

## Assessment of Nurse's Role to Prevent Urinary Tract Infections for Neonates with Urinary Catheter

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### Abstract

**Background:** Urinary tract infection is the most common healthcare associated infection that usually results from prolonged use of urinary catheter and results in prolonged hospital stay. Prevention of catheter associated urinary tract infection in pediatric patients regarded now as an important hospital policy worldwide. **Aim of the study:** This study aimed to assess nurses' role to prevent urinary tract infections for neonate with urinary catheter. **Design:** A descriptive research design was utilized to achieve the aim of this study. **Setting:** The study was conducted at two neonate's intensive care units; Maternity and Gynecological Hospital affiliated to Ain Shams University Hospitals and Benha Specialized Pediatric Hospital affiliated to Ministry of Health. **Study subjects:** A convenient sample of 40 nurses who represent all available nurses in the previous mentioned setting. **Data collection tools:** A Pre-Designed Questionnaire Sheet and Catheter associated urinary tract infection bundle. **Results:** The study showed that, the mean age of the studied nurses was 24.29±4.19 years, 85.0 % of nurses were female, 40.0% of them had institute level of education and 45.0% of them had <5 years of experience. Regarding level of knowledge, 70.0% of studied nurses had poor knowledge prevention of urinary tract infection for neonate with urinary catheter and 90.0% of nurses had incompetent practice regarding urinary tract infection prevention for neonate with urinary catheter. **Conclusion:** The study findings concluded that, more than two thirds of studied nurses had poor level of knowledge and most of them had incompetent level of practice about urinary tract infections for neonates with urinary catheter. Also, a significant statistical positive correlation was found between knowledge of the studied nurses and their practice. **Recommendation:** A similar study should be replicated on a large sample and other place to generalize the findings.

**Keywords:** Nurses role, Neonatal urinary tract infections and urinary Catheter.

### Introduction

Urinary tract infection (UTI) is an infection that involves any part of the urinary system as urethra, bladder, ureters or kidney (Leung *et al.*, 2019). Urinary tract infection is one of the most common hospital-acquired infections. The risk of urinary tract infection (UTI) is reported 13.6–16.4% in full term neonate who present with fever or other signs of infection. The overall occurrence of UTI is reported higher in pre-term neonate as compared to term neonate (Goldberg *et al.*, 2021).

In the neonate's intensive care units (NICUs), many neonates are catheterized for long periods, thus increasing the risk of acquiring UTI (Lalitha *et al.*, 2022). Approximately 75% of urinary tract infections are associated with a urinary catheter, which is a tube inserted into the bladder through the urethra to drain urine. Catheter-associated urinary tract infections are responsible for prolonged hospital lengths of

stay, bacterial resistance, urosepsis, and even cause death (Zegeye *et al.*, 2022).

Generally, the most common pathogens producing CAUTI as reported by Center for Disease Control were Escherichia coli (21.4%), Candida (21.0%), Enterococcus (14.9%), Pseudomonas aeruginosa (10.0%), Enterobacter Klebsiella pneumonia (7.7%) and Staphylococcus (4.1%) (Oumer *et al.*, 2022).

Nurses at NICUs play a main role in CAUTI prevention through delivery of evidence-based practices regarding care of urinary catheter and CAUTI prevention. Therefore, nurses should have adequate knowledge and practical skills regarding CAUTI prevention as well as performing efficient nursing care for their pediatric patients using such knowledge and EBP order to meet the standards of care (Ahmed, Mohammed and Elwasefy, 2019).

### Significance of the study

Urinary tract infection is the 5<sup>th</sup> most common type of nosocomial infection (*Kamel et al., 2022*). Up to 70%–80% of these infections are attributed to insertion of an indwelling urethral catheter (*Lalitha et al., 2022*).

Neonates with urinary tract infection (UTI) are susceptible to higher rates of morbidity and mortality. It has been estimated that each year, more than 13,000 deaths are associated with UTIs. Thus, prevention of CAUTI in pediatric patient is regarded currently as an essential hospital policy (*Abdelrheem et al., 2022*).

Nurses are considered as the primary health care providers who are responsible for implementation of evidence-based guidelines during urinary catheters insertion, daily maintenance care, and proper well-timed catheter removal for pediatric patients (*Haza'a, Al-Jaradi and Odhah, 2021*).

Therefore, this study was conducted to assess nurses' role to prevent urinary tract infections for neonate with urinary catheter.

### Aim Of The Study

This study aimed to assess nurses' role to prevent urinary tract infections for neonate with urinary catheter.

#### Research questions:

The following research question was formulated to achieve the aim of the current study:

- 1- What is the nurses' knowledge regarding prevention urinary tract infections for neonate with urinary catheter?
- 2- What is the nurses' practice regarding prevention urinary tract infections for neonate with urinary catheter?
- 3- Is there a relation between nurses' knowledge and practice regarding prevention of urinary tract infection with their catheterization?

#### Subject and Methods

**Subjects and methods for this study were portrayed under the four main designs as the following:**

- Technical design.
- Operational design.
- Administrative design.
- Statistical design.

#### 1- **Technical design:**

The technical design includes research design, setting, subjects and tools of data collection used in this study.

#### **Research design:**

A descriptive research design was utilized to achieve the aim of this study.

#### **Setting:**

This study was conducted at the NICUs at Maternity and Gynecological Hospital and Children's Hospital affiliated to Ain Shams University Hospitals and Benha Specialized Pediatric Hospital affiliated to Ministry of Health and Population.

#### **Subjects:**

A convenient sample of all available nurses was 40 at previous mentioned study setting.

#### **Inclusion criteria for studied nurses:**

Nurses who were responsible for providing care for neonates with the urinary catheter at NICU regardless their age, sex, and years of experience.

#### **Tools of data collection:**

Data was collected using the following tools:

#### **Tool I: A Pre-Designed Questionnaire Sheet:**

It was developed by the researcher in a simple Arabic language after reviewing of the recent and relevant literature such as (*Ahmed et al., 2019, Haza'a et al., 2021 & Abou El Fadl et al., 2022*). It included the following:

**a. Nurses' characteristics:** - to assess the nurse's age, sex, educational qualification, marital status, residence, years of experience, attendance of training courses about neonatal UTI with urinary catheterization, and availability of handout or brochure in the workplace about the prevention of urinary tract infection for newborns with urinary catheterization.

**b. Neonates' characteristics:** -to assess the neonate's gender, type of labor, gestational age, chronological age, weight and length.

#### **Part 2: Nurse's Knowledge regarding prevention of urinary tract infection for neonate with urinary catheter.**

This tool was developed by researcher after reviewing of the related literatures. To assess the nurses' knowledge regarding prevention of urinary tract infection for neonate with urinary catheter. It consisted of 22 open-ended questions categorized under four main domains as the

following:

- ◆ Knowledge about urinary tract system (2 questions).
- ◆ Knowledge about urinary catheter (8 questions).
- ◆ Knowledge about Prevention of urinary tract infection for neonate's with urinary catheter (8 questions).
- ◆ Knowledge about Nurses' role in preventing urinary tract infection (4 questions)

#### Scoring system

Responses obtained from the studied nurses were checked with model key answer prepared by the researcher and graded as following mark: -

- **Zero** was given for each incorrect answer.
- **One** was given for each correct answer.

The total scores of knowledge were summed up and converted into a percentage score. The total mark was 22 which equal 100% and categorized as following:

- ◆ **Poor** knowledge if total score <75%.
- ◆ Average knowledge if total score ranged 75% - < 85%.
- ◆ Good knowledge if total score ranged  $\geq$  85%

#### Tool II: Catheter associated urinary tract infection bundle:

This tool was adapted from *Da Silva et al., (2018)* and aimed to assess nurses' practices regarding prevention urinary tract infection for neonate with urinary catheter. It included 117 items under ten main domains that represented as the following:

- ◆ Nursing care Practice (Bundle) (7 steps).
- ◆ Hand washing Practice (18 steps).
- ◆ Hand rub practices (8 items).
- ◆ Practices of aseptic cleanroom gowning (12 steps).
- ◆ Practices of putting on sterile gloves (12 steps).
- ◆ Practices of urinary catheter insertion procedure (16 steps).
- ◆ Practices of urinary catheter insertion for male neonate (15 steps).
- ◆ Practices of urinary catheter insertion for female neonate (12 steps).
- ◆ Practices of infection control measures related to urinary catheter (17 steps).

#### Scoring system

The total score of studied nurses' practices ranged from 0-117 mark which equal 100%. Each steps observed to be were done in scored one and the steps that was not done or not applicable was scored zero. These scores were summed and converted into a percentage score and categorized as follow:

- **Competent** if total score  $\geq$  85%.
- **Incompetent** if total score < 85 %.

#### 2-Operational design:

It includes preparatory phase, content validity and reliability, pilot study and field work.

##### A- The preparatory phase:

It include reviewing the recent related literature and theoretical knowledge of various aspects of the study using books, articles, internet, periodicals, magazines in order to develop and modify the data collection tools.

##### B-Tool's Validity and Reliability (Appendix III):

###### (1) Validity:

The face and content validity was done through a panel of five experts from Pediatric Nursing department, faculty of nursing, Ain Shams University. Their opinions were regarding comprehensiveness, accuracy, clarity, relevance and appropriateness of the study tools. Minor modifications were done based on expert's judgment and the final form was developed.

###### (2)-Reliability:

Testing reliability of the proposed tools was done statistically by Cronbach's alpha test. The coefficient alpha for

- Nurses' knowledge questionnaire =0.79.
- Nurses' practice checklist=0.72.

##### C-Pilot study:

A pilot study was carried out on 10% of the available nurses (4 nurses) to test clarity, applicability of the data collection tools. The subjects who were included in the pilot study were included in the study sample.

##### D-Field work

A written informed consent was obtained from each participant prior to the data collection after explaining the aim of the study. Data collection started and completed within three months from the beginning of October (2022) until the end of December (2022). Data collection was done by the researcher in the morning shift at 10.00 AM to 2.00 PM. at the previous

mentioned setting two days per week (Monday and Wednesday) at (NICU) at Benha specialized children's hospital and two days per week (Sunday and Thursday) at Maternity and Gynecological Hospital.

Each nurse took about 45 minutes for interviewing and completing the questionnaires data; questionnaire took about 5 minutes, knowledge questionnaire took about 15 minutes and **tool II** took about 25 minutes.

Nurses' knowledge questionnaires were filled by the participant nurses and observational checklists were filled by the researcher through direct observation of nurses during providing actual care to neonates.

#### **Ethical Considerations:**

Approval to conduct the study was obtained from the ethical committee in the faculty of nursing, Ain shams University before starting the study. The researcher explained and clarified the study aim and conducting way to the participants before taking the consent of participation. The researcher assured maintaining anonymity and confidentiality of data of subjects included in the study. The participants were informed about their right to withdraw from the study at any time without giving any reason.

#### **3-Administrative design:**

Approval to carry out this study was obtained from the faculty of nursing, Ain shams University to the medical and nursing directors of Maternity and Gynecological Hospital and Children's Hospital that affiliated to Ain Shams University Hospitals and Benha Specialized Pediatric Hospital.

in the workplace about the prevention of urinary tract infection for newborns with urinary catheterization

**Figure (1) illustrate that,** 40.0% of studied nurses had poor knowledge regarding total knowledge about nurses' role to prevent urinary tract infection while 35.0% of them had average knowledge and 25.0% of them had good knowledge.

**Figure (2) shows that,** 90.0% of nurses had incompetent practice about urinary tract infection prevention for neonate with urinary catheter.

**Table (2) shows that,** 92.5% of the nurses had incompetent practice regarding hand rub with alcohol based, aseptic cleanroom gowning, general procedure and infection control measures for urinary catheter. Also, 90.0% of

#### **4-Statistical design:**

The collected data were organized, categorized, tabulated and statistically analyzed using the statistical package for social science (SPSS) version 26 and Microsoft Excel version 2010. Quantitative data were presented as mean and standard deviation (SD) while qualitative data were expressed as frequency and percentage. Independent T- test and F-test were used to test significance of relations between quantitative variables. Also, Pearson correlation was used to test correlation between quantitative variables.

The observed differences and associations were considered as follows:

- $P > 0.05$  was considered non- significant (NS).
- $P \leq 0.05$  was considered Significant (S).
- $P \leq 0.001$  was considered Highly Significant (HS).

#### **Results**

**Table (1) shows that,** 45.0 % of the studied nurses were in age group from 20-<30 years with mean age  $24.29 \pm 4.19$  years, 85.0 % of them were female and 40.0% of them had technical nursing Institute. Also, 60.0% of them were married and 55.0 % of them were from rural residence.

Additionally, 45.0% of them had less than 5 years of experience and 60.0% of them didn't attend training courses about neonatal UTI with urinary catheterization. Moreover, 85.0% of them reported availability of handout

them had incompetent practice regarding nursing care practice, hand washing and put on sterile gloves. Additionally, 87.5% and 82.5% of them had incompetent practice regarding Procedure of urinary catheter insertion for male neonates and Procedure of urinary catheter insertion for female neonates respectively.

**Table (3) illustrates that,** there was no significant statistically relationship between nurses' demographic characteristics and their total level of knowledge at ( $P$ -value  $> 0.05$ ).

**Table (4) reveals that,** there was a significant statistical relationship between nurses' age, educational qualification and years of experience and their total level of practice at  $P$ - value = 0.021, 0.007 and 0.004 respectively.

On the other hand, there was no significant statistical relationship between nurses'

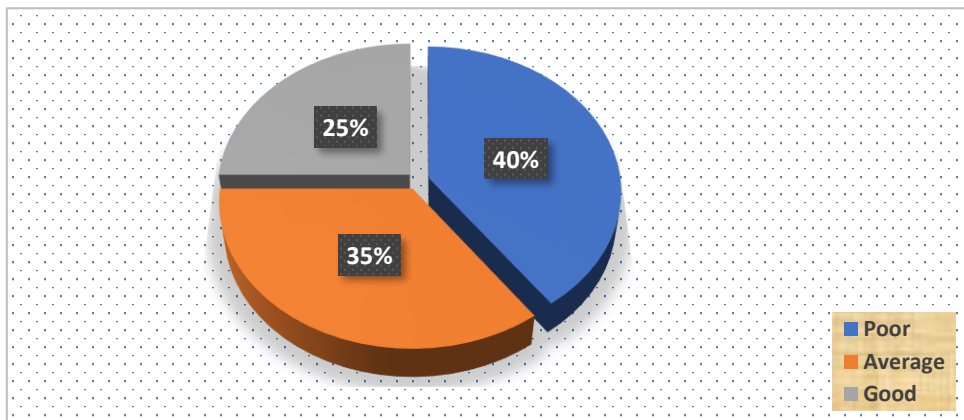
gender, marital status, residence, training courses and availability of handout and their total level of practice at P- value =0.551, 0.181, 0.772, 0.384 and 0.924 respectively.

**Table (5) reveals that,** there was a significant statistical positive correlation between total level

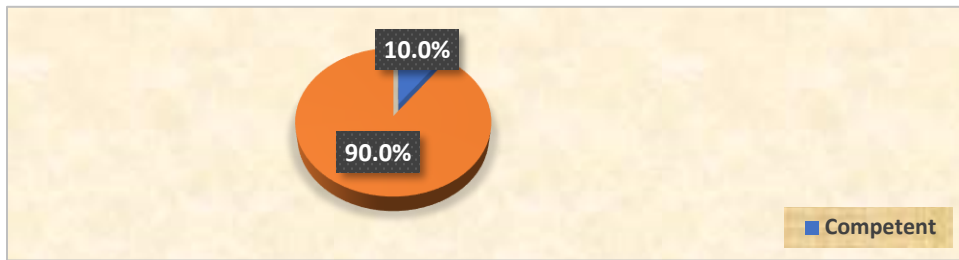
of knowledge and total level of practices among the studied nurses at P-value= 0.01

**Table (1):** Distribution of studied nurses regarding their demographic characteristics (n= 40).

Demographic Characteristics	Items	No	%
Age( in years)	20-<30	18	<b>45.0</b>
	30-<40	14	35.0
	40-<50	8	20.0
	<b>Mean ±SD</b>	<b>24.29±4.19</b>	
Gender	Male	6	15.0
	Female	34	<b>85.0</b>
Qualification	Nursing school diploma	12	30.0
	Technical nursing Institute	16	<b>40.0</b>
	Bachelor of Nursing	10	25.0
	Postgraduate	2	5.0
Marital status	Single	12	30.0
	Married	24	<b>60.0</b>
	Widowed	4	10.0
Residence	Rural	22	<b>55.0</b>
	Urban	18	45.0
Years of experience	<5	18	<b>45.0</b>
	5-<10	6	15.0
	10-<15	2	5.0
	≥15	14	35.0
Attendance training courses about neonatal urinary tract infection with urinary catheter catheterization	Yes	16	40.0
	No	24	<b>60.0</b>
Handout in the workplace about the prevention of urinary tract infection for newborns with urinary catheterization	Yes	34	<b>85.0</b>
	No	6	15.0



**Figure (1):** Percentage distribution of studied Nurses regarding their total knowledge about nurses' role to prevent urinary tract infection (n=40).



**Figure (2):** Percentage distribution of studied nurses regarding their total practices about prevention of urinary tract infection for neonate with urinary catheter (n=40).

**Table (2):** Distribution of studied nurses regarding their total practices, about prevention of urinary tract infection for neonate with urinary catheter (n=40).

Total Practice	Competent		Incompetent	
	No	%	No	%
Nursing care practice (Bundle)	4	10.0	36	90.0
Hand washing	4	10.0	36	90.0
Hand rub with alcohol based	3	7.5	37	92.5
Aseptic cleanroom gowning	3	7.5	37	92.5
Put on sterile gloves	4	10.0	36	90.0
General procedure	3	7.5	37	92.5
Procedure of urinary catheter insertion for neonate males	5	12.5	35	87.5
Procedure of urinary catheter insertion for neonate females	7	17.5	33	82.5
Infection control measures for urinary catheter	3	7.5	37	92.5

**Table (3):** Relationship between demographic characteristics of studied nurses and their total level of knowledge (n= 40).

Demographic Characteristics		Total level of knowledge		F test	P value
		$\bar{x}$	SD		
Age/ years	20-<30	13.89	2.39	1.740	0.190 NS
	30-<40	13.86	2.85		
	40-<50	11.25	6.15		
Gender	Male	15.67	.51	3.029	0.090
	Female	12.94	3.78		
Qualification	Nursing school	11.83	5.13	1.162	0.338 NS
	Nursing institute health Institute	14.37	2.36		
	Bachelor of nursing	13.40	3.23		
	Postgraduate	14.00	0		
Marital status	Single	13.50	2.74	0.028	0.973 NS
	Married	13.33	4.23		
	Widowed	13.00	2.30		
Residence	Rural	13.82	4.25	0.811	0.374 NS
	Urban	12.78	2.69		
Experience/years	<5	14.0	2.91	1.657	0.194 NS
	5-<10	15.0	1.78		
	10-<15	14.0	0		
	≥15	11.71	4.73		
Attendance training courses on neonatal UTI with urinary catheterization	Yes	13.0	2.58	0.243	0.625 NS
	No	13.58	4.22		
Handout in the work-place	Yes	14.33	2.73	0.512	0.479 NS
	No	13.17	3.76		

Student T test was used \* P-value ≤ 0.05=Significant (S). P-value > 0.05=Non-Significant (NS).

**Table (4):** Relationship between-demographic characteristics of studied nurses and their total level of practice (n= 40).

Demographic Characteristics		Total level of their practice		F test	P value
		$\bar{x}$	SD		
Age ( in years )	20-<30	83.28	12.49	4.325	<b>0.021*</b> S
	30-<40	90.43	6.73		
	40-<50	95.63	10.73		
Gender	Male	85.67	18.83	0.362	0.551 NS
	Female	88.71	9.81		
Qualification	Nursing school	93.50	9.16	4.761	0.007* s
	Nursing institute	81.68	12.65		
	health Institute	89.70	1.06		
	Bachelor of nursing	102.00	15.55		
Marital status	Single	83.25	14.31	1.792	0.181 NS
	Married	90.66	9.99		
	Widowed	88.75	1.25		
Residence	Rural	87.77	15.34	0.085	0.772 NS
	Urban	88.83	1.50		
Experience/years	<5	87.55	10.37	5.306	<b>0.004*</b> S
	5-<10	76.00	8.62		
	10-<15	102.00	15.55		
	≥15	92.42	8.85		
Attendance training courses on neonatal UTI with urinary catheterization	Yes	86.31	5.87	0.777	0.384 NS
	No	89.54	13.79		
Handout in the workplace	Yes	87.83	1.71	0.009	0.924 NS
	No	88.32	12.24		

Student T test was used \* P-value ≤ 0.05=Significant (S). P-value > 0.05=Non-Significant (NS).

**Table (5):** Correlation between total level of knowledge and total level of practices among the studied nurses.

Variables	Total level of Practice	
	r	P value
Total level of Knowledge	0.402	0.010*

\* Correlation is significant at P-value ≤ 0.05

## Discussion

Urinary tract infection is the most common healthcare associated infection (HCAI) that usually results from prolonged use of urinary catheter that results in prolonged hospital stay (*Krocová and Prokešová, 2022*). Prevention of catheter associated urinary tract infection (CAUTI) in pediatric patients regarded now as an important hospital policy worldwide. The pediatric nurses should deliver evidence-based practices regarding care of urinary catheter and CAUTI prevention, that needs proper knowledge, practical skills in order to meet the standards of care. The updated knowledge and practices of the nurses of neonates play a significant role in the control and prevention of HAI in NICU (*Bano et al., 2022*).

Owing to nurse's years of experiences, the findings of the present study revealed that more than two fifths of the studied nurses had less than 5 years of experience with mean years  $6.90 \pm 2.20$  (**Tab. 1**).

These findings might be attributed to that the higher percentage of nurses were newly graduated

This result was consistent with *Elfiky, El-Sayed, Zaher and Amin (2022)*, in a study entitled " Healthcare-associated infection in neonatal intensive care units: what is the role of nurses' knowledge and practice?" who found that more than half of the NICU nurses had less than 5 years of experience.

Also, this result was contradicted with

*Ayed, Ismail, Hegazy and Magor, (2022)*, in a study entitled "and found that half of the NICU nurses had 6-14 years of experience.

**Pertaining to attending courses related to neonatal UTI with urinary catheterization**, the findings of the present study revealed that three fifths of the studied nurses hadn't attended courses (**Tab. 1**).

This result was consistent with *Ahmed, Mohammed and Elwasefy, (2019)*, in a study entitled "Effect of preventive bundle guidelines on nurses' knowledge and practice towards healthcare-associated infections in NICU" and found that three fifths of the NICU nurses had no participation in any training courses toward preventive bundle guidelines of HAI.

This result was inconsistent with *Zegeye, Kassahun and Temechu, (2022)*, in a study entitled "Knowledge, practice and associated factors of catheter-associated urinary tract infection prevention among nurses working at university of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia" and found that more than half of the nurses had attend training on CAUTI prevention

**Regarding to knowledge about nurses' role in preventing CAUTIs**, the findings of the present study revealed that two fifths of the studied nurses had poor level of knowledge (**Fig. 1**).

This result was in agreement with *Abdelmoaty, Abdelghany, Soliman, Kenawy and Saleh, (2022)*, in a study entitled "Improving nurses' knowledge about prevention of catheter acquired urinary tract infections in intensive care units" who documented that more than three quarters of nurses had unsatisfactory level of knowledge about urinary catheter care.

**In relation to total level of knowledge**, the findings of the present study revealed that more than two thirds of the studied nurses had poor level of knowledge.

This result was supported with *Abu Samra and Abd El Aziz, (2022)*, in a study entitled "Effectiveness of evidence-based guidelines on catheter associated urinary tract infection rate among pediatric intensive care children" who found that most of the studied nurses had unsatisfactory level of knowledge about urinary catheter and CAUTI prevention in NICU.

**In relation to total level of practice**, the findings of the present study revealed that most of the studied nurses had incompetent level of

practice (**Fig. 2**).

This result was in accordance with *Abu Samra and Abd El Aziz, (2022)*, in a study entitled "Effectiveness of evidence-based guidelines on catheter associated urinary tract infection rate among pediatric intensive care children" who found that most of the studied nurses had incompetent level of practice about urinary catheter and CAUTI prevention in PICU.

On the other hand, this result was disagreed with *Ayed, Ismail, Hegazy and Magor, (2022)*, in a study entitled "Effect of using mind mapping about infection control on pediatric nurses' performance at neonatal intensive care units" who found that more than half of the studied nurses had competent practice at baseline assessment.

**Concerning to relation between socio-demographic characteristics of the studied nurses and their total level of knowledge**, the findings of the present study revealed that there was no significant statistical relationship between nurse's total knowledge level and their socio-demographic characteristics (**Tab. 3**).

This result was in accordance with *Ibrahim, Gadallah, Ali and Abolwafa, (2019)*, in a study entitled "Assessment of nurses' knowledge and practices related neonatal sepsis in neonatal intensive care units at El-Minia Hospitals" who found that there was no significant statistical relationship between nurse's total knowledge level and their demographic characteristics.

On the other hand, this result was inconsistent with *Zegeye, Kassahun and Temechu, (2022)*, in a study entitled "Knowledge, practice and associated factors of catheter-associated urinary tract infection prevention among nurses working at university of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia" who found that age, work experience and presence of guideline and training courses on prevention of catheter associated urinary tract infection were found to have significant association with nurses' knowledge regarding to prevention of CAUTI.

**Regarding to relation between socio-demographic characteristics of the studied nurses and their total level of practice**, the findings of the present study revealed that there was a significant statistical relationship between nurse's total practice level and their age, educational qualification and years of experience. While, there was no significant statistical rela-



relationship between nurse's total knowledge level and their gender, residence, marital status, attending courses and protocol or brochure in the workplace (Tab. 4).

This result may be interpreted as more time of education and clinical training may assist studied nurses to improve their awareness and develop their practices.

This result was agreed with *Mohamed and Abd-Elmawgood, (2021)*, in a study entitled "Effect of evidence-based infection prevention and control guidelines on pediatric nurses' practices in neonatal intensive care units" who found that there was a significant statistical relationship between nurse's total practice level and their years of experience. While, there was no significant statistical relationship between nurse's total practice level and their marital status.

**In relation to the correlation between total level of knowledge and level of practice,** the findings of the present study revealed that there was a significant positive correlation between total level of knowledge and level of practice among the studied nurses (Tab. 5).

This result was in the same line with *Ayed, Ismail, Hegazy and Magor, (2022)*, in a study entitled "Effect of using mind mapping about infection control on pediatric nurses' performance at neonatal intensive care units" who found that there was a positive correlation between total studied nurses' knowledge and total nurses' practices.

### Conclusion

**Based on findings of the current study, it can be concluded that,** regarding to nurse's knowledge, more than two thirds of studied nurses had poor level of knowledge about prevention of urinary tract infections for neonate with urinary catheter. In relation to nurse's practice, it was found that most of them had incompetent level of practice about prevention of urinary tract infections for neonate with urinary catheter.

Concerning the relation between nurses' knowledge and practice, a significant statistical positive correlation was found between knowledge of the studied nurses and their practice about prevention of urinary tract infections for neonate with urinary catheter.

### Recommendations

**Based on the results of the present study, the following recommendations are suggested:**

- ◆ Continuous foster sustained improvements in practices of NICU nurses toward CAUTIs
- ◆ Design hand out and protocol regarding CAUTI. Infection to nurses at NICU.
- ◆ An in-service training / continuing education must be stressed and provided for nurses to improve their performance regarding infection control measure related to CAUTI to insurance implementing the established standards of care which must be up dated periodically.
- ◆ Infection control committee should encourage carrying out surveillance and follow written guidelines.
- ◆ Further longitudinal study should be done to evaluate the effect of the educational guideline on the nurses' performances toward CAUTIs in NICUs and different health service department.
- ◆ A similar study should be replicated on a large sample and other place to generalize the finding.

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