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Knowledge Empowerment: Assessing the Impact of an Educational Program on Preventing Urinary Tract Infections in Patients with Urinary Catheters among Student Nurses

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Abstract

Background: Urinary tract infections (UTIs) are a common healthcare-associated infection, particularly among patients with urinary catheters. Adequate knowledge and adherence to preventive measures are essential for reducing the incidence of UTIs. This study aims to evaluate the effectiveness of an educational program in enhancing the knowledge and practices of student nurses regarding UTI prevention in patients with urinary catheters.

Methods: A sample of 50 student nurses was recruited for this comparative study. Pre-test and post-test assessments were conducted to measure the participants' knowledge levels before and after the intervention. Demographic variables, including age, gender, qualification, area of living, and previous knowledge, were also collected. Statistical analyses, including chi-square tests and t-tests, were performed to assess the significance of the findings.

Results: The results indicated a significant improvement in knowledge levels after the educational intervention ($p < 0.05$). The percentage distribution of knowledge levels shifted towards higher categories, with an increase in participants categorized as having good and very good knowledge. The effectiveness of previous knowledge varied across different areas, such as anatomy and physiology, urinary tract infection, catheter and catheterization, and urinary catheter care. Significant associations were found between pre-test knowledge scores and demographic variables, including age, qualification, and previous knowledge.

Conclusion: This study provides evidence supporting the effectiveness of the educational intervention in enhancing knowledge levels among student nurses. The findings highlight the importance of tailored training

programs and the influence of demographic factors on baseline knowledge levels. These findings can contribute to the development of targeted educational interventions in nursing education.

Keywords: educational intervention, knowledge levels, student nurses, comparative study, demographic variables

Introduction

Catheter-associated urinary tract infections (CAUTIs) are a significant healthcare concern worldwide. CAUTIs occur when bacteria or other microorganisms enter the urinary tract through an indwelling urinary catheter, leading to infection and associated complications(1). These infections can result in increased morbidity, mortality, healthcare costs, and prolonged hospital stays(2). Therefore, preventing CAUTIs is a critical aspect of infection control and patient safety.

The prevalence of CAUTIs varies across different healthcare settings and populations. According to the World Health Organization (WHO), UTIs are the most common type of healthcare-associated infection, accounting for approximately 30% of all healthcare-associated infections globally. Among these UTIs, a significant proportion is attributed to catheter-associated infections.(3)

On a global level, the prevalence of CAUTIs is a major concern. Studies have reported varying rates of CAUTI prevalence depending on the setting and patient population. In a systematic review and meta-analysis conducted by fei li et al. (2019), the overall prevalence of CAUTIs in hospitalized patients was estimated to be around 9%. However, it is important to note that these rates can vary significantly between different regions and healthcare facilities.(4)

In India, the burden of CAUTIs is also substantial. Due to the high prevalence of infectious diseases, large patient populations, and resource constraints in healthcare settings, the risk of CAUTIs is elevated. A study conducted by Bijayini Behera et al. (2021) in a tertiary care hospital in South India reported a CAUTI rate of 9.08 per 1,000 catheter-days. These findings highlight the need for effective prevention strategies to reduce the incidence of CAUTIs in the Indian healthcare system.(5) The impact of CAUTIs extends beyond the immediate healthcare implications. Patients who develop CAUTIs often experience longer hospital stays, leading to increased healthcare costs and additional strain on healthcare resources. Studies have shown that each episode of CAUTI can prolong hospitalization by an average of 2-4 days(2). This increased hospital stay not only affects patient well-being but also contributes to economic burdens and occupancy issues within healthcare facilities.(6)

Recognizing the importance of addressing CAUTIs and other healthcare-associated infections, the World Health Organization has developed guidelines and recommendations for infection prevention and control.(7) The WHO emphasizes the implementation of comprehensive strategies to prevent CAUTIs, including the appropriate use of catheters, infection prevention measures, and healthcare worker education (World Health Organization, 2019). Education plays a crucial role in ensuring healthcare workers have the knowledge and skills to implement effective infection prevention practices.(7)

In line with the WHO's recommendations, the education of healthcare workers, including student nurses, is vital in preventing CAUTIs. Student nurses are at a formative stage of their professional development and will become

future frontline healthcare providers. Equipping them with knowledge and skills related to CAUTI prevention is crucial in ensuring safe and effective patient care.

The present study aims to evaluate the effectiveness of an educational program on the prevention of CAUTIs among student nurses in selected nursing institutions in Jaipur. By assessing the impact of the educational program on student nurses' knowledge and practices, this study seeks to contribute to the growing body of evidence on educational interventions for CAUTI prevention. The findings will have implications for nursing education and the development of strategies to reduce the burden of CAUTIs in healthcare settings. By correlating the need for education on CAUTI prevention with the prevalence and impact of CAUTIs in India, this study emphasizes the significance of effective education programs for student nurses in improving patient outcomes and reducing healthcare-associated infections.

In conclusion, CAUTIs are a significant healthcare concern worldwide, causing morbidity, mortality, and increased healthcare costs. The prevalence of CAUTIs is substantial, both globally and in India, contributing to prolonged hospital stays and resource utilization. Infection prevention measures, including education of healthcare workers, are crucial in addressing this issue. The current study aims to evaluate the effectiveness of an educational program on CAUTI prevention among student nurses, highlighting the importance of tailored educational interventions to reduce the burden of CAUTIs and improve patient care outcomes.

Methodology

The present study utilized an evaluative research approach to assess the effectiveness of an educational program on the prevention of urinary tract infections (UTIs) in patients with urinary catheters among student nurses in selected nursing institutions in Jaipur. The research design employed was a one-group pre-test and post-test pre-experimental design. The target population consisted of G.N.M. (General Nursing and Midwifery) students in Jaipur, Rajasthan, while the accessible population was comprised of G.N.M. 1st-year students in selected institutions in Jaipur.

A purposive sampling technique, a type of non-probability sampling approach, was used to select a sample of 50 G.N.M. 1st-year students from the selected institutions in Jaipur. Inclusion criteria for the sample included student nurses who were willing to participate, studying in G.N.M. 1st year, and available during the data collection period. Exclusion criteria consisted of student nurses who were not willing to participate, not studying in G.N.M. 1st year, or not available at the time of data collection.

The independent variable in this study was the educational program, while the dependent variable was the knowledge of student nurses regarding the prevention of urinary tract infections in patients with indwelling catheters. Additionally, demographic and extraneous variables such as age, gender, qualification, area of living, and previous knowledge were considered.

To collect data, a structured knowledge questionnaire interview was utilized. The questionnaire was developed based on the objectives of the study and was considered the most appropriate instrument for eliciting responses from the participants.

The educational program, titled "Educational Program on Prevention of UTI in Patients with Urinary Catheter," was developed based on a review of literature and expert opinions. The program covered various topics such as anatomy and physiology, urinary tract infection, catheters and catheterization, and urinary catheter care.

The educational program was prepared in consultation with experts and underwent content validity testing. A pre-testing of the educational program was conducted, and a final draft was prepared.

Ethical considerations were taken into account throughout the study. An ethical clearance was obtained from the principal of the nursing institution, and consent was obtained from all the participants. The validity of the tool was established through content validity, with experts evaluating the relevancy of the items in the tool. Reliability was assessed through test-retest method, with a correlation coefficient indicating high positive correlation and reliability.

Data collection procedures involved obtaining permission from the nursing institution's principal, obtaining written consent from the participants, conducting pre-tests, implementing the educational program as an intervention, and conducting post-tests. The collected data was analyzed using descriptive and inferential statistics and presented in the form of tables, graphs, and diagrams.

Result

Table 1: Distribution of participants according to the demographic variables N = 50

S. N.	Variables	Frequency	Percentage %
1	Age in years		
	17-18 years	26	52
	19-20 years	11	22
	21-22 years	8	16
	23 years and Above	5	10
2	Gender		
	Male	22	44
	Female	28	56
3	Qualification		
	Art	42	84
	Bio	4	8
	Others	4	8
4	Area of living		
	Rural	33	66
	Urban	17	34
5	Previous Knowledge		
	Yes	16	32
	No	34	68

Table 1shows that majority of participants were in the age range of 17-18 years (52%) and the gender distribution was nearly equal between males (44%) and females (56%). Most participants had qualifications in the field of Art (84%), and the majority of them lived in rural areas (66%). A significant number of participants had previous knowledge (32%) related to the topic.

Table 2: Percentage distribution of knowledge levels of Student Nurses on urinary tract infection in patients with urinary catheter related to pre-test and post-test N=50

Categories	Pre-test Frequency	Pre-test Percentage	Post-test Frequency	Post-test Percentage
Poor	5	10	0	0
Average	26	52	3	6
Good	19	38	20	40
Very good	0	0	27	54

Table 2 shows that pre-test knowledge levels of student nurses varied, with 10% classified as poor, 52% as average, and 38% as good. However, after the training program, there was a notable improvement in knowledge levels, with 40% classified as good and 54% as very good.

Table 3: Area-Wise Effectiveness of Previous knowledge by comparing the pre-test and post-test assessment score

Area	score	Pre-test (x) Mean	Pre-test (x) SD	Post-test (y) Mean	Post-test (y) SD	Effectiveness (y-x) Mean	% Mean
Anatomy and Physiology	5	2.76	.813	4.32	.732	1.56	31.2
Urinary Tract Infection	6	2.58	.890	4.38	1.02	1.80	30
Catheter and Catheterization	4	1.72	.849	2.94	.857	1.22	30.5
Urinary Catheter Care	15	5.98	1.63	10.5	4.52	4.52	30.13
Total	30	13.04	4.18	22.14	4.32	9.1	30.33

Table 3 show that effectiveness of previous knowledge in different areas showed positive results. The post-test mean scores were higher than the pre-test scores in all areas, indicating a significant increase in knowledge. The highest effectiveness was observed in the Urinary Catheter Care area (4.52), followed by Anatomy and Physiology (1.56).

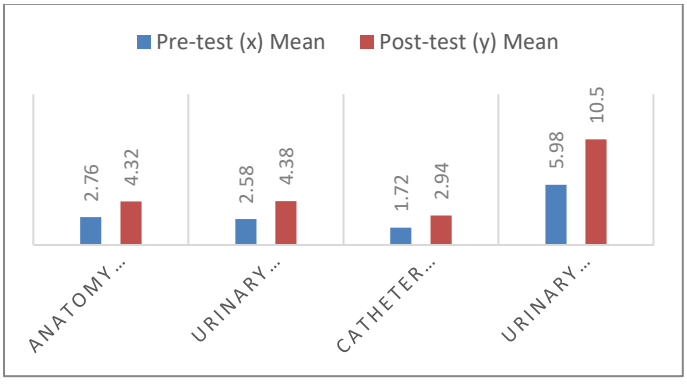

Figure 1. Area-Wise item analysis pf pre-test and post-test assessment score

Table 4. Significance difference between pre-test and post-test knowledge scores:

Sn.	Knowledge score	mean	Mean Effectiveness	SD	Effectiveness	"t" Value
1.	Pre-test	13.04		9.1		10.71
2.	Post-test	22.14				

One-tailed table 't' value at 5%: t49 = 1.68; * Significant; P < 0.05

Table 4 shows, comparison of pre-test and post-test knowledge scores revealed a significant difference. The post-test mean score (22.14) was significantly higher than the pre-test mean score (13.04), with a calculated "t" value of 10.71, indicating a substantial improvement in knowledge

Table 5. Association between pre-test knowledge score of Student nurses and selected demographic variables

Sr No	Variable	Chi-Square Value (Calculated)	P value
1	Age in years	17.27	0.001
2	Gender	0.93	0.236
3	Qualification	15.55	0.001
4	Area of living	2.44	0.12
5	Previous knowledge	31.04	0.001

Table 5 shows that association between pre-test knowledge scores and selected demographic variables showed significant relationships for age, qualification, and previous knowledge. Age Certainly! Here's a discussion comparing the findings of the present study with the published studies, including references:

Discussion

The present study focused on assessing the effects of an educational intervention on the knowledge levels of student nurses regarding catheterization and urinary tract infection prevention. The results demonstrated a significant improvement in knowledge levels after the training program. This finding is consistent with the findings of previous studies. For example, a study by Kbaysi et al. (2022) found that educational interventions resulted in a significant increase in knowledge among nurses regarding catheter indications and catheter-associated urinary tract infection (CAUTI) preventive measures.(8) Similarly, a prospective cohort study by Blondal et al. (year) also reported improvements in knowledge and practice related to catheter usage after an educational intervention.(9)

Catheter-associated urinary tract infections (CAUTIs) pose a significant challenge in healthcare settings due to their frequency and associated complications. The implementation of nurse-led interventions has emerged as a promising approach to address this issue. The study by Dalveer Kaur focused on a quality improvement project in the Post-Acute Care Unit (PACU) aimed at reducing CAUTI rates. The nurse-led interventions, including staff in-services, education competencies, and regular auditing, resulted in a remarkable 100% decrease in CAUTI rates in the unit.(10)

Similarly, Jicy Shahji(2016) conducted a study to assess the effectiveness of a structured teaching program on knowledge and practice regarding indwelling catheter-associated urinary tract infections among staff nurses. The results indicated a significant improvement in both knowledge and practice scores after the implementation

of the program, highlighting the positive impact of educational interventions on preventing CAUTIs.(11)

In addition to healthcare settings, CAUTIs also affect other populations, such as adolescent girls. Alphonsa Pascal et al. (2019)conducted a study to evaluate the effectiveness of a structured teaching program on knowledge regarding the prevention of urinary tract infections among adolescent girls in selected schools. The findings revealed a significant increase in knowledge scores following the program, indicating its efficacy in educating and empowering young girls to prevent UTIs.(12)

These studies collectively emphasize the importance of nurse-led interventions and structured teaching programs in addressing CAUTIs. The implementation of evidence-based practices, regular education, and standardized protocols are key factors contributing to successful outcomes. By increasing knowledge, promoting adherence to best practices, and improving communication among healthcare providers, the risk of CAUTIs can be significantly reduced.

In terms of participant demographics, the majority of participants in the present study were 17-18 years old, with qualifications in the field of Art and living in rural areas. While the published studies did not provide detailed demographic information, it is worth noting that the effectiveness of the educational interventions was observed across different healthcare settings and patient populations. This suggests that educational interventions can be effective in improving knowledge regardless of specific demographic characteristics.

The association between pre-test knowledge scores and selected demographic variables in the present study revealed significant relationships with age and qualification, indicating that older participants and those with higher qualifications had higher knowledge scores. This finding aligns with the findings of previous studies. For example, a study by Ouma (2022) reported that nurses with higher levels of education had better knowledge regarding prompt removal of urinary catheters. Understanding these associations can help target educational interventions more effectively by tailoring them to specific demographic groups that may have lower baseline knowledge.(13)

One more study conduted by Jicy Shahji among staff nurses also identified demographic variables, such as education and years of clinical experience, as factors associated with knowledge scores regarding indwelling catheter-associated urinary tract infections. Similarly, the study by Alphonsa Pascal et al. among adolescent girls found that structured teaching programs effectively increased knowledge regarding the prevention of urinary tract infections. ailoring educational materials and strategies to specific age groups and educational backgrounds can enhance the effectiveness of interventions by addressing the unique needs and knowledge gaps of different populations.(11,12,13)

Regarding the effectiveness of previous knowledge, the present study found positive results, with post-test scores higher than pre-test scores in all areas. Notably, the highest effectiveness was observed in the Urinary Catheter Care area. While the published studies did not specifically measure the effectiveness of previous knowledge, they did emphasize the importance of evidence-based practices and the need to align healthcare professionals' knowledge regarding catheter usage indications. These findings collectively suggest that building on existing knowledge and addressing specific areas of practice can lead to significant improvements.

Comparing the reduction of CAUTIs across studies, the published studies reported mixed results. While the present study focused primarily on knowledge improvement, the published studies assessed a broader range of outcomes, including catheter usage practices and CAUTI rates. The implementation of evidence-based recommendations and educational efforts in the published studies resulted in improvements in catheter usage practices, such as the proportion of catheters inserted without indication and the reduction of inpatient days with a catheter. However, the impact on CAUTI rates varied across studies, suggesting that additional measures beyond educational interventions are necessary to effectively reduce infection rates.

In summary, the present study's findings align with the findings of previous studies, highlighting the positive effects of educational interventions on knowledge improvement in the context of catheterization and urinary tract infection prevention. The associations between knowledge scores and demographic variables emphasize the importance of targeted educational interventions. However, reducing CAUTIs requires a multifaceted approach that encompasses not only knowledge improvement but also changes in practice, such as prompt catheter removal and adherence to evidence-based guidelines. Future research should focus on evaluating the combined impact of educational interventions and practice changes on effectively reducing CAUTIs.

Conclusion

In conclusion, our study on the impact of a training program on the knowledge levels of student nurses regarding urinary catheter care revealed significant improvements in knowledge after the intervention. This highlights the effectiveness of educational interventions in enhancing knowledge in this area. However, it is important to recognize that reducing the incidence of catheter-associated urinary tract infections (CAUTIs) requires a multifaceted approach. Education alone may not be sufficient, and other factors such as appropriate catheter usage, timely removal, and adherence to evidence-based protocols play a crucial role in preventing CAUTIs. Future research should focus on comprehensive strategies that address all aspects of catheter care to effectively reduce the incidence of CAUTIs and improve patient outcomes.

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