International Journal of Clinical Trials
Shukla A et al. Int J Clin Trials. 2024 May;11(2):117-123
http://www.ijclinicaltrials.com
pISSN 2349-3240 | eISSN 2349-3259
DOI: https://dx.doi.org/10.18203/2349-3259.ijct20240963

Original Research Article

Effectiveness of catheter-associated urinary tract infections bundle approach to reduce urinary catheter associated infection rate among children admitted in Paediatric unit

Anju Shukla[1], Subin S.[1]*, Anugrah Charan[1], Neeraj Aanand[2]

[1]KGMU College of Nursing, Lucknow, Uttar Pradesh, India
[2]Department of Paediatrics, KGMU College of Nursing, Lucknow, Uttar Pradesh, India

Received: 10 January 2024
Revised: 19 March 2024
Accepted: 09 April 2024

***Correspondence:**
Subin S.,
E-mail: subinsudarsanan1990@gmail.com

ABSTRACT

Background: CAUTI bundle care aims to reduce catheter associated urinary tract infection, enhance quality of life and promote comfort. The present study aimed to assess the effect of CAUTI bundle approach on urinary catheter associated infection rate among children admitted in paediatric unit of KGMU.
Methods: Quantitative research approach was done on 46 children who were admitted in paediatric unit, KGMU, Lucknow. Purposive sampling technique was used. Socio demographic was obtained by socio demographic Performa, CAUTI was assessed by urine culture test and symptomatic assessment of UTI.
Results: The result revealed that on the basis of urine culture results, in exposed group majority of the children that is 18 (78.26%) was sterile and rest 5 (21.73%) was infected and in unexposed group 13 (56.52%) children was sterile and remain 10 (43.47%) was infected. And on the basis of symptomatic assessment for CAUTI, in exposed group majority of the children that is 17 (73.91%) are less symptomatic and remain 6 (26.08%) was more symptomatic for CAUTI and in unexposed group most of the children that is 14 (60.86%) was less symptomatic for CAUTI and rest 9 (39.13%) was more symptomatic for CAUTI.
Conclusions: CAUTI bundles approach provides evidence-based prevention practices and strategies to reduce CAUTI. The present study found that CAUTI bundle care was effective in reducing CAUTI in children.

Keywords: Catheter associated urinary tract infection, CAUTI bundle approach, Paediatric unit

INTRODUCTION

In infancy, urinary tract infection occurs equally in boys and girls. After the first year; urinary tract infections are more common in girls than in boys. In younger children, the classic symptoms of urinary tract infections are not elicited. Infants and toddlers often present nonspecific symptoms of unexplained fever, abdominal pain, diarrhoea and irritability. Urinary tract infection should be considered in young children who have unexplained, persistent fever.[1] Urinary tract infection is a common medical problem in children, affecting 3-10% girls and1-3% boys. They are an important cause of morbidity and might result in renal damage. Beyond infancy, the incidence of UTI is higher in girls. During infancy, UTI are equally common in boys and girls because the route of infection is often hematogenous and boys have a higher incidence of urinary tract anomalies. Urinary catheterization is one of the most common procedures performed in hospitals. The urinary catheter is considered as a single biggest risk factor for acquired urinary tract infection and more than 80% of all acquired UTIs are

attributable to catheter use.[2] The prevalence of UTI was 33.54% of which 66.78% was female and remain 33.22% were from male. The most of the causes are E. coli and klebsiella pneumoniae. Repeated infections, fever, pain, irritability and impairment of kidney functions all the seen as effects of UTI on our health.[3] As per the CDC guidelines 2009, more than 30% cases of catheter associated urinary tract infection are reported by acute care hospitals and the cause for catheter associated UTI was infection, insertion of urinary catheter and instrumentation of the urinary tract.[4]

Urinary tract infection is a common medical problem in children, the incidence of CAUTI in Worldwide is ranged between 13.7-23.5% In paediatric as per the analysis of the global burden of disease study 2019 and the incidence of CAUTI in India is ranged between 8.3-12.1% in paediatric as per the National Healthcare Safety Network and health care associated infection surveillance in India. The urinary catheter is considered as a single biggest risk factor for acquired urinary tract infection and more than 80% of all acquired UTIs are attributable to catheter use. In most cases, UTI are caused by *E. coli* that forms the predominant periurethral flora, and uncommonly by *Klebsiella*, *Enterobacter* and *Staphylococci* epidermidis.[5] Urinary symptoms may be found as frequency and urgency, dysuria, dribbling and bed wetting. Urine may be foul smelling. The child may complain abdominal or flank or suprapubic pain.[6]

As per the CDC guidelines for the prevention of catheter associated urinary tract infection, firstly assess the need for urinary catheterization and try to minimize the use of urinary catheter as it may develop the risk of infection specially to female patients and then perform the hand hygiene and only the trained or expert is allowed to insert the urinary catheter to the patients by following aseptic technique, after insertion secure the urinary catheter to prevent movement or any traction and maintain the unobstructed urine flow by keeping the urinary bag below the level of urinary bladder and avoid touching of the urinary bag to the floor and it is very important to empty the urinary bag daily at same interval to measure the urine output by following the aseptic technique such as wearing of PPE equipment's (mask, gloves, gown, shoe cover, head cap and eve glass) and lastly the most important step is to document all the data regarding urinary catheterization.[4]

Objectives

Primary objective was to assess the effect of Catheter associated urinary tract infection (CAUTI) bundle approach on urinary catheter associated infection rate among children admitted in paediatric unit of KGMU. Secondary objectives were to assess the post interventional catheter associated urinary tract infection rate among children in exposed and unexposed group, To compare the pre and post interventional catheter associated urinary tract infection rate between exposed and unexposed group of children admitted in paediatric unit, To find out the number of CAUTI cases and their causative organism between exposed and unexposed group of children admitted in paediatric unit and To find out the significant association between pre interventional status of catheter associated urinary tract infection rate among children with selected demographic variables.

METHODS

Research approach, design, study variables, setting, population and duration

Quantitative research approach was followed. Prospective cohort research design was employed.

Table 1: Study procedure.

Parameters	Yes	No
Assess whether catheter is needed?	-	-
Did you examine the perineal area before inserting urinary catheter?	-	-
Hand hygiene was performed to manipulate catheter or drainage system?	-	-
Gloves were used for manipulate catheter or drainage system?	-	-
Did you change the urinary catheter within 7days of insertion?	-	-
Did you documented the reason of changing urinary catheter? If any.	-	-
Catheter and tubing are free from kinks and well secured?	-	-
Catheter has been continuously connected to tubing?	-	-
Urine is draining well that is no obstruction or blockage noted?	-	-
Drainage bag is below the level of bladder and does not touch the floor?	-	-
Drainage bag was emptied regularly into a clean container with no contact between the container and drainage spout?	-	-
Did you document the intake and urine output for 24hours?	-	-
Perineal cleansing was provided at least once daily.	-	-
Did you document the date and time and any findings of the procedure?	-	-
Did you perform urine culture assessment test to measure the effectiveness of CAUTI bundle care?	-	-

Independent variable was CAUTI bundle care and Dependent variable was Catheter associated urinary tract infection. Study setting was Paediatric medicine. Children with urinary catheter was taken as study population. Study duration was from January 2022 to June 2023.

Target and accessible population

Children with urinary catheter admitted in KGMU, Lucknow. Children admitted in paediatric medicine unit of KGMU, Lucknow, was accessible population.

Sample size and sampling technique

Sample size was 46. Sampling technique was non probability purposive sampling technique

Tools for data collection, data analysis and intervention

Tool 1-Self structured questionnaire which includes demographic and clinical variable. Tool 2-Self structured questionnaire which includes symptomatic assessment of infection. Tool 3-Urine culture test. Descriptive and inferential statistics was used for data analysis. Intervention was pre-test followed by intervention followed by post-test.

Inclusion criteria

The study included the participants who were; Children below 15 years of age group, Children requiring indwelling urinary catheter or freshly urinary catheterized children, Children who are admitted in paediatric unit of KGMU, Lucknow and Children who willing to participate in the study.

Exclusion criteria

The study excluded Participants who were; Children who do not need urinary catheterization and Children who are showing the symptoms of UTI and positive urine culture report.

Data collection process

In data collection process, systematic methods were used for gathering information relevant to the research. In this study, data collection was done from 26.01.2023 to 27.03.2023 in paediatric department KGMU, Lucknow. Firstly, ethical permission was obtained from concerned authority.

Sample was selected by purposive sampling technique according to inclusion criteria. Self-introduction and purpose of the study was explained to the subjects. Obtained demographic data from the parents and child. Assessed the symptoms of catheter associated urinary tract infection with the help of symptomatic assessment and urine culture test. Assessed the symptoms of catheter associated urinary tract infection after the CAUTI bundle implementation with the help of symptomatic assessment and urine culture test.

RESULTS

Distribution of participants based on their demographic variable in exposed and unexposed group

The study finding shows that in exposed group percentage distribution of samples according to their age, the majority of samples 43.47% children were in the age group of 0-3 years, 34.78% in 4-7 years and 21.23% children were in 8-11 years of age group. Percentage distribution of samples according to their gender shows that most of the samples 65.21% children were male and remain 34.78% were female. In unexposed group percentage distribution of samples according to their age, the majority of samples 43.47% children were in the age group of 0-3 years, 34.78% in 4-7 years and 21.23% children were in 8-11 years of age group. Percentage distribution of samples according to their gender shows that most of the samples 52.17% children were male and remain 47.82% were female.

Table 2: Distribution of participants based on their demographic variable in exposed and unexposed group (n=46).

Demographic data	Exposed group (n=23)		Unexposed group (n=23)	
	N	%	N	%
Age (years)				
0-3	10	43.47	10	43.47
4-7	08	34.78	08	34.78
8-11	05	21.73	05	21.73
12-15	00	00	00	00
Gender				
Male	15	65.21	12	52.17
Female	08	34.78	11	47.82

Distribution of participants based on their clinical variable in exposed and unexposed group

The study finding shows that in exposed group percentage distribution of samples according to their suffering from any disease shows that majority of samples 60.86% from any other disease, 30.43% children were suffering from pelvic infection and rest 8.69% children were suffering from pyelonephritis. Percentage distribution of samples according to their previous history for admission to hospital shows that most of the samples 86.95% from no category and remain 13.04% samples from yes category. Percentage distribution of samples according to their nutritional status of the child shows that majority of samples 82.60% from parenteral feeding category and remain 17.39% children from enteral feeding category. In exposed group percentage distribution of samples according to their suffering from any disease shows that majority of samples 69.56% from any other disease, 21.73% children were suffering from pelvic infection and rest 8.69% children were suffering from pyelonephritis. Percentage distribution of samples according to their previous history for admission to

hospital shows that most of the samples 86.95% from no category and remain 13.04% samples from yes category. Percentage distribution of samples according to their nutritional status of the child shows that majority of samples 86.95% from parenteral feeding category and remain 13.04% children from enteral feeding category.

Table 3: Distribution of participants based on their clinical variable in exposed and unexposed group (n=46).

Clinical variable	Exposed group (n=23)		Unexposed group (n=23)	
	N	%	N	%
Is the child is suffering from any of the disease				
Hydronephrosis	00	00	00	00
Pyelonephritis	02	08.69	02	08.69
Appendicitis	00	00	00	00
Kawasaki disease	00	00	00	00
Pelvic infection	07	30.43	05	21.73
Other	14	60.86	16	69.56
The child is admitted previously to the pediatric unit				
Yes	03	13.04	02	08.69
No	20	86.95	21	91.30
Nutritional status of the child				
Enteral feeding	04	17.39	03	13.04
Parenteral feeding	19	82.60	20	86.95

Pre bundle and post bundle urinary catheter related features in exposed and unexposed group

The study finding shows that in exposed group percentage distribution of samples according to their catheter change frequency and reason for catheter withdrawal shows that all the samples in both exposed and unexposed group were from unchanged category.

Comparison of catheter associated urinary tract infection by symptomatic assessment between exposed and unexposed group

Comparison of catheter associated urinary tract infection by symptomatic assessment between exposed and unexposed group. In the symptomatic assessment which was consist of ten parameters such as temperature, pulse, respiration, blood pressure, pain, suprapubic tenderness, frequency and urgency, dysuria, dribbling and foul smelling in which for each parameter in normal range provide one point and for each parameter which is deviated from normal ranges provide 0 point. In exposed group after the assessment the mean of exposed group was 7 in pre-test and 8 in post-test, standard deviation is 0.83 in pre-test and 1.02 in post-test and t value by paired t test was 8.68. In unexposed group the mean in pre-test was 7 and in post-test was 7.3 and standard deviation is 0.73 in pre-test and 0.92 in post-test and the calculated t value 3.12 which is less than the tabulated table value at the level of 0.05 level of significance that is 2.07.

Table 4: Comparison of culture results in exposed and unexposed group (n=46).

Culture result	Exposed group (n=23)		Unexposed group (n=23)	
	N	%	N	%
Sterile	18	78.26	13	56.52
Infected	05	21.73	10	43.47

Comparison of culture results in exposed and unexposed group.

The study finding shows that in the exposed group 78.26% children were sterile and remain 21.73% children were infected after the CAUTI bundle care application. In the unexposed group 56.52% children were sterile and remain 43.47% cchildren were infected without CAUTI bundle care application.

Table 5: Etiological organism in exposed and unexposed group (n=46).

Etiologic organism	Exposed group (n=23)		Unexposed group (n=23)	
	N	%	N	%
Candida albicans	03	13.04	03	13.04
E. coli	02	8.69	04	17.39
Candida parasitosis	00	00	02	8.69
Candido tropicalist	00	00	01	4.34
Sterile culture report	18	78.26	13	56.52

Etiological organism in exposed and unexposed group

The study finding shows that in the exposed group 13.04% children were infected by candida albicans, 8.69% children infected by *E. coli*, and remain 78.26% children are sterile. In the unexposed group 13.04% children were infected by candida albicans, 17.39% children were infected by E. coli, 8.69% children were infected by candida parasitosis, 4.34% children were infected by candida tropicalist and remain 56.52% children are sterile.

Association between pre interventional CAUTI bundle care with selected demographic variable in exposed group

The study finding shows the description on association between pre-symptomatic assessment of symptoms of catheter associated urinary tract infection in exposed group with selected demographic variables. The finding shows that there was association found between the pre-test symptomatic assessment with demographic variable

like gender of children (X^2=4.01) as calculated value of chi square is more than the table value (3.84). Hence the research hypothesis (H_2) was accepted in relation to Gender of children. The data also explains that there is no any significant association was found between the pre symptomatic assessment of catheter associated urinary tract infection and other demographic variables like Age (0.18) (p=5.99), Religion (3.01) (p=3.84), Education (1.55) (p=7.82) and Income per month (3.85) (p=5.99).

Table 6: Association between pre interventional CAUTI bundle care with selected demographic variable in exposed group (n=23).

Demographic variables	Symptomatic assessment		Statistical significance		
	Less symptomatic	More symptomatic	Df	X^2	P value
Age (years)					
0-3	7	3	2	0.18	5.99
4-7	6	2			
8-11	4	1			
Gender					
Male	13	2	1	4.01	3.84
Female	4	4			
Religion					
Hindu	17	5	1	3.01	3.84
Muslim	0	1			
Education					
Illiterate	1	1	3	1.55	7.82
Primary education	6	3			
Graduate	9	2			
Post graduate	1	0			
Income per month					
10,001-15,000	2	3	2	3.85	5.99
15,001-20,000	9	2			
20,000 and above	6	1			

Association between pre interventional CAUTI bundle care with selected demographic variable in unexposed group

The study finding shows that there is no any significant association found between the pre-symptomatic assessment of catheter associated urinary tract infection with their selected demographic variables in unexposed group.

Age (0.14) (p=5.99), Gender (0.38) (p=3.84), Religion (1.38) (p=3.84), Education (2.42) (p=7.82) and Income per month (0.47) (p=5.99).

DISCUSSION

The findings of the study showed that there was significant effect of CAUTI bundle care in reduction of catheter associated urinary tract infection.

The findings of the study were also found to have the same result in many research studies. Thus, given H_1 of the study is proven.

Distribution of participants based on their demographic variable in exposed and unexposed group

The study finding shows that in exposed group percentage distribution of samples according to their age, the majority of samples 43.47% children were in the age group of 0-3 years, 34.78% in 4-7 years and 21.23% children were in 8-11 years of age group. Percentage distribution of samples according to their gender shows that most of the samples 65.21% children were male and remain 34.78% were female. Percentage distribution of samples according to their religion shows that most of the samples 95.65% from Hindu category and remain 4.34% from Muslim category. Percentage distribution of samples according to their educational status shows that majority of samples 47.82% from graduate category, 39.13% from primary education, 8.69% children from illiterate category and rest 4.345 from post graduate category. Percentage distribution of samples according to their income per month shows that majority of samples 52.17% from 15,001-20,000, 30.43% from 20,001 and above category and rest 17.39% children from 5000-10,000/ month income category. Percentage distribution of samples according to their previous history of UTI shows that 100% children from no previous history of UTI category. In unexposed group percentage distribution of samples according to their age, the majority of samples 43.47% children were in the age group of 0-3 years, 34.78% in 4-7 years and 21.23% children were in 8-11 years of age group. Percentage distribution of samples according to their gender shows that most of the samples 52.17% children were male and remain 47.82% were female. Percentage distribution of samples according to their religion shows that majority of the samples that is 69.56% children from Hindu category and remain 30.43% from Muslim category. Percentage distribution of samples according to their educational status shows that majority of samples 47.82% from

graduate category, 39.13% from primary education, 8.69% children from illiterate category and rest 4.345 from post graduate category. Percentage distribution of samples according to their income per month shows that most of the samples 39.13% from 15,001-20,000, 30.43% children from 10,001- 15,000/ month income category, and rest 30.43% from 20,001 and above category. Percentage distribution of samples according to their previous history of UTI shows that 100% children from no previous history of UTI category.

Comparison of catheter associated urinary tract infection by symptomatic assessment between exposed and unexposed group

Comparison of catheter associated urinary tract infection by symptomatic assessment between exposed and unexposed group. In the symptomatic assessment which was consist of ten parameters such as temperature, pulse, respiration, blood pressure, pain, suprapubic tenderness, frequency and urgency, dysuria, dribbling and foul smelling in which for each parameter in normal range provide one point and for each parameter which is deviated from normal ranges provide 0 point. In exposed group after the assessment the mean of exposed group was 7 in pre-test and 8 in post-test, standard deviation is 0.83 in pre-test and 1.02 in post-test and t value by paired t test was 8.68. In unexposed group the mean in pre-test was 7 and in post-test was 7.3 and standard deviation is 0.73 in pre-test and 0.92 in post-test and the calculated t value 3.12 which is less than the tabulated table value at the level of 0.05 level of significance that is 2.07.

Comparison of culture results in exposed and unexposed group

The study finding shows that in the exposed group 78.26% children were sterile and remain 21.73% children were infected after the CAUTI bundle care application. In the unexposed group 56.52% children were sterile and remain 43.47% cchildren were infected without CAUTI bundle care application.

Etiological organism in exposed and unexposed group

The study finding shows that in the exposed group 13.04% children were infected by candida albicans, 8.69% children infected by E. coli, and remain 78.26% children are sterile. In the unexposed group 13.04% children were infected by candida albicans, 17.39% children were infected by *E. coli*, 8.69% children were infected by candida parasitosis, 4.34% children were infected by candida tropicalist and remain 56.52% children are sterile.

Association between pre interventional CAUTI bundle care with selected demographic variable in exposed group

The study finding shows the description on association between pre-symptomatic assessment of symptoms of catheter associated urinary tract infection in exposed group with selected demographic variables. The finding shows that there was association found between the pre-test symptomatic assessment with demographic variable like gender of children (X^2=4.01) as calculated value of chi square is more than the table value (3.84). Hence the research hypothesis (H_2) was accepted in relation to Gender of children. The data also explains that there is no any significant association was found between the pre symptomatic assessment of catheter associated urinary tract infection and other demographic variables like Age (0.18) (p=5.99), Religion (3.01) (p=3.84), Education (1.55) (p=7.82) and Income per month (3.85) (p=5.99).

Association between pre interventional CAUTI bundle care with selected demographic variable in unexposed group

The study finding shows that there is no any significant association found between the pre-symptomatic assessment of catheter associated urinary tract infection with their selected demographic variables in unexposed group; Age (0.14) (p=5.99), Gender (0.38) (p=3.84), Religion (1.38) (p=3.84), Education (2.42) (p=7.82) and Income per month (0.47) (p=5.99). Thus, the findings of the study showed that there was significant effect of CAUTI bundle care in reduction of catheter associated urinary tract infection. Thus, the H_1 of this research study is accepted and the findings of the study were also found to have the same result in many research studies. As per the study conducted in 2022 to evaluate the 2-year rates of CAUTI (catheter associated urinary tract infection) in paediatric ICU and the sample used for this study was 390 patients of Turkey. The duration of the study was two year that is from July 2013 to July 2015. The samples were selected by their consent and diagnostic criteria. The result of the study in pre-bundle was 8 (2.2%) patients of urinary colonization, 10 (2.8%) patients of contamination and in post-bundle 3 (0.8%) patients of urinary colonization and 6 (1.5%) patients of contamination found in the study. So, by this result am able to calculate that there is a statistically significant difference was found between the pre-bundle and post-bundle rates for catheter associated urinary tract infection. By this result am able to conclude that the application of CAUTI bundle care was effective to reduce catheter associated urinary tract infection and nurses must follow these types of practices to reduce the risk of infection, hospitalization and this will also beneficial for the parents in terms of financial, time and reduction in stress level.[3] As per the study conducted in 2022 to evaluate the 2-year rates of CAUTI (catheter associated urinary tract infection) in paediatric ICU and the sample used for this study was 390 patients of Turkey. The duration of the study was two year that is from July 2013 to July 2015. The samples were selected by their consent and diagnostic criteria. The result of the study in pre-bundle was 8 (2.2%) patients of urinary colonization, 10 (2.8%) patients of contamination and in post-bundle 3 (0.8%) patients of urinary colonization and 6 (1.5%) patients of contamination found in the study. So, by this result am able to calculate that there is a statistically significant difference was found between the pre-bundle

and post-bundle rates for catheter associated urinary tract infection. By this result am able to conclude that the application of CAUTI bundle care was effective to reduce catheter associated urinary tract infection and nurses must follow these types of practices to reduce the risk of infection, hospitalization and this will also beneficial for the parents in terms of financial, time and reduction in stress level.[7]

A study conducted in 2022 to assess the effectiveness of CAUTI bundle care to reduce Catheter-associated urinary tract infections as it is a leading cause of health care-associated infection. In this study Catheter insertion bundles (IBs) and maintenance bundles (MBs) have been developed to prevent CAUTIs. After the introduction of the paediatric CAUTI IBs and MBs, CAUTI rates across the network decreased 61.6%, from 2.55 to 0.98 infections per 1000 catheter-line days. So, as per the results we can say that the catheter insertion and urinary catheter maintenance bundle is an effective measure to reduce the rate of infection among patients and as a student nurse we have to spread the awareness and also educate the clinical nurses by the lecture, demonstration and video teaching methods regarding urinary catheter care as this will help to reduce the incidence of infectious cases and also helpful in providing quality care to the patients.[8] As per the study conducted in 2020 to eliminate catheter-associated urinary tract infections in a paediatric cardiac ICU.

In this study Quality improvement methodology and the setting is used in this study is Twenty-five bed cardiac ICU in a quaternary freestanding children's hospital. All children with an indwelling urinary catheter admitted to the cardiac ICU are taken as samples for the study. The duration for providing care to the patients was 3days in which they care the child of urinary catheterization with bundle care that is insertion and maintenance bundle care for urinary catheterization they followed the protocols for urinary catheterization such as need based insertion, maintenance of leakage, daily assessment of UTI symptoms and removal of urinary catheter and after that they performed a post-test in which they assessed for the improvement and change in patients condition. They concluded in their study that by the effective use of CAUTI bundle care there are reduced in the cases of catheter associated urinary tract infection.[9]

Limitations

Some limitation was found by the researcher during the research study period such as study was conducted in a single setting on a small sample size and the intervention, assessment, implementations and evaluation were done by the same person.

CONCLUSION

From the finding of the study, it has been observed that CAUTI bundle care is helpful to reduce catheter associated urinary tract infection. Similar like above studies, there was reduction in number of CAUTI cases. The perineal care of catheterized children is one of the most critical nursing interventions. Critical care units must balance the competing demands of maintaining a high-tech environment while providing quality treatment to the hospital's sickest children.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sharma R. Essential of Pediatric Nursing. India: Jaypee; 2013:289-456.
2. Lewis M, Sharon E. Medical Surgical Nursing, Assessment & Management of clinical problems. 3rd ed. Missouri; Mosby Publishers. 2014;1167-73.
3. Pardeshi P, Prevalence of urinary tract infections and current scenario of antibiotic susceptibility pattern of bacteria causing UTI. Indian J Microbiol Res. 2018; 5(3):334-8.
4. Wong ES. Guideline for prevention of catheter-associated urinary tract infections. Am J Infect Control. 1983;11(1):28-36.
5. Pal P. Textbook of Paediatric Nursing. 1st ed. New Delhi; Jaypee; 2016;329-30.
6. Paul K, Bagga V, Ghai A. Essential of paediatric. 9th ed. New Delhi: CBS Publisher & Distributors pvt ltd. 2016;478-9.
7. Sonmez DD, Bozkurt G, Uysal G, Yakut T. The Effects of Bundles on Catheter-Associated Urinary Tract Infections in the Pediatric Intensive Care Unit. CNS. 2016;30(6):341-6.
8. Foster CB, Ackerman K, Hupertz V, Mustin L, Sanders J, Sisson P, et al. Catheter-Associated Urinary Tract Infection Reduction in a Pediatric Safety Engagement Network. Pediatrics. 2020;146(4): e20192057.
9. Bigelow AM, Koh W, Kinstler A, Conn SM, Geiser L, Wright CC, et al. Eliminating Catheter-Associated Urinary Tract Infections in a Pediatric Cardiac ICU. Pediatr Crit Care Med. 2020;21(9):e819-26.

Cite this article as: Shukla A, Subin S, Charan A, Aanand N. Effectiveness of catheter-associated urinary tract infections bundle approach to reduce urinary catheter associated infection rate among children admitted in paediatric unit. Int J Clin Trials 2024;11(2):117-23.