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Research Article

A Pre-Experimental Study to Assess the Effectiveness of Structured Teaching Programme in Terms of Knowledge Regarding Central Line Associated Blood Stream Infection (CLABSI) Prevention Among Nursing Officers Working in the Selected Hospital of Delhi NCR

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A B S T R A C T

Introduction: As per the data of the World Health Organization, 30% of patients in the ICU develop hospital-acquired infections, among which the majority are blood infections due to the existence of catheters in the venous cavity. Infections can be reduced by educating staff on the aseptic care of patients with central venous catheters (CVCs).

Materials and Methods: A pre-experimental research study with one group pre-test post-test design was used for this study. The Yashoda Hospital and Research Centre in Nehru Nagar, Ghaziabad, Uttar Pradesh, served as the study's location. The approach of purposeful sampling was employed to choose 30 nursing officers from the hospital who were working in the Medical ICU, Surgical ICU, Neonatal ICU and Paediatric ICU. A structured teaching programme was conducted on CLABSI (Central Line Associated Blood Stream Infection) infection. Nursing Officers' learning outcomes were assessed by using the structured knowledge questionnaire regarding CLABSI prevention.

Results: Following the delivery of a structured teaching programme, a post-test was conducted which revealed that the majority of Nursing Officers (23, 76.66%) had moderately adequate knowledge, 7 (23.33%) had adequate knowledge, and none of the group had inadequate knowledge.

Conclusion: The results of the current study demonstrate the effectiveness of structured teaching programmes by demonstrating that most nursing officers had moderately adequate knowledge regarding CLABSI prevention after receiving the programme, which was administered to them.

Keywords: Central Line Associated Blood Stream Infection (CLABSI), Structured Teaching Programme, Nursing Officers

Introduction

A central line, also described as a central venous catheter, is an elongated, supple, thin, empty tube that is used to thread a big vein (blood vessel). An intravenous catheter is inserted into a tiny blood vessel in the arm; a central line is identical to this, but it is longer and placed in a larger blood vessel that travels to the heart, neck, upper torso, thigh, or arm as opposed to the arm's small vein. The catheter described above differs from a standard one that is thinner, carries fluids into a wider blood vessel and may be endured inside the body for a significantly extended time frame.

Infections contracted in hospitals are a major cause of death and illness and massively boost healthcare expenditures. In 2002, there were roughly 1.7 million instances of HCAI in the United States, and at 4.5 infections per 100 hospitalisations, there were almost 100,000 fatalities. 11% of HAIs are ailments of the bloodstream, the majority of which are connected to central venous devices.[1]

More than one positive blood culture which is associated with symptoms of systemic infection like high temperature, chills, and low blood pressure is called bloodstream infection (BSI). A distinction can be made between primary and secondary haematological disorders. Spontaneous blood infection occurs in the absence of other known focus of infection. A region of detectable infection becomes the cause of secondary bacteremia. One such secondary BSI is bacteremia due to urinary tract infection.

A bloodstream infection (BSI) can be referred to as more than one positive blood culture associated with symptoms such as fever, chills, and/ or low blood pressure. Diseases of the circulatory system can be divided into primary and secondary diseases. Spontaneous systemic infection may occur in the absence of any other known infectious agent. A measurable site of infection causes bacteremia that progresses to secondary bloodstream infection. A classic example of secondary BSI is urinary bacteremia following bacterial infection.[1]

Bacteraemia can notably prolong hospitalisation and increase costs. According to BSI estimates, the mortality rate is between 12% and 25%. 11% of healthcare-associated illnesses were bloodstream infections associated with central venous catheters. Coagulase-negative *Staphylococcus*, methicillin-susceptible or methicillin-resistant Staphylococcus aureus, *Enterococci, E. coli, Klebsiella,* and *Candida* are commonly isolated BSI organisms.

The upkeep and treatment of the CVC insertion site depend heavily on nurses. The prevalence of CLABSI can be decreased and patient outcomes can be enhanced by nurses adhering to evidence-based practice. Lack of expertise and information is one of the major obstacles to incorporating evidence-based nursing concepts into practice, according to several studies.

Material and Methods

This one group pre- and post-test (pre-experimental methodology) study was conducted on Nursing Officers of Yashoda Hospital and Research Institute, Ghaziabad, Delhi NCR from January 4, 2023 to January 12, 2023. For this investigation, a total of 30 adult subjects, both male and female, were included. The study's participants were selected from the Medical ICU, Surgical ICU, Paediatric ICU, and Neonatal ICU using the purposive sampling method.

Inclusion Criteria

1. Nursing Officers working in Medical ICU, Surgical ICU, Paediatric ICU, Neonatal ICU
2. Both gender
3. Older than 18 years

Exclusion Criterion

1. Nursing Officers of other hospitals

Methodology

A well-designed structured questionnaire regarding CLABSI prevention was employed to gather information about the recruited nursing officers. The questionnaire included two sections; section I consisted of sociodemographic characteristics such as age, gender, previous education on prevention of CLABSI, previous training on prevention of CLABSI, years of experience and department and section II consisted of 30 questions related to CLABSI prevention.

Formal approval for carrying out the study was taken from the Medical Director of Yashoda Hospital and Research Institute, Nehru Nagar, Ghaziabad. Formal written permission for conducting the study was taken from the Institutional Ethics Committee of Jamia Hamdard University, New Delhi. Written, fully informed consent from the study subjects was obtained by explaining to them about the study, its purpose, and other details. The anonymity and confidentiality of participants were maintained.

Thirty samples were chosen by purposive sampling technique. Assessment of the nursing officers' baseline data on knowledge regarding CLABSI prevention was done by using a 'Structured knowledge Questionnaire' as a pre-test on day 1 prior to the organised teaching curriculum.

The researcher provided a structured teaching programme on "CLABSI prevention" which was scheduled for two offline sessions of 40 minutes each on day 1, among the nursing officers. The post-test was conducted on the eighth day following the conclusion of the educational programme.

Statistical Analysis

The SPSS 20 software program (SPSS Inc., Chicago, IL) was used to analyse the data. Items related to Nursing Officers' characteristics were analysed with regard to frequency and

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percentage. The frequency and percentage distributions of Nursing Officers in terms of learning outcomes were analysed. Paired 't' test was used to find out the significant differences in mean pre-test and post-test scores of the structured knowledge questionnaire regarding CLABSI prevention.

Result

SECTION I: Findings Related to the Demographic Characteristics of the Nursing Officers

This part explains the demographic characteristics of the subjects under study. The sample consisted of 30 Nursing Officers working in the ICU of the selected hospital of Delhi NCR. The data obtained described the sample characteristics pertaining to their age, gender, previous education on CLABSI prevention, previous training on CLABSI prevention, years of experience in Intensive care units (ICU), and department.

Tables and statistics show the frequency and percentage distribution of nursing officers according to their demographic characteristics.

Table 1.Sociodemographic Characteristics of the Nursing Officers

N = 30

S. no.	Demographic Characteristics	Frequency (f)	Percentage (%)
Age (years)			
a)	21–25	9	30.00
b)	26–30	6	20.00
c)	31–35	12	40.00
d)	> 36	3	10.00
Gender			
a)	Male	8	26.66
b)	Female	22	73.33
c)	Others	0	0.00
Previous education on CLABSI prevention			
a)	In-service education	24	80.00
b)	Mass media	2	6.66
c)	Books	3	10.00
d)	Magazines	1	3.33
Previous training on CLABSI prevention			
a)	Undergone	18	60.00
b)	Not undergone	5	16.66
c)	If any other	7	23.34
Years of experience in Intensive Care Units (ICU)			
a)	0–2	8	26.66
b)	3–5	6	20.00
c)	> 6	16	53.33
Department			
a)	Paediatric ICU	3	10.00
b)	Neonatal ICU	11	36.66
c)	Medical ICU	8	26.66
d)	Surgical ICU	8	26.66

According to data in Table 1, 12 nursing officers (40%) were in the age range of 31–35 years. Nine nursing officers, or 30%, were in the 21-25 years age range, six nursing officers, or 20%, were in the 26–30-year age range, and three nursing officers, or 10%, were in the 36 and over age range.

Regarding gender, the statistics revealed that 22 (73.34%) nursing officers were female and 8 (26.66%) were male.

Regarding previous education on CLABSI prevention, the data showed that the majority of the nursing officers got their previous education on CLABSI prevention from in-service education 24 (80%), followed by books (3, 10%), mass media (2, 6.67%), and through magazines (1, 3.33%).

The data on prior CLABSI prevention training revealed that 18 (60%) nursing officers had completed CLABSI prevention training before, followed by various methods in training in 7 (23.34%), and the remainder had not completed any CLABSI prevention training (5, 16.66%).

According to the data, 16.3% of nursing officers had worked in intensive care units (ICU) for at least 6 years, followed by those with an experience of between 0 and 2 years (8.6%), and those with an experience of 6 or fewer years (20.0%).

Regarding the department, the data revealed that most of the nursing officers (11, 36.66%) worked in the Neonatal ICU, followed by those in the Medical and Surgical ICU, both of which had similar frequency and percentages of subjects working there (8, 26.67%), and those in the Paediatric ICU (3, 10.00%).

SECTION II: Findings Related to the Evaluation of the Structured Teaching Programme on CLABSI Prevention in terms of Knowledge of the Nursing Officers

SECTION II(a): Maximum Score, Scoring Range, Mean, Median, Mean Difference, Standard Deviation, and 't' Value of Knowledge Scores on the Pre- and Post-Tests

This section describes the findings related to the evaluation of the effectiveness of the structured teaching programme on CLABSI prevention in terms of knowledge among the Nursing Officers. The pre-test and post-test knowledge scores obtained through a structured knowledge questionnaire were analysed by mean, median, standard deviation, mean difference and paired 't' test.

Maximum score, range of obtained scores, mean, median, mean difference, standard deviation and 't' value of pre-test and post-test knowledge scores were calculated and are presented in tables.

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Table 2.Pre-Test and Post-Test Knowledge Scores of Nursing Officers Regarding CLABSI Prevention

N = 30

Knowledge Test	Possible Range of Knowledge Scores	Obtained Range of Knowledge Scores	Mean	Median	Mean Difference	Standard Deviation	Paired 't' Test Value	df
Pre-test	0–30	8–23	16.56	15.50	3.67	3.901	8.30*	29
Post-test	0–30	15–27	20.23	20.00		3.370		

*t(29) = 1.699, *p < 0.05

SECTION II (b)

Table 3.Level of Knowledge of Participants Before and After Administering the Structured Teaching Programme Regarding CLABSI Prevention

N = 30

Level of Knowledge	Score Range	Pre-Test		Post-Test	
		Frequency	Percentage	Frequency	Percentage
Inadequate	0–14	10	33.33	0	0.00
Moderately adequate	15–22	17	56.66	23	76.66
Adequate	23–30	3	10.00	7	23.33

The information in Table 2 shows that there was a mean difference of 3.67 between the mean post-test knowledge score (20.23) and the mean pre-test knowledge score (16.56). The estimated 't' value, which is 8.30 at the 0.05 level of significance, makes it clear that the obtained mean difference suggested that there was knowledge growth among nursing officers and that this finding was statistically significant. The pre-test standard deviation was 3.901, while the post-test standard deviation was 3.37. This demonstrated that the groups were marginally distinct but more homogeneous prior to the test than following it.

These findings revealed that the mean difference between pre-test and post-test knowledge scores was a true difference and not by chance. This indicated that the structured teaching programme on CLABSI prevention was effective in increasing the knowledge of the nursing officers.

The data presented in Table 3 showed that the before administration of the structured teaching programme, the knowledge scores of most of the Nursing Officers were moderately inadequate 17 (56.66%), followed by inadequate (10, 33.33%) and adequate (3, 10.00%). After administrating the structured teaching programme, their obtained post-test knowledge score showed a vast improvement in their knowledge score which was moderately adequate for 23 (76.66%) participants, followed by adequate for 7 (23.33) participants and no inadequate for none.

SECTION III: Findings Related to the Area-Wise Modified Mean Percentage Gain on the Comparison of the Nursing Officers' Pre-Test and Post-Test Knowledge Scores on CLABSI Prevention

This section describes the area-wise modified mean, modified mean percentage and modified mean percentage gained in pre-test and post-test knowledge scores of the Nursing officers to compare the modified mean percentage gain in the area of introduction of CLABSI, location of central lines, indications of central lines, types of central lines, signs of complications related to central line and CLABSI prevention.

The modified mean percentage of knowledge scores obtained by the Nursing Officers in all six areas in the pre-test and post-test was computed by dividing the total scores secured in each area by the maximum scores of the respective area. The area with the lowest percentage score indicated the highest deficit area and the area with the highest percentage score indicated the lowest deficit area.

Table 4.Area-wise Analysis of Pre-Test and Post-Test Knowledge Scores of the Nursing Officers on CLABSI Prevention

N = 30

Areas	No. of Items	Pre-Test			Post-Test			Modified Mean Gain (%)	Rank Order of Modified Mean Gain (%)
		Mean	Modified Mean	Modified Mean (%)	Mean	Modified Mean	Modified Mean (%)		
Introduction of CLABSI	2	1.60	0.80	80	1.59	0.79	79	-1	-

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Location of central lines	2	0.66	0.33	33	1.56	0.78	78	45	I
Indications of central lines	3	1.62	0.54	54	2.02	0.67	67	13	III
Types of central lines	3	2.05	0.68	68	1.96	0.63	63	-5	-
Signs of complication related to central line	7	4.41	0.63	63	4.54	0.64	64	1	IV
CLABSI prevention	13	6.45	0.49	49	8.55	0.65	65	16	II

The data in Table 4 indicates that the highest pre-test modified mean percentage obtained by the nursing officers was in the area of introduction of CLABSI (80%), followed by the area types of central lines (68%), signs of complications related to central lines (63%), indications of central lines (54%), CLABSI prevention (49%), and locations of central lines (33%).

It indicates that the lowest knowledge deficit area in the pre-test was indications of central lines (54%), CLABSI prevention (49%), and locations of central lines (33%).

The highest post-test modified mean percentage obtained by the nursing officers was in the area of introduction to CLABSI (79%), followed by the location of central lines (78%), indications of central lines (67%), CLABSI prevention (65%), signs of complications related to central lines (64%), and the types of central lines (63%).

The data further indicates that there was a rise in the post-test modified mean percentage knowledge score in four areas: the location of central lines, CLABSI prevention, indications of central lines, and signs of complication related to the central line. Thus, there was a gain in four areas indicating the effectiveness of the structured teaching programme.

SECTION IV: Findings Related to the Association of Post-Test Knowledge Scores with the Selected Demographic Variables

This section describes the findings related to the determination of the association between post-test knowledge score and the selected demographic variables (previous training on CLABSI prevention and years of working experience in the ICU). The association between post-test knowledge scores and the selected demographic variable was determined by Fisher's Exact test.

Table 5.Association Between Post-Test Knowledge Scores and Selected Demographic Variables

N = 30

Selected Demographic Variables	No.	%	Knowledge Scores			Test Applied	p Value
			Inadequate	Moderately Adequate	Adequate		
Previous training on CLABSI prevention						**Fisher's Exact test**	-
Undergone	18	60.00	0	15	3	2.036	0.417*
Not undergone	5	16.66	0	4	1		
Any others	7	23.33	0	4	3		
Year of experience in the Intensive Care Unit (ICU)						**Fisher's Exact test**	-
0–2	8	26.67	0	7	1	2.770	0.272*
3–5	6	20.00	0	3	3		
≥ 6	16	53.33	0	13	3		

*p > 0.05, non-significant

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The information in Table 5 shows that the calculated Fisher's exact value for the association between post-test knowledge scores and the chosen demographic variable, i.e., prior training on CLABSI prevention, was 2.036 and the obtained p value was 0.417, which was not significant at the 0.05 level of significance. This shows that after administering a structured teaching programme on CLABSI prevention, there was no significant association between nursing officers' post-test knowledge scores and their prior CLABSI training.

Also, regarding the association between post-test knowledge scores and years of experience in intensive care units (ICU), the calculated Fisher's exact value was 2.770 and the obtained p value was 0.272, which was significant at 0.05 level of significance. This also indicates that there was no significant association between years of experience in intensive care units (ICU) and post-test knowledge scores among nursing officers after the administration of the structured teaching programme on CLABSI prevention.

Discussion

The primary goal of the current research was to evaluate nursing officers' knowledge of CLABSI prevention. The information was gathered using a structured knowledge questionnaire about CLABSI prevention in a chosen hospital in Delhi NCR.

According to the current study, 10 nursing officers had inadequate knowledge, 17 (56.66%) had somewhat adequate knowledge, and just 3 (10%) had adequate knowledge. The findings of the present study are in agreement with those of a similar study performed by Kokila[2] on the Staff Nurses of a specific hospital in Dharmapuri in terms of knowledge and skill. A maximum of 15 staff nurses (or 50%) had average knowledge, 6 (20%) had insufficient knowledge, and only 9 (30%) had appropriate knowledge, according to the results. The post-test knowledge score revealed that overall, 17 samples (or 56.7%) had sufficient knowledge, 13 samples (or 43.3%) had average knowledge, and none of the samples had insufficient knowledge.

The data of the present research shows that the mean score of pre-test knowledge of nursing officers regarding CLABSI prevention was 16.56 with an SD of 3.901 and in the post-test, the mean score was 20.23 with an SD of 3.3. The mean difference was 3.67 with 't' value 8.30. The findings of the current study fall in line with the previous study done by Gowhar[3] to evaluate staff nurses' expertise in Jammu and Kashmir regarding CLABSI. The findings indicated that 21 staff nurses (70%) had insufficient knowledge of bloodstream infections linked with central lines. The mean value of their knowledge score was 12.93 ± 4.25.

By utilising Fisher's exact test, the current results show that there is no statistically significant correlation between their chosen demographic characteristics, such as prior training in CLABSI prevention and years of ICU work experience. The outcome highlighted the lack of a significant relationship between post-test knowledge scores and chosen demographic variables ($p < 0.05$). The results of this study are consistent with those of a study by Daniel,[4] which examined the effectiveness of a structured training programme for nurses at a specific Bangalore cancer centre on how to care for patients using central venous access devices. The outcome demonstrated that no statistically significant relationship between post-test knowledge outcomes and their chosen demographic variables was found.

The present study revealed that the computed 't' value was 8.30 and the table value of 't' at df (29) was 1.699 at a 0.05 level of significance (95% confidence). This value is highly significant and shows the strong effectiveness of structured teaching programmes regarding CLABSI prevention among nursing officers. Similar results were obtained in a study carried out by Gabriel[5] in which the teaching method was successful, as shown by the statistically paired "t" test result of 8.5 (p value = 0.0001).

The present findings showed that female nursing officers made up the majority of the study sample (73.33%), while male nursing officers made up only 26.66%. This study's conclusion concurs with one by Xu et al.[6] which revealed that the bulk of the study sample (95.2%) consisted of females (14). The distribution of the high proportion of female nurses admitted in study pairs for every five students in universities and other institutions is as follows: (1) male, (4) female.

According to years of experience in ICU, the results illustrated that a higher number of nurses (53.33had more than 5 years of experience in ICU. These findings of the study agreed with research done by Aydoğdu et al.[7] which revealed that 29.7% of the study sample had between two and five years of nursing experience.

Conclusion

The study clearly showed that the knowledge of nursing officers was enhanced by the structured teaching programme. Hence such programmes should be provided to them more often on varying topics.

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Conflict of Interest: None

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