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Effect of an Educational program on Nurses' Performance in Caring for Urinary Catheter in Intensive Care Unit

Elshimaa Mohamed gad[1], Mervat Anwar Abd ELAziz[2] & Mogedda Mohamed Mehany[3]
[1.] Nurse Specialist at Directorate of Health Affairs in Assiut, Egypt.
[2.] Professor of Critical Care and Emergency, Nursing Faculty of Nursing, Assiut University, Egypt.
[3.] Professor of Critical Care and Emergency, Nursing Faculty of Nursing, Assiut university, Egypt.

Abstract
Background: Urinary catheter can induce a life-threatening condition known as bleeding, urinary tract infection, so correct urinary catheter proceed and care from nurses is crucial for lifesaving all patients. **Aim:** Evaluate effect of an educational program on nurses' performance in caring for urinary catheter in Intensive Care Unit. **Design:** quasi-experimental research design (pre- and post-test). **Setting:** Intensive care unit in Eleman general hospital at Assuit **sample**: All available nurses who work in above mention setting **Tools Tool 1: (1):** A structured questionnaire sheet to assess nurses` knowledge about urinary catheter care. **Tool (II):** Assessment checklist to evaluate nurses' practical performance in urinary catheter care. **Results:** The findings showed that the average age of participating nurses was 27.9 years, with 96% being female. Regarding educational qualifications, 42% held a three-year nursing diploma. Similarly, 42% of the nurses had less than 10 years of work experience. Notably, 100% of the nurses reported no prior training related to urinary catheter care. **Conclusion:** The application of nursing educational program s was effective and successfully improved the nurses' knowledge and practice regarding a urinary catheter care **Recommendation:** Establishing nursing educational program s in hospitals will improve the nurses' knowledge and practice about how to care of urinary catheter

Keyword: Educational program, Nurses' performance & Urinary catheter.

Introduction
The urinary system (also known as the renal system) plays a vital role in maintaining the body's internal balance. It is primarily responsible for removing waste products and excess substances from the bloodstream and excreting them in the form of urine. This system includes the kidneys, ureters, bladder, and urethra (**Ashalath & Deep., (2019) and Tortora, & Derrickson, (2018)).**

A urinary catheter may be indicated in many situations, including: Urinary retention, in palliative care or end-of-life situations. Bladder or urethral surgery: Following certain surgeries on the bladder or urethra, a urinary catheter may be inserted temporarily to allow for proper healing and drainage of urine (**Tamer &Mervat., 2018)** & **(Alshalath et al., 2020).**

Urine output in critically ill patients must be monitor by using urinary catheter to accurately measure urine output, which can be an important indicator of kidney function and fluid balance **(Sheehan & Jacqueline., 2020)**

It is important to note that the use of a urinary catheter is not without risks, and it should only be used when necessary and under proper medical supervision, as it can increase the risk of urinary tract infections. Symptoms may include pain, burning during urination, cloudy or foul-smelling urine, and fever. catheter-associated urinary tract infection (CAUTI): Prolonged catheter use can lead to a higher risk of developing a CAUTI, which is a specific type of UTI caused by the catheter. CAUTIs can lead to more serious complications such as kidney infections (**CDC Core Practices for Infection Prevention 2019).**

Bladder and urethral trauma: Improper or forceful insertion of a catheter can cause damage to the bladder or urethra. This can result in bleeding, pain, or difficulty urinating. Urinary retention: In some cases, the bladder can become dependent on the catheter for emptying, leading to a diminished ability to urinate without the catheter **(Ashalath & Deep., 2019)**.

Bladder spasms: The presence of a catheter can cause irritability and spasms in the bladder, leading to discomfort and frequent urges to urinate. Urethral strictures: Repeated catheter use can cause scarring and narrowing of the urethra, known as a urethral stricture. This can result in difficulties with urination even after the catheter is removed. Administering medications or fluids: A urinary catheter can also be used to directly administer medications or fluids **(Sheehan et al., 2020).**

Previous studies have demonstrated a lack of knowledge among healthcare professionals regarding catheter care , nurses are not aware enough about the

correct intervention used in the management of urinary catheter care **(Dribin et al., 2022).**

Nurses may be responsible for inserting and securing urinary catheters for patients who require them. This involves following strict aseptic technique to minimize the risk of infection (**World Health Organization 2020).**

Monitoring: Once a urinary catheter is in place, nurses need to monitor the patient for any signs of complications or infections, such as catheter-associated urinary tract infections. They will assess the urine output and closely observe the catheter site for any signs of redness, swelling, or discharge. Maintenance:

Nurses are responsible for maintaining the integrity of the urinary catheter system. This includes keeping the catheter and collection bag clean, properly securing the catheter, and ensuring the tubing is not kinked or obstructed. Troubleshooting: If a patient experiences any issues with their urinary catheter, such as blockages or leakages, nurses may need to troubleshoot the problem and take appropriate action. This may involve flushing the catheter, adjusting the positioning, or contacting a urologist for further intervention **(Al-dossary et al., 2020)**

Nurses play a crucial role in educating patients and their families about urinary catheter care. This includes providing information on proper hygiene, recognizing signs of infection, and emphasizing the importance of regular catheter care. Lastly, nurses are responsible for safely removing urinary catheters when they are no longer needed. This involves ensuring the patient is ready for removal, preparing the patient for the procedure, and following proper removal techniques to minimize discomfort and the risk of infection Overall, the role of a nurse in urinary catheter management is to ensure the safety, comfort, and well-being of the patient while minimizing the risk of complications related to catheter use **(Tamers & Mervat., 2018)**

Education for ICUs nurses regarding urinary catheter care is very crucial However, the education to the ICUs nurses which eventually have a great impact on the practice of the ICUs. Nurses dealing with the patient and making them more vigilant to the changes that might happened to their patients as well as this status leaded to extend the length of stay as well as increase in mortality and morbidity rate **(Dribin et al., 2022).**

Significance of the Study

Urinary catheter insertion requires a specialized nursing care to enhance patient recovery and prevent potential complication. Such as catheter –associated urinary tract infection (CAUTIs) between 2018 and 2022 approximately 8,383 patients were admitted to the intensive care unit in Eleman general hospital of whom 6873 required urinary catheterization.

Urinary tract infection (UTIs), particularly CAUTIs ,remain among the most common bacterial infections globally ,affecting millions of individuals each year. Understanding the underlying causes, risk factors, and appropriate treatment strategies for UNTIs is essential for delivering effective patient care and improving health outcomes (**World Health Organization, 2020**).

Therefore ,this study aims to evaluate effect of an educational program on nurses' performance in caring for urinary catheter in Intensive Care Unit

Aim of the study

To evaluate effect of an educational program on nurses' performance in caring for urinary catheter in Intensive Care Unit through the following:

a) Assessment of the nurses' knowledge and practice about caring of patient with urinary catheter.
b) Design and Implement the program about care of urinary catheter based on the previous assessment.
c) Evaluate the effect of the program on the nurses' knowledge and practice related care of patient with urinary catheter.

Research hypothesis:-

1- There will be a statistically significant improvement in nurses' performance regarding caring of patient with urinary catheter post implementing nursing educational program
2- A positive correlation will be observed between nurses' knowledge and their practice scores after the implementation of the educational program Positive relationship between the socio-demographic and nurses' knowledge
3- There will be a positive relationship between nurses' socio-demographic characteristics and their knowledge levels.
4- There will be a positive relationship between nurses' socio-demographic characteristics and their practice.

Subjects and method

Research design:

A quasi experimental research design was used in the present study

Study variable:

- The educational program serves as the independent variable,
- Nurses' knowledge and practice regarding the treat ment of patients with urinary catheters serve as the dependent variable.

Setting:

The study done at intensive care unit in Eleman general hospital directorate of minster of health affairs in Assuit.

Sample:
A convenient sample of all available nurses who was recruited from intensive care unit in Eleman general hospital at Assuit who were 50 nurses .

Tools of the study:
Two tools were used in this study:-

Tool (1): Nurses' knowledge assessment tool:
This tool was developed by the researcher following a comprehensive review of relevant literature, aiming to evaluate nurses' knowledge regarding the care of patients with urinary catheters. It comprises two parts:

Part (1): Demographic Information: This section foc us on demographic information, such as the nurses' co de, age, sex, workplace, years of experience, educatio n, and participation in urinary catheter-related training programs.

Part (2): Pre/post Nurses' knowledge about caring of patient with urinary catheter **(structure interview questionnaire):**
This section was used to assess the necessity and effectiveness of the educational program. It includes a mix of essay questions, multiple-choice questions, and true/false questions covering the following topics: Male and female urinary system architecture and phys iology, urinary catheter insertion techniques, complic ations, symptoms of urinary tract infections, patient h ealth education, and the role of nurses prior to, during , and following urinary catheter insertion

Scoring system of nurses' knowledge assessment:
Responses were scored as follows:

- **1 point** for a correct answer
- **0 points** for an incorrect or "don't know" response

Knowledge levels were categorized as:

- **Satisfactory**: A score of **60% or above**
- **Unsatisfactory**: A score of **less than 60%**

Tool (2): Nurses' practice assessment tool This tool was developed by the researcher after reviewing the related literature **(**Liu & etall.**,**2015**)** to assess nurses practice regarding caring of patient with urinary catheter

This tool consisted of the following procedure:

1- Insertion of urinary catheter.
2- Daily care of urinary catheter.
3- Intake and output monitoring
4- Taking of urine sample

Scoring system of nurses' practice was the following:
One point was awarded for completing a step correct, whereas zero points were awarded for completing a step incorrectly or not at all.

The nurses' practice received a total score of 98, which was divided into two Levels a satisfactory overall score is defined as 60% or higher. Less than 60% of the total score is considered unsatisfactory.

Technique for data collection;
Preparation, implementation, and evaluation are the th ree primary stages of the study's execution.

Preparatory phase:-

- After outlining the purpose and scope of the study, t he competent hospital authorities granted permissio n to perform it.
- Seven critical care nursing professionals evaluated t he study's instruments for face validity, and any req uired adjustments were made.
- Based on a survey of pertinent literature, the researc her created the data collection instruments.
- Seven experts in the study's critical care nursing fie ld tested the study tools for face validity, and any ne cessary adjustments were made.

Pilot study:
A pilot study was conducted on 10% of the total sample (5 nurses) to evaluate the clarity, feasibility, and applicability of the research tools. As no major modifications were required based on the pilot findings, these participants were included in the final study sample

Face validity of the study tools (knowledge and practice assessment tools) was established through expert review. A panel of five specialists in critical care nursing evaluated the tools for relevance, clarity, and comprehensiveness. Based on their feedback, minor modifications were made to enhance clarity and ensure that the tools accurately reflected the concepts being measured.

Reliability:
The reliability of both tools-Tool 1 (Knowledge Assessment Tool) and Tool 2 (Practice Assessment Tool)-was evaluated using **Cronbach's alpha** to ensure internal consistency.
Tool I:0.844 and for Tool II ; 0.921

Ethical consideration:

Research proposal was approved from Ethical Committee in the faculty of nursing with serial number 1120230653 .There is no risk for study nurses during application of the research. The study was following common ethical principles in clinical research. Written consent was obtained from nurses that is willing to participate in the study, after explaining the nature and purpose of the stud. Confidentiality and anonymity were assured. Study nurses have the right to refuse to participate and or withdraw from the study without any rational any time. Study nurses' privacy was considered during collection of data.

Implementation phase:

Knowledge assessments were conducted
twice in the following manner:

The second questionnaire administration was conduct ed following the execution of the educational progra m in order to determine effect on nurses' knowledge. One was used as a pretest evaluation before start educational program .

Assessment of nurses' practice:

Before and after the educational program was put int o place, the researche used an observational check list tool to observe the nurses' practices.

As the nurses demonstrated nursing procedures linked to urinary catheters the researcher filled out the check list

Construction of educational program:

The educational program was designed by the researcher based on the initial assessment of nurses' knowledge and performance related to urinary catheter care. Revisions were made with guidance from clinical experts, and the final teaching booklet was written in Arabic using simple language and visual aids to enhance comprehension.

Implementation of the program:

The program was conducted in the nurses' lounge within the critical care unit of Eleman General Hospital. Nurses were grouped based on their work schedule to ensure maximal participation. The key implementation details included:

- **Sessions were held during the** morning shift **to maximize attendance.**
- **Nurses were divided into** five groups**, each consisting of** 10 nurses**.**
- **Each group attended** two sessions per week**, with each session lasting** two hours**.**
- **Teaching methods inclucded** PowerPoint presentations, videos, group discussions, demonstrations, and re-demonstrations**.**
- **Each nurse received an** educational pamphlet **during the session**
- In addition to the preliminary one, educational sessi ons were introduced, with a two- hour duration for each session.

The overall objectives of the developed educational program was to improving the nurses' knowledge and practice about care of urinary catheter.

Specific objectives of the program:-

At the end of the program the nurses can be able to:-

1) Describe the anatomy of the urinary system.
2) Enumerate function of urinary system.
3) List indications of urinary catheter
4) List steps of urinary catheter insertion
5) List urinary catheter insertion complication.
6) Describe manifestation of urinary tract infection.
7) Patient health education about caring of urinary catheter.
8) Nurse role in urinary catheter insertion

Preliminary session (1):

In this session, the researcher introduced the participants to the program, outlining its objectives, content, evaluation methods, and expectations. Additionally, a brief review of the anatomy and physiology of the **urinary system** was provided to establish foundational knowledge.

Session (2): This session focused on defining the urinary system, identifying the indications for catheterization, explaining various catheter insertion techniques, and discussing potential complications associated with urinary catheterization.

Session (3): Participants were introduced to different types of urinary catheters, the clinical manifestations related to catheter use, and the signs and symptoms of catheter-associated infections. Emphasis was placed on monitoring techniques and early detection mistake as the topic is urinary catheter care.

Session (4) include: Patient health education, nurse role in catheter care.

Session (5) include: The researcher underlined and summarized the key points from the previous session. Every nurse performs the steps entirely and repeatedl y shows them on their own.

Evaluation phase

Two assessments of nurses' knowledge and practice were conducted:

A **pre-test** was administered at the beginning of the study to evaluate baseline nurses' knowledge and their practice.

A **post-test** was administered following the implementation of the educational program to measure its effect on nurses' knowledge and their practice.

Statistical analysis

Using SPSS version 26 (26), the gathered data were tabulated and statistically analyzed to determine the differences between the groups under study using frequencies and percentages with a mean ± SD. The association between the variables was examined using Pearson's correlation test, Chi-square testing, and independent sample T-tests. P values less than 0.05 are regarded as significant, P values less than 0.001 as very significant, and P values greater than 0.05 as non-significant.

Results

Table (1): Distribution of demographic data among nurses (n=50)

Variables		
Age Mean ±SD	27.94±4.683	
Variables	**N**	**%**
Sex		
- Male	6	12.0
- Female	44	88.0
Level of education - Diploma	21	42.0
- Institute of nursing	16	32.0
- Bachelors	11	22.0
- Institute of technical health	2	4.0
Years of experience - Less than one years	9	18.0
-1-≥ 5 years	3	6.0
-5-≥ 10 years	21	42.0
- More than 10 years	17	34.0
Attendance of previous Training regarding oxygen therapy -Yes	0	0.0
-No	50	100

Data described as (N&%) *chi-square and(±SD)independent sample t-test*

Table (2): Comparison between nurses' knowledge score pre and post implementing of educational program regarding urinary catheter care (n=50)

Nurses knowledge	Total score	pretest	Posttest	p. v
		Means ± SD	Means ± SD	
Anatomy and physiology of urinary tract	2	.780± .789	2.00±0.00	0.001**
Enumerate function of urinary system	3	1.92± .274	3.00±0.00	0.042*
List indications of urinary catheter	5	1.980± 809	5.000±0.00	0.001**
List steps of urinary catheter insertion	3	1.340±879	2.900±303	0.001**
List urinary catheter insertion complications	6	4.266± .703	5.960± .282	0.001**
Describe manifestation of urinary tract infection	1	.320±.471	.980±.141	0.001**
Patient health education about caring of urinary catheter	2	1.92± .274	2.0	0.001**
Nurse role in urinary catheter insertion	3	.320±.471	2.900	0.001**
Total knowledge score	25	12.846	24.74	0.001**

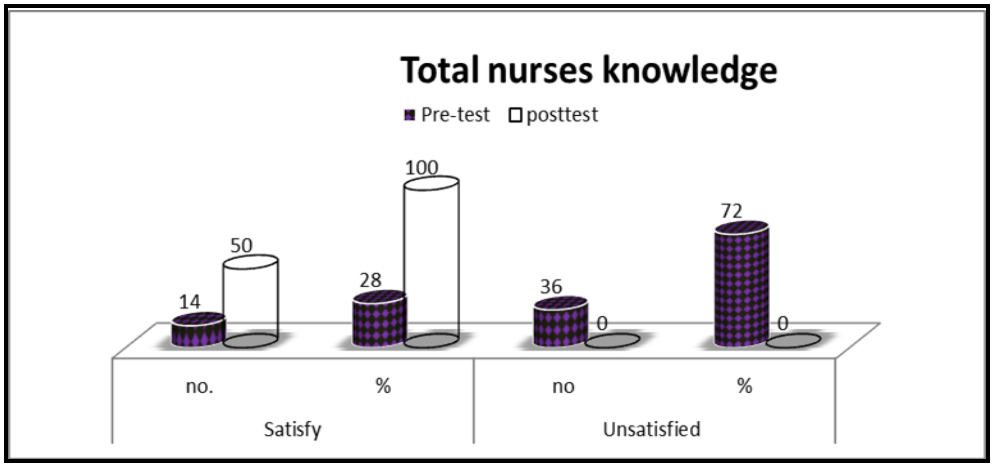

Figure (1): Level of satisfaction among nurses' knowledge score pre and post implementing of educational program regarding urinary catheter care (n=50)

Table (3): Comparison between pre-posttest for Total nurses' practice regarding urinary catheter care (n=50)

	done Correctly		done incorrectly		Not Done			done correctly	Done incorrectly		Not Done		p.v
	N	%	N	%	N	%	N	%	N	%	N	%	
Insertion of urinary catheter.	32	64.0	3	6.0	15	30.0	50	100	0	0	0	0	0.001
Daily care of urinary catheter.	32	64.0	2	4.0	16	32.0	50	100	0	0	0	0	0.001
Intake and output monitoring	29	58.0	3	6.0	18	36.0	50	100	0	0	0	0	0.001
4Taking of urine sample	31	62.0	2	4.0	17	34.0	50	100	0	0	0	0	0.001
Total	31	62.0	3	6.0	16	32.0	50	100	0	0	0	0	0.001

Chi-Square Tests *Ns= Non significant difference P>0.05*

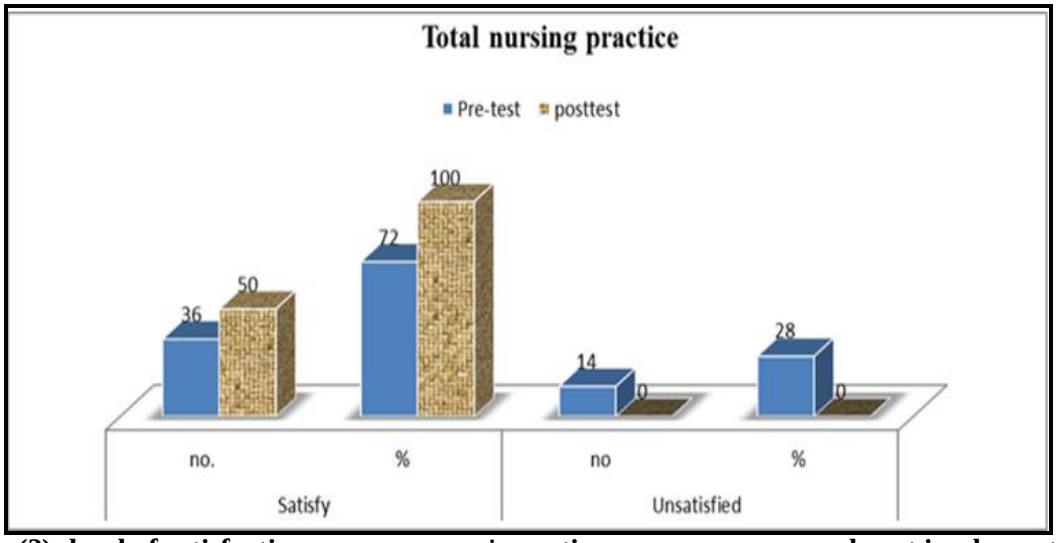

Figure (2): level of satisfaction among nurses' practice mean score pre and post implementing of educational program regarding urinary catheter care (n=50)

Table (4): Relation between total nurses' knowledge mean score pre-post test, and demographic characteristics (n=50)

Variables		N	Pretest	Posttest
			Mean ±SD	Mean ±SD
Level of education	Diploma	21	8.523±4.884	18.904±.300
	institute of nursing	16	7.687±5.147	19.000±0.00
	Bachelors	11	12.272±2.969	18.636±.504
	institute of technical health	2	8.500±4.949	18.000±1.414
	Total	50	9.080±4.818	18.840±.421
Years of experience	<1	9	7.333±5.567	18.777±.666
	1-< 5 years	3	7.333±6.658	18.666±.577
	5-< 10 years	21	9.571±4.566	18.857±.358
	> 10 years	17	9.705±4.579	18.882±.332
Sex	Male	2	11.00±1.41	18.50±.707
	Female	48	9.00±4.89	18.85±.412
Age group	20<30 yrs.'	40	8.47±4.87	18.84±0.41
	30<40 yrs	9	11.66±4.12	19.00±0.00
	>40 yrs	1	10.00±0.0	18.00±0.00
	Total	50	9.08±4.81	18.84±0.42

Table (5): Relation between nurses' practice mean scores pre-post test and demographic characteristics (n=50)

Variables		N	Pretest Mean ±SD	posttest Mean ±SD	P1	P2
Level of education	Diploma	21	63.857±7.863	97.904±.436	Ns	Ns
	institute of nursing	16	61.812±7.704	97.875±.500	Ns	Ns
	Bachelors	11	63.909±9.417	98.000±0.00	Ns	Ns
	institute of technical health	2	59.500±2.121	98.000±0.00	Ns	Ns
	Total	50	63.040±7.941	97.920±.395	0.780	0.865
Years of experience	<1	9	58.777±5.494	97.777±.666	Ns	Ns
	1-< 5 years	3	59.333±5.033	98.000±.000	Ns	Ns
	5-< 10 years	21	62.952±7.473	97.904±.436	Ns	Ns
	>10 years	17	66.058±9.086	98.000±.000	Ns	Ns
	Total	50	63.040±7.941	97.920±.395	0.124	0.584
Sex	Male	2	60.00±1.14	98.00±0.00	Ns	Ns
	Female	48	63.16±8.08	97.91±0.403	0.85	0.77
Age group	20<30 yrs	40	62.45±6.95	97.91±0.41	Ns	Ns
	30<40 yrs	9	65.11±11.87	98.00±0.00	Ns	Ns
	>40 yrs	1	68.00±0.00	98.00±0.00	Ns	Ns
	Total	50	63.04±1.12	97.92±0.39	0.552	.918

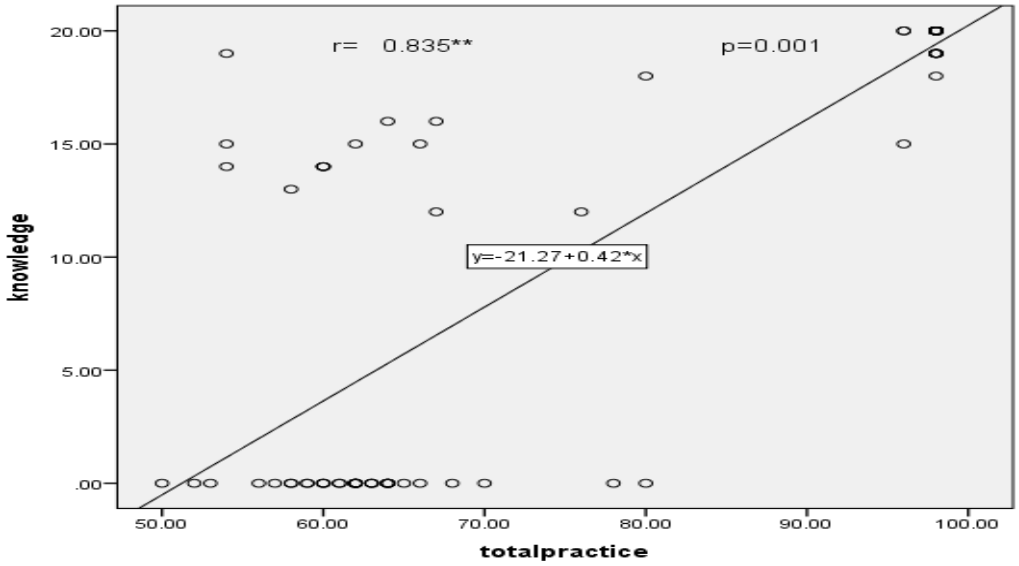

Figure (3): Relation between level of nurses' knowledge and practice (n= 50)

Table (1): The findings showed that 96% of the nurses were female with an average age of 27.9 years; regarding education, 42% held a three-year nursing diploma, 32% graduated from a technical nursing institute, 22% had a bachelor's degree in nursing, and 4% completed a technical health institution program; in terms of experience, 42% had less than 10 years, 34% had more than 10 years, 18% had less than one year, and 6% had more than five years; notably, 100% of the nurses had not received any prior training on urinary catheter care.

Table (2): It demonstrates that nurses' mean scores on urinary catheter care knowledgesignificantly different before and after the educational program was put into place ($p<0.001$).

Figure (1): It illustrate that about 72% of nurses have unsatisfied knowledge in the pretest and100%of nurses have a satisfied knowledge in posttest with highly significance difference between them.

Figure (2): It show that 14% of nurses have unsatisfied practice in pretest and 100% of nurses

have a satisfied practice after the educational program.

Table (3): It show that nurses mean score on urinary catheter care practice different change before and after educational program was put into ($p>0.05$)

Table(4): The relationship between knowledge and yearsof experience, sex, and age group before and aft er the implementation of an educational program does not differ significantly.

Table (5): It illustrate that there is no significance differences in Relation between nurses' practice and demographic characteristics pre and post implementation of educational program**.**

Figure (3): It illustrate that there is positive correlation between total nurse' knowledge and total nurses' practice

Discussion:

It is believed that the frequency of urinary catheter insertions is partially influenced by nurses' ability to recognize the clinical manifestations of urinary tract infections and manage them appropriately. This study aimed to assess the knowledge and practices of nurses working in intensive care units regarding urinary catheter care before and after the implementation of a structured nursing educational program.

Concerning the demographic characteristic of the sample under study illustrated that, over half of nurses' ages fell between 30 and 45 years , about three-quarters of nurses having diploma degrees and graduated from many years. This result is in line with research conducted by (**Tortora,** & **Derrickson**,. **2018)** who established that the studied nurses' average age was 48.7 years old. However, this result did not align with the research conducted on the same point of study by (**Mosbeh., 2021)** found the mean age of the nurses under study was 22.6±1.3 years old, and half of the nurses were between the ages of 20 and 3 years old.

Also the majority of them were females this result may be explained by the fact that women make up the majority of Egyptian nurses and continue to outnumber men in the nursing profession. This result was inconsistent with research conducted by **(Macy & Poon., 2022)** they mentioned that about two third of the studied sample was male.

According to education level, about three-quarters of nurses had a diploma, and greater than two-fifths of them have between 11 and 20 years of experience. Despite many years of experience, not all nurses have received any training program about antibiotic administration or anaphylaxis management. So their knowledge and practice in this study about urinary catheter had unsatisfactory and inadequate levels before applying nursing educational teaching.

The findings of the current study indicate that a significant proportion of the sample demonstrated a knowledge deficit in the pre-test phase. This may be attributed to the fact that none of the nurses had received prior training in urinary catheter care. Additionally, heavy workloads may have limited their ability to consult updated resources or engage in continuous learning. It difficult for them to keep up with reading recent textbooks and update their knowledge These factors highlight the necessity of enhancing nurses' knowledge to improve their clinical practice, ensure safe urinary catheter insertion, and prevent catheter-associated infections.

The nurses' interest in learning more about the study issue may have contributed to the improvement that was seen and the written materials they received about urinary catheter care. These materials served as a valuable source of ongoing reference for the nurses and facilitated their knowledge acquisition. Along with encouraging participation, questions, interactions and their implementation of learning guidelines throughout the instructional sessions are crucial aspects.

The researcher discovered that after implementation of the nursing educational program , there was a great improvement in the nurses' practice scores in the post-test (immediately).This research supports the findings of **(Fayed et al., 2022)**, who found an excellent level of practice after applying the educational program compared to before it, with a statistically significant improvement.

Ultimately, the study's findings demonstrated that, with highly statistically significant differences, nurses' knowledge and practice regarding urinary catheter care improved after implementing the nursing educational program . This finding aligns with the findings of (**Mohamed & Said., 2020)** who observed a positive association between the total knowledge and total practice scores of nurses during the post-program implementation phase.

Conclusion:

The study concluded that the implementation of the nursing educational program led to a significant improvement in nurses' knowledge and practice regarding urinary catheter care, with a positive correlation observed between their knowledge and practice post-intervention compared to pre-intervention.

Recommendations:

- All nurses' performance should be evaluated periodically regarding urinary catheter by training personnel in hospitals to assess the nurses' practice level and provide advice to correct their incorrect practices.

- Attractive posters about urinary catheter care should be available in the medical and intensive care departments.
- Apply such study on large sample size in various of intensive care units to generalize the research results and improve nurses' knowledge and practice toward urinary catheter care

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