (14.1%)
Empty the collecting bag regularly and use separate, clean urine collecting jug for each patient	131 (71.2%)	53 (28.8%)
Maintain the closed system all the time	130 (70.7%)	54 (29.3%)
Use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system	153 (83.2%)	31 (16.8%)

Do you use the appropriate techniques for catheter removal?		
Protect yourself during catheter removal	161 (87.5%)	23 (12.5%)
Use a syringe on the catheter to deflate the balloon	173 (94%)	11 (6%)
Use release technique any catheter fixation devices easy removal	127 (69%)	57 (31%)
Removed date recorded	98 (53.3%)	86 (46.7%)

5.4 Institutional factors on knowledge and practice of ICU nurses on the prevention of CAUTI.

Table 5.4; shows the frequency distribution of institutional factors that affect the knowledge and practice of ICU nurses towards the prevention of CAUTI. More than half of the respondents 95 (51.6%) had guidelines/protocols in their institution for the insertion of a urinary catheter but 113 (61.4%) of respondents didn't get proper on job training about urinary catheterization.Only less than two-fifth of the respondents 71 (38.4%) have goton job training.More than half of the respondents 102 (55.4%) had a handwashing facility in their institution (soap, water, Antiseptic), whereasonly 100 (54.3%) of the participants had enough supplies of their institution (like a lubricant, solution for cleansing, sterile drapes).

Table 5.4; frequency distribution of institutional factors that affect knowledge and practice of ICU nurses on the prevention of catheter-associated urinary tract infection.

Variables (factors)	frequency (%)	
	Yes	No
Do you have guidelines for the proper insertion of a foley catheter?	95 (51.6%)	89 (48.4%)
Have you ever got on job training about catheterization?	71 (38.6%)	113 (61.4%)
Do you have enough supply for catheterization at your institution?	100 (54.3%)	84 (45.7%)
Do you have a handwashing facility in your work area?	102 (55.4%)	82 (44,6%)

5.5 Factors that affect nurses' knowledge and practice towards the prevention of CAUTI

5.5.1. Association between demographic characteristics and institutional factors with nurse's knowledge towards the prevention of CAUTI.

Table 5.5; summarizes the associationbetween socio-demographic characteristics and knowledge level of the respondents, and also the institutional factors and knowledge level of the respondents. The Pearson chi-square and Fischer exact test were used to assess the association. Pearson chi-square was used when the expected frequency for each cell in the association was greater than five while Fisher's exact test was used when each cell in the association of variables had an expected frequency equal to or less than five.

From demographic characteristics,only professional experiences showed that there is statistically association between the knowledge level of respondents with P-value=0.031, while other demographic characteristics (age, level of educations, current working department) revealed that there is nostatistical association to the respondent's knowledge with p values = 0.163, 0.204 and 0.317 respectively. Similarly, the institutional factors (guidelines, training, and handwashing facility) showed that there is no statistical association between the respondent's knowledgewith p-value >0.05.

Table 5.5, the association between demographic characteristics, institutional factors, and nurse's knowledge towards the prevention of CAUTI

Demographic variable and institutional factors	**Number of respondents (N=184)**					
	Effect of demographic and institutional factors on respondents' knowledge.					
	Knowledge level					
	Good knowledge		**Poor knowledge**		**Test used**	**p-value**
Sex of respondents	**N**	**%**	**N**	**%**	**Pearson chi-square test**	0.542
Male	34	39.5	52	60.5		
Female	34	34.7	64	65.3		
Age category					**Fischer exact test**	0.163
20-29 years	37	32.7	76	67.3		
30-39 years	25	41.0	36	59.0		
40-49 years	6	60.0	4	40.0		
Level of education					**Fischer exact test**	0.204
Diploma	0	0.0	3	100.0		
BSc	48	35.0	89	65.0		
MSc	20	45.5	24	54.5		
Professional experience					**Fischer exact test**	**0.031**
Less than 1 year	3	21.4	11	78.6		
1-5 years	27	29.3	65	70.7		
6-10 years	24	45.3	29	54.7		
11-15 years	8	50.0	8	50.0		
16-20 years	3	50.0	3	50.0		
Above 21 years	3	100.0	0	0.0		
Marital status					**Fischer exact test**	0.186
Single	26	31.3	57	68.7		
Married	41	43.2	54	56.8		
Divorced	1	16.7	5	83.3		
Current working dept.					**Pearson chi-square test**	0.317
Adult medical ICU	18	31.6	39	68.4		
Adult surgical ICU	21	34.4	40	65.6		
Pediatric ICU	29	43.9	37	56.1		
Do you have guidelines for proper insertion of catheter?					**Pearson chi-square test**	1.000
Yes	35	36.8	60	63.2		
No	33	37.1	56	62.9		
Have you ever got on job					**Pearson chi-**	0.211

training about catheterization?					**square**	
Yes	22	31.0	49	69.0	**Test**	
No	46	40.7	67	59.3		
Do you have enough supply for catheterization?					**Pearson chi-square test**	0.878
Yes	36	36.0	64	64.0		
No	32	38.1	52	61.9		
Do you have a handwashing facility?					**Pearson chi-square test**	0.284
Yes	34	33.3	68	66.7		
No	34	41.5	48	58.5		

P-value is significant if it is p <0.05

5.5.2. Association betweendemographic characteristics and institutional factors with nurse's practice towards the prevention of CAUTI

Table 5.6; shows the association between socio-demographic characteristics and practice level of respondents, and also the association between the institutional factors and the practice level of the respondents. The Pearson chi-square and Fischer exact test were used to assess the association. From the table below the result shows that there is no statistical association between the demographic characteristics (age, sex, level of education, professional experience, and marital status) and practice level of the respondents, as well as there is no statistical association between the institutional factors (guidelines, training…) and the practice level of the respondents. Since the p-value of the variables is above 0.05.

Table 5.6; the association between demographic characteristics, institutional factors, and nurse's practice towards the prevention of CAUTI

Demographic variable and institutional factors	Number of respondents (N=184)					
	Effect of demographic and institutional factors on respondents' practice.					
	practice level					
	Good practice		Poor practice		Test used	p-value
Sex of respondents	**N**	**%**	**N**	**%**	**Pearson chi-squaretest**	0.239
Male	49	57.0	37	43.0		
Female	47	48.0	51	52.0		
Age category					**Fischer exact Test**	0.680
20-29 years	56	49.6	57	50.4		
30-39 years	34	55.7	27	44.3		
40-49 years	4	40.0	6	60.0		
Level of education					**Fischer exact Test**	0.505
Diploma	2	66.7	1	33.3		
BSc	68	49.6	69	50.4		
MSc	26	59.1	18	40.9		
Professional experience					**Fischer exact Test**	0.700
Less than 1 year	6	42.9	8	57.1		
1-5 years	47	51.1	45	48.9		
6-10 years	29	54.7	24	45.3		
11-15 years	8	50.0	8	50.0		
16-20 years	3	50.0	3	50.0		
Above 21 years	3	100.0	0	0.0		
Marital status					**Fischer exact Test**	0.337
Single	43	51.8	40	48.2		
Married	48	50.5	47	49.5		
Divorced	5	83.3	1	16.7		
Current working dept.					**Pearson chi-squaretest**	0.807
Adult medical ICU	29	50.9	28	49.1		
Adult surgical ICU	34	55.7	27	44.3		
Pediatrics ICU	33	50.0	33	50.0		
Do you have guidelines for proper insertion of catheter					**Pearson chi-square test**	0.076
Yes	56	68.9	39	41.1		
No	40	44.9	49	55.1		
Have you ever got on job training about catheterization?					**Pearson chi-square**	0.449
Yes	40	56.3	31	43.7	**Test**	
No	56	49.6	57	50.4		

Do you have enough supply for catheterization?					**Pearson chi-square test**	0.100
Yes	52	52.0	48	48.0		
No	44	52.4	40	47.6		
Do you have a handwashing facility?					**Pearson chi-square test**	0.300
Yes	57	55.9	45	44.1		
No	39	47.6	43	52.4		

P-value is significant if it is p <0.05

Table 5.7; shows the correlation between nurses' levels of knowledge and practice toward the prevention of CAUTI. Regarding the association between nurses' level of knowledge and practices toward CAUTI prevention, it was observed that there was no statistical association between nurses' knowledge and practice toward CAUTI prevention with a p-value= 0.450.

Table 5.7; Correlation between Nurses' Levels of Knowledge and Practice toward Prevention of CAUTI.

Level of nurse's knowledge and Practice correlation		
		Level of Practice
Level of Knowledge	**Spearman correlation**	**0.057**
	p-value	**0.450**

All the variables were not associated with the knowledge and practice of nurses except work experience of the respondents and also knowledge level of the respondents and the practice level were not statistically associated. So, I recommend that further longitudinal study, large sample size will be done.

6. DISCUSSION

In recent years, many efforts have to be done to determining effective strategies to reduce indwelling urinary catheter (IUC) utilization and prevention of its associated complication. Most of these interventions help to change the behaviors of nurses towards the prevention of CAUTI and limiting unnecessary use of IUC(2). The aim of the current study was to assess the knowledge and practice of ICU nurses towards the prevention of CAUTI.

6.1. Socio-demographic variables of the respondents

As the current study showed that, more than half of the respondents 98(53.3%) were females. This isrelatively congruent with the study done in Egypt revealed that nearly two-thirds55.6% were females(3), similarly, thestudydone in Rwanda shows that more than half of the respondents55% were females(26). While this study ishigher thana study done in the Philippines at Iloilo city in 2014 among ICU nurses less than half of (43.3%) were females(16). This might be related to the high ratio of female nurses comparing male nurses. The current study revealed that the majority of the respondents 113(61.4%) were age group from 20-29 years old. This is opposed to a study done at Pakistan, Lahore hospital in 2017,40.4% of respondents was age group between 20-30 years old(31), and also a studydone in Rwanda 24.5% of respondents were at age group 20-29 years(26).This might be due to most of the ICUs have nurses in the younger age groups and they are likely to read more and productive.

In this study, nearly three-fourths of the respondents 137 (74.5%) had a Bachler of Science degree (BSc). This is in line with a study conducted in the Philippines at Iloilo city in 2014 found that among ICU nurses75.7% were holding a bachelor's degree(16),this consistency might be explained by the fact that most ICUs need nurses with a higher level of educational qualification. But contrary to this study conducted in Rwanda selected referral hospitals only17% had Bachler of Science (BSc) in degree(26).Thisdiscrepancy might be due tothe selection of the study area.

In the current study half of the respondents, 92 (50%) had 1-5 years of work experience. This study is contradicted with astudy done in Egyptthat showed 19.1% were 1-5 years of experience(3). This might be nurses relatively stay longer time because of thinking some risk allowance in their working department.

6.2. Nurses' knowledge towards the prevention of CAUTI

Most nurses in this study had a poor level of knowledge 116 (63.04%) and only 68 (36.96%) had a good level of knowledge for the prevention of CAUTI. This result is relatively higher thana study done in the Philippines at Iloilo city in 2014,30% had a good knowledge (16). This might be due to the sample size difference since the previous study had a lower sample size (n=30). This study is in linewith a studyconducted by Purbia, et alin India showed that 36.12% of nurses have adequate knowledge(6),Similarly,a survey was done in Egypt revealed that 37.23% and a study done in Rwanda showed that 35.48% of nurses had a good level of knowledge(3), The possible reason for the inline of above studiesdue to the same working facilities and equipment's. While this study is contradicted with a study done in Pakistan at public hospitals in Lahore reported that the majority of participants 51.87% were having a good knowledge (17). Similarly, a study was done in Iran among ICU nurses revealed that 57% had agood knowledge about the prevention of CAUTI(28).This discrepancymay be due to the educational status of the participants and the limitation of adequate training related to the prevention of CAUTI.

Specifically in this study, the majority of nurses 132 (71.7%) had a good knowledge ofthe proper insertion method for an indwelling urinary catheter using aseptic techniques and using sterile equipment. This result is similar to a studydone by shehzadi et al. 2018who found that 72.5% of respondents had a good knowledge of the proper insertion methods for an indwelling urinary catheter using aseptic techniques and using sterile equipment(17). But this finding is lower thana study done by Mukakamanzi.J in 2017, which found that 100% of ICU nurses identify the proper insertion methods for an indwelling urinary catheter using aseptic techniques and sterile equipment(26).This may be due to the fact that different settings, types of service delivery, level of training ofnurses, and availability of the resource. In this study nearly two-thirds 123 (66.8%) of the respondents applied CDC 2015 guideline for the prevention of CAUTI, for operated patients who have been catheterized, it is advised to remove the catheter as soon as possible postoperatively, preferably within 24 hours. This study is nearly congruent with a study done by shehzadi et al. 2018, which found that 65.4% of respondents applied CDC 2015 guidelinesfor the prevention of CAUTI, for operated patients to remove the catheter as soon as possible postoperatively, preferably within 24 hours(26). In the current study more than half 107 (58.2%) of respondents knew the risk factor for developing CAUTI is a prolonged time

of catheterization. This study is nearly similar to a study was done in Rwanda by mukakamanzi. J showed that60.2% knew the risk factor for developing CAUTI is a prolonged time of catheterization. In the current study slightly more than two-thirds 124 (67.4%) respondents understood patient is at high risk for developing CAUTI were elderly patients of more than 65 years and women. This result is in linewitha study was done in Rwanda by mukakamanzi. J revealed that 67.2% of respondents understood patient is at high risk for developing CAUTI were elderly patients of more than 65 years and women(26). This might be due to the same study subjects and study setups (ICU).

6.2. Nurses' practice towards the prevention of CAUTI

In the current study, more than half 96 (52.2%) of the respondents had a good level of practice in the prevention of CAUTI. This result is slightly higher than a study conducted in Pakistan showed that 49% of the respondents had a good level of practice for the prevention of CAUTI(31). This might be due to the educational status of the participants, in which the present study participant had more of a Bachler's Science Degree. While this result is lower thana study conducted in Rwanda ICU nurses showed that the majority of nurses 79.9% had a good level of practice for the prevention of CAUTI(26). This discrepancy might be due to tool differences and supplies. But a cross-sectionalstudydone in the Philippines revealed that one-thirds 33.3% of the respondents had a good level of practice(16),and a study was conducted in Egypt revealed that16.1% of respondents had agood level of practice for the prevention of CAUTI(3), this is contradicted from the current study. This discrepancy might be fact thatthe difference in the study setting and sample size since the previous study had a lower sample size (n=30 and 137) respectively.

Regarding handwashing more than three-fourth of 145 (78.8%) ofICU nurses performed handwashing before and after catheterization, while 116 (63%) performed hand washing before catheterization, and 150 (81.5%) performed handwashing after catheterization. This study is nearly consistent with the study done in Iran revealed that 80% had a good practice on handwashing after catheterization in the prevention of CAUTI(28). Similarly, a study done in Zambia revealed that a higher number of participants 75.4% had a good practice of handwashing before and after catheterization(32).This might be consistent due to the presence of handwashing facilities in their working areas.

In this study,155(84.2%) of the respondents used an aseptic technique to insert the catheter to prevent CAUTI. This result is nearly consistent with a study done in India, 2018 by Cutinho et al, found that 85.4% had a good practice of used aseptic technique to insert a catheter(6),But the current study slightly lower thana study was done in Rwanda 2018, almost all (98.1%) of respondents used aseptic technique to catheterization(26). This might be due to differences in the availability of the necessary equipment and supplies for the maintaining of the aseptic technique.

The current study shows,nearly three-fourths 135 (73.4%) of the ICU nurses are cleaning the urethra meatus with an antiseptic solution before catheterization for the prevention of CAUTI. This study iscontradicted with a study done in the Philippines at Iloilo city in 2014 revealed that 3.3% had a good practice in cleaning the urethra with an antiseptic solution before inserting the catheter(16). This might be the fact that the sample size difference since the current study had a higher sample size (n=184). In the current study, slightly less than two-thirds126 (68.5%) of the respondents used a single-packed lubricant jelly for insertion of the urinary catheter. This study is nearly similar toa study done in Rwanda in 2018 by Mukakamanzi.J found that more than half 64.2% of nurses had a good practice on using single-packed lubricant jelly for the insertion of a urinary catheter(26). In this study most 158 (85.9%) of respondents keepingthe collecting urine bag below the bladder to prevent CAUTI. This is nearly similar to a study conducted in Rwanda that showed 90% of respondents keeping the collecting bag below the bladder(26). This study shows that more than two-fourths130 (70.7%) of therespondents maintained a closed drainage systemat all times to prevent CAUTI. This study is slightly lower than a studydone in Pakistan revealed that most 94.7% of nurses(6), and a study conducted in Rwanda found that almost all 98.1% of the nurses had a good level of practice on maintained a closed drainage system at all time for CAUTI prevention(26). This discrepancy might be due to differences in training and tools (equipment).

6.4. Institutional factors of the respondents

In the current study, nearly half 95 (51.6%) of the respondents had guidelines/protocols for proper insertion of a foley catheter. While more than one-third of71 (38.6%) of the respondentshave goton job training about catheterization. However, more than half 100 (54.3%)

of the respondents had enough supply(like a lubricant, solution for cleansing, sterile drapes), and 102 (55.4%) of the respondents had a handwashing facility (soap, water, Antiseptic) in their work area. This study is nearly consistent with the study done in Pakistan at public hospitals in Lahore found that 54.4% of the respondents applied guidelines/protocols for the prevention of CAUTI,and 30.7% of the respondents have got training about catheterization(17).The possible reason for the consistency of the above study might be the same study setting and study subjects. While the study conducted in Egypt reported that the majority of nurses (91.2%) got a training program on urinary catheterization(3), and a study conducted in Rwanda showed that more than three-fourths 79.2% of the respondents got training on urinary catheterization for the reduction of CAUTI(26), this study is contradicted with the result observed in this study.This discrepancy might bedue to the difference in institutional capability and resource limitation.

6.5. Association between nurse's knowledge, practice, socio-demographic variable, and institutional factors:

In this study, the result shows that the association between nurses' level of knowledge with a level of practice is not statistically associatedwith a p-value=0.450. This study isinagreement with a study done in Pakistan at a private hospital Iloilo city(16) and a study done in Egypt showed that there was no statistical association betweennurse's level of knowledge with the level of practice(3). This agreement might be due to the level of nurse's knowledge and practice were very poor.

In the current study, the result showed that there is a statistical association between professional experience and knowledge level of the respondents with p-value= 0.031. This study is in line with a study conducted in Pakistan 2019 by Ghauri et al showed that the professional experiences of nurses were statistically associated with the knowledge level of respondents (p-value<0.05)(33). Thissimilarity mightbe due to work experience increases the level of knowledge also increases for the prevention of CAUTI. In this study, other socio-demographic factors (age, sex, level of education, marital status) and institutional factors (training, guideline) were not statistically associated withthe knowledge and practice level of the respondents (p-value >0.05).This study is similarto a study conducted in Pakistan 2019by Ghauri et al showed that age, educational level, and gender were notstatistically associated withthe knowledge and

practice of nurses (p-value >0.05)(33).A similar study conducted in Egypt showed that there was no statistical association between nurses' knowledge and practice with gender, education level, and training (P > 0.05)(3),a study done in Rwanda revealed that there was no statistical association between demographic characteristics (age, sex, level of education), training and knowledge and practice of nurses (p> 0.05)(26), and a study conducted in Kenya showed that no statistical association was observed between the nurses' knowledge and practice on training about urinary catheterization for the prevention of CAUTI (p>0.05)(30).

This study is contradicted with a study conducted in Iran that revealed there was no statistical association between professional experienceandknowledgeofnurses (p>0.05)(28). This discrepancy might be the fact that professional experiences increment acquired different knowledge and experience sharing for the prevention of CAUTI. Thus, the study concluded that there is no impact of socio-demographic characteristics (except professional experience) and institutional factors on nurse's knowledge and practice towards the prevention of CAUTI as the (p>0.05) for all the results.

7.STRENGTH AND LIMITATION

7.1.Strength of the study

- It is the first study that attempts to assess the level of knowledge and practice of ICU nurses towards the prevention of CAUTI in federally administered hospitals in Addis Ababa, Ethiopia.
- It is a multicenter study

7.2. Limitation of the study

- The study did not observe the actual practices of ICU nurse's catheter insertion and the prevention of CAUTI in the patient but relied on the self-administered questionaries by the respondents.

- The study was limited to federally administered hospitals in Addis Ababa only. It would have been possible to assess differences between regional and federal hospital nurses' experiences as well as among different federal hospital nurses.
- Finally, the studywas a cross-sectional study and can reflect the experience of nurses at the time of assessment, and therefore, a causal relationship cannot be established between knowledge, practice, and its predictors.

8. CONCLUSION AND RECOMMENDATION

8.1. Conclusion

One of the most hospital-associated infections is CAUTI. It is mostly preventable if proper indication, aseptic insertion, good maintenance of the catheter, and other preventative measures are carefully followed.According to the current study, there was poor knowledge and poor practice for the prevention of CAUTT among ICU nurses in federally administered hospitals of Addis Ababa. There isa statistical association between nurses' knowledge and professional experiences. While there is no statistical association betweenknowledge levels of nurses and socio-demographic characteristics, knowledge levels of nurses, and institutional factors. Similarly, there are no statistically associated practice levels of nurses and socio-demographic characteristics, practice levels of nurses, and institutional factors.

8.2. Recommendation

Based on the finding of this study, the following are recommended:

To thefederal ministry of health bureau; by considering this study result, there should be recruited experienced nurses, developed national guidelines, and protocols for the prevention and treatment of CAUTI.

To federally administered hospitalsauthorities; give high priorities by establishing policies, protocols, special training, and refreshment programs on urinary catheter indications and CAUTI prevention measures.

To all ICU nurses; update their knowledge and practice regarding the prevention of CAUTI through continuous professional development, regular on the job training, education, sharing information with their respective colleagues, and online reading. Nurses should be followed guidelines, protocols, and standards for catheter insertion.

To researchers;further studies may be needed to investigate the factors affecting nurses' knowledge and practice towards the prevention of CAUTI by increasing the sample size.

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ANNEXES

Annex I: Consent form

Hello! Good morning/afternoon? My name is ---------- I am here today to collect data on the assessment of the knowledge and practice of nurses towards the prevention of catheter-associated urinary tract infection working in the intensive care unit of federally administered hospitals in Addis Ababa. The objective of this questionnaire was to assess theknowledge and practice of nurses working in the intensive care unit of federally administered hospitals in Addis Ababa. Your correct and genuine response or answer to the questions can make the study achieve its goal. Therefore, you are kindly requested to respond very voluntarily with patience. The questionnaire may take 10 to 15 minutes. We assure you that this study is surely confidential, thus writing your name is not needed.

Are you willing to participate in answering the questionnaire?

Yes! Go to the next page.

No! Thank them and interrupt to take a response.

Sign of the participant ……

Name of the investigator: Tilahun Teshager

Address of investigator: 0931967923

Email:tilish22@gmail.com

Annex II. Questionnaire

General instruction: This questionnaire is divided into 4 sections. Part I is related to your personal data. Part II is your knowledge about the prevention of Catheter-Associated Urinary Tract Infections (CAUTI). Part III is your practice regarding the prevention of CAUTI. part IV is your factor that affects catheterization.

Instructions: Read each question carefully and tick (√) the option that best suits your response.

Part I: Socio-demographic data

Q101. Gender male ☐ Female ☐

Q102. Age in complete years ----------

Q103. Level of education/ Qualification

1. Diploma ☐
2. Degree in bachelor science (BSc) ☐
3. Master of Science in degree (MSc) ☐

Q104. Professional experience

1. Less than 1 year ☐
2. 1-5 years ☐
3. 6-10 years ☐
4. 11-15 years ☐
5. 16-20 years ☐
6. Above 21 years ☐

Q105. Marital status

1. Single ☐
2. Married ☐
3. Divorced ☐
4. Widowed ☐

Q106. Current working department ☐ ☐

1. Adult medical ICU
2. Adult surgical ICU
3. Pediatric ICU

Part II: Knowledge of nurses on urinary catheter indications and catheter-associated urinary tract infection (CAUTI) prevention.

Instruction: Please read the statement carefully and circle the most correct answer.

Q201. Which is **not**anappropriate indication for indwelling urinarycatheterization?

a. Acute urinary retention and bladder obstruction.

b. Inserting catheter for identifying the color of urine.

c. Need for accurate measurements of urine output in patients who are severely ill.

d. To ensure comfort for end-of-life care.

Q202. Which one of the following is the proper method used for an indwelling urinarycatheter?

a. Using clean technique with clean equipment.

b. Using clean technique with sterile equipment

c. Using aseptic technique with sterile equipment

d. Using aseptic technique with clean materials

Q203. Based on CDC 2015 Guidelines for the prevention of Catheter-associated urinary tract infection,operative patients who have been catheterized, it is advised to remove the catheter as soon as possible postoperatively, preferably within …….

a. 24 hours

b. 6 hours

c. 36 hours

d. 12 hours

Q204. As a nurse in a critical care unit, you find that the indwelling urinary catheter is obstructedduring your patient assessment, what will be the next steps?

a. Change the catheter immediately

b. Notify the physician

c. Clamping indwelling catheters and wait for the physician order

d. Perform instillation of antiseptic or antimicrobial solutions into a urinary drainage bag.

Q205. One of the following is **not** a nursing achievement to prevent infections from urinary catheters?

a. Maintain continuous urine flow.

b. Changing the urinary catheters or drainage bags only at routine and fixed intervals

c. Keep the collecting bag under the level of the bladder at all times.

d. Empty the collecting bag regularly using a separate, clean collecting container for each patient.

Q206. Which one among the following is a risk factor for CAUTI?

a. Prolonged immobility

b. Using aseptic techniques during catheter insertion

c. Prolonged time of catheterization

d. None of the above

Q207. Among the following category, which patient is at high risk for developingCAUTI?

a. Children less than12 years old

b. young adult between 18-25 years old

c. adult patients of 30-50 years old

d. Elderly patients of more than 65 years and women

Q208. All the following are complications of CAUTI **excep**t:

a. Death

b. Sepsis

c. Hypertension

d. Hemorrhage

Part III:Checklist to assess the Practice of Emergency and ICU nurses towards CAUTIprevention

Instruction: Please read the statement carefully and put an √ in the box that most closely reflects your answer to the following questions.

Elements performed by nurses to prevent CAUTI	YES (1)	NO (0)
when do you perform hand hygiene?		
1. Handwashing before and after catheter insertion		
2. Handwashing before catheter manipulation		
3. Hand washing after catheter insertion		
Do you use the following while doing catheterization?		
1. Use sterile equipment like sterile gloves, drape, sponges and solution.		
2. Use an aseptic technique to insert the catheter		
3. Clean the urethra meatus with an antiseptic solution		
4. Use a single packed lubricant jelly		
5. Secure indwelling catheter properly after insertion to prevent movement and urethral traction		
6. Being familiar with the use of catheter alternatives like condom or adsorbent pads.		
Do you do the following while routine catheter care?		
1. Keep the catheter and collecting tube free from kinking		
2. Always keep the collecting bag below the bladder.		
3. Empty the collecting bag regularly and use separate, clean urine collecting jug for each patient.		
4. Maintain the closed system all the time.		

5. Use of gloves and gown as appropriate, during any manipulation of the catheter or collecting system		
Do you use the appropriate techniques for catheter removal?		
1. Protect your self during catheter removal		
2. Use a syringe on the catheter to deflate the balloon		
3. Use release technique any catheter fixation devices to allow easy removal		
4. Removed date recorded		
Part VI, the institutional factor that affects catheter insertion?		
1.Your facility has guidelines/protocols for proper insertion of a foley catheter.		
2. Have you ever get on job training about catheterization?		
3. Do you have enough supply for catheterization at your institution (like a lubricant, solution for cleansing, sterile drapes)?		
4. Do you have a handwashing facility (soap, water, Antiseptic) in your work area?		

Thank You!!!!