



Effectiveness of betadine versus normal saline for catheter care on occurrence of urinary tract infection among patients with indwelling catheter in ICUS of a tertiary care hospital

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Abstract

Hospital acquired infection is an infection whose development is favoured by a hospital environment. Most hospital acquired infections are associated with catheterization.

Material and Method: A Randomized Controlled Trial was used to assess the effectiveness of Betadine versus Normal Saline for catheter care on occurrence of urinary tract infection among patients with indwelling catheter in ICUs of DMCH, Ludhiana. Total 30 patients with indwelling catheter were drawn from the target population by using random sampling technique.

Results: The finding of present study revealed that statistically non-significant results were found for urinary tract infection.

Conclusion: Betadine 10% and Normal saline 0.9% both can be recommended for catheter care in reducing the occurrence of urinary tract infection in clinical practice.

Keywords: betadine, normal saline, catheter care, urinary tract infection

Introduction

Urinary tract infection associated with urinary catheter is an infection (lower urinary tract and upper urinary tract) in patient who had indwelling catheter in place within 48 hours of admission. Bacteria and yeast including those naturally occurring as the part of microbium can grow within the bio film that forms along the surface of urinary catheter. Under normal circumstances urethral flora, which tends to migrate into the bladder, is constantly flushed out during urination. When catheter is inserted, this flushing mechanism is circumvented and perineal and urethral flora can pass up into the bladder in the fluid layer between the outside of the catheter and the urethral mucosa or in the urine in the catheter lumen (i.e., endogenous). Because of this, bladder colonisation is inevitable if catheters are left in place for prolonged periods. In addition, bladder infection can be caused by bacterial reflux from contaminated urine in the drainage bag. Closed drainage systems reduce onset of infection by limiting access of bacteria to the urine. Hands of personnel may also contaminate the urinary catheter system during insertion or management (i.e., exogenous). Healthcare-associated UTIs are more resistant to antibiotics. This is because hospitalised patents become colonised with resistant microorganisms, a process encouraged by an increased length of stay and exposure to antibiotics. E. coli is the most frequent cause of catheter-associated UTI (CAUTI). However, increasingly, CAUTIs are caused by more resistant Gram-negative species, including Klebsiella and Pseudomonas, as well as resistant E. coli. Similarly, ampicillin-resistant Enterococcus and vancomycin-resistant E. Faecium are becoming common. With additional antibiotic exposure, infections occur with multiply drug resistant bacteria. Resistant microorganisms may also be acquired by transfer from other patents, most commonly via contaminated staff hands, but sometimes from environmental sources. Urine and urinary catheter systems should be carefully disposed of, bottles and jugs cleaned and disinfected, and hands properly washed and decontaminated during insertion and management. This leads to the infection in the bladder, kidneys and others organs connected to the urinary tract. CAUTI can leads to complication such as prostatitis, epididymitis, and orchitis in men and cystitis, pyelonephritis, gram negative bactermia, endocarditis, vertebral osteomyelitis, septic arthritis, endophthalmitis and meningitis in all patients. Additional infectious complications usually identified in patients with chronic indwelling catheter, obstruction, bladder urolithiasis, purulent urethritis, gland abscesses and for male prostatitis. CAUTI causes discomfort to the patients, prolonged hospital stay, increased cost and mortality. UTIs are easily treated by antibiotic & it inhibits the aggressive measures for their prevention and recognition. UTI is a main cause of secondary bloodstream

infections, responsible for 0.5% to 4% of these infections. In few studies it was found that bacteriuria had associated with an almost three fold higher chance of dying than for patients without bacteriuria. Indwelling catheters are generally considered short terms if they are in-situ for less than 30 days and chronic long term when in-situ for 30 days or more. Several evidences based guidelines provide recommendations for the development and maintenance of prevention program for CAUTI. Approaches to the prevention include avoidance of catheter use, policies for catheter insertion and maintenance. Meatal cleaning should be performed regularly to ensure that the meatus is free from encrustation. There are various solutions for use catheter maintenance like normal saline, Betadine, chlorohexidine, etc. There are various Strategies to reduce urinary tract infection drink or give plenty of fluid or water. This is because regular urination can flush bacteria from the urinary tract infection. One study examined participants with long term urinary catheters and found that low urine output was associated with an increased risk of developing a UTI. Use of appropriate urinary catheter, utilize proper techniques for urinary catheter insertion, select catheter material carefully, do catheter care with Betadine, Normal saline, chlorohexidine, soap and water to clean the urethral meatus to reduce the occurrence of urinary tract infection. Healthcare personnel performing urinary catheterization should receive training on correct procedures for insertion and maintenance of urinary catheters based on local written protocols.

Material and Methods

Research approach involves the description of the plan to investigate the phenomenon under study in a qualitative (unstructured) or a quantitative (structured) or a combination of two methods. For the present study quantitative research approach was used. The research design for the present study was Randomized Controlled Trial.

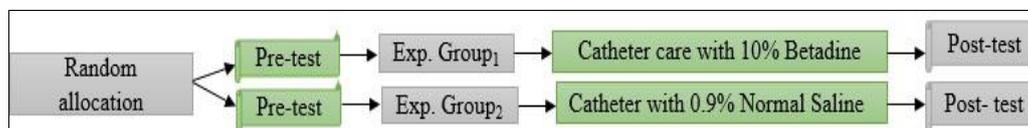


Fig 1: Randomized controlled trial

Table 1: Frequency and percentage distribution of patients with indwelling catheter among experimental group₁ and experimental group₂ as according to urine culture report after 48 hours of catheterization and after 7 days of enrolment N=30

Urine culture	Frequency (%)				x2 Statistics	
	After 48 hours of catheterization		7 th day of enrolment		After 48 hours of catheterization and after 7 days of enrolment	
	Exp gp ₁	Exp gp ₂	Exp gp ₁	Exp gp ₂	Exp gp ₁	Exp gp ₂
Positive	1(6.7)	0	4(26.7)	3(20)	2.160	3.333
Negative	14(93.3)	15(100)	11(73.3)	12(80)	df=1 p=0.330 ^{NS}	df=1 p=0.224 ^{NS}
x2 Statistics	1.034 df=1 p=1 ^{NS}		0.186 df=1 p=1 ^{NS}			

NS (Non-significant)

Table-1 depicts the distribution of patients with indwelling catheter among experimental group₁ and experimental group₂ according to urine culture report after 48 hours of catheterization and after 7 days of enrolment, After 48 hours of catheterization, in experimental group₁, majority of the patients i.e. 14 (93.3%) had negative urine culture report and only 1 (6.7%) patient had positive urine culture report, in experimental group₂ (n₂=15) all patients (100%) had negative urine culture report. Hence, statistically non-significant results were found between experimental group₁ and experimental group₂ (p=1). After 7th day of enrolment, in experimental group₁ majority of the patients i.e. 11 (73.3%) had negative urine culture report and 4 (26.7%) patients had positive urine culture report. In experimental group₂ majority of the patients i.e. 12 (80%) had negative urine culture report and 3 (20%) patients had positive urine culture report. Hence, statistically non-significant results were found between experimental group₁ and experimental group₂ (p=1). In experimental group₁, after 48 hours of catheterizations majority of the patients i.e. 14 (93.3%) had negative urine culture report and only 1 (6.7%) patient had positive urine culture report, after 7th day of enrolment majority of the patients i.e. 11 (73.3%) had negative urine culture report and 4 (26.7%) patients had positive urine culture report. Hence, statistically non-significant results were found within experimental group₁ (p=0.330). In experimental group₂, after 48 hours of catheterizations, (n₂=15) all patients (100%) had negative urine culture report and after 7th day of enrolment, majority of the patients i.e. 12 (80%) had negative urine culture report and 3 (20%) patients had positive urine culture report. Hence, statistically non-significant results were found within experimental group₂ (p=0.224). Hence, it is concluded that non-statistically significant difference was found between experimental group₁ and experimental group₂ after 48 hours of catheterization (p=1) and on 7th day of enrolment (p=1) and also non-significant results were found within the experimental group₁ (p= 0.330) and experimental group₂ (p= 0.224) from 48 hours of catheterization till 7th day of enrolment. Thus null hypothesis is accepted according urine

culture report. *I.e.* there will be no significant difference on occurrence of Urinary Tract Infection among the experimental group₁ and experimental group₂.

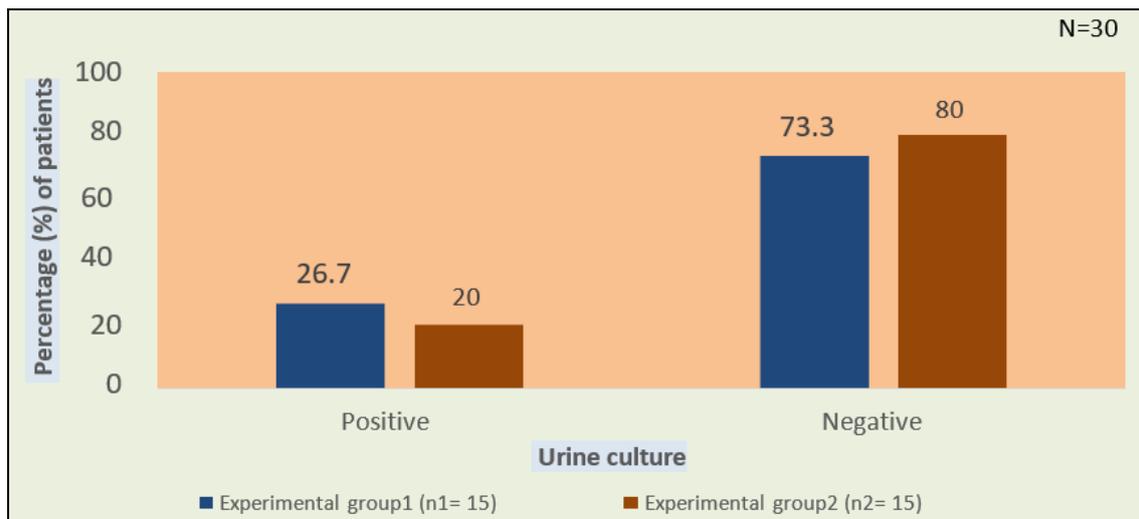


Fig 2: Distribution of patients with indwelling catheter among experimental group₁ and experimental group₂ according to urine culture after 7th day of enrolment

Figure-2 illustrates the distribution of patients with indwelling catheter among experimental group₁ and experimental group₂ according to urine culture after 7th day of enrolment. After 7th day of enrolment, in experimental group₁, 26.7% patients had positive urine culture report and 73.3% patients had negative urine culture report. In experimental group₂, 20% patients had positive urine culture report and 80% patients had negative urine culture report. Thus, it is concluded that after 7th day of enrolment experimental group₁ (10% Betadine) was showing 26.7% positive reports whereas in experimental group₂ (0.9% Normal saline) was showing 20% positive reports. Hence difference was there in urine culture report but it was non-significant.

Major findings of the study

As per socio demographic profile the two groups experimental group₁ and experimental group₂ were statistically identical *i.e.* homogenous ($p > 0.05$) as per their age, gender, habitat, educational status, religion, marital status, dietary habits, occupation and socio economic status. Age mean \pm SD (years) in experimental group₁ is 51.27 ± 17.519 and age mean \pm SD (years) in experimental group₂ is 54.93 ± 18.10472 . In experimental group₁ maximum of patients *i.e.* 53.3 % had diagnosis related to central nervous system and in experimental group₂ maximum of patients *i.e.* 40% had diagnosis related to gastrointestinal system. As per socio clinical profile the two groups experimental group₁ and experimental group₂ were statistically identical *i.e.* homogenous ($p > 0.05$) as per their diagnosis, days of hospitalizations, days of ICU stay, days of immobilizations, BMI, indications of catheterizations, previous experience of being catheterized, previous history of urinary tract infection, comorbidities, bowel incontinence, on ventilator support, GCS score, on medication and any addiction. Mean days of hospitalization \pm SD in experimental group₁ is 4.47 ± 3.815 and in experimental group₂ is 3.47 ± 1.807 , mean days of ICU stay \pm SD in experimental group₁ is 12.80 ± 3.688 and in experimental group₂ is 2.40 ± 1.993 , mean days of immobilization \pm SD in experimental group₁ is 7.0 ± 3.780 and in experimental group₂ is 6.40 ± 3.851 , mean BMI in experimental group₁ is 23.03 ± 3.215 and in experimental group₂ is 24.35 ± 2.978 , mean days of mechanical ventilation \pm SD in experimental group₁ is 3.0 ± 4.192 and in experimental group₂ is 2.33 ± 2.469 . Statistically non-significant results were found for urinary tract infection clinical sign (which include body temperature, pulse rate, suprapubic tenderness, pus discharge, haematuria, bad odor) from D1 (48 hours of catheterization) to D7 (7th day of enrolment) ($p > 0.05$). Statistically non-significant results were found for the mean body temperature within experimental group₁ ($p = 0.431$) and within experimental group₂ ($p = 0.974$) and there was no significant difference between the experimental group₁ and experimental group₂ from D1 (after 48 hours of catheterization) to D7 (7th day of enrolment) ($p > 0.05$). Statistically non-significant results were found for the mean pulse rate within experimental group₁ ($p = 0.937$) and within experimental group₂ ($p = 0.474$) and there was no significant difference between the experimental group₁ and experimental group₂ from D1 (after 48 hours of catheterization) to D7 (7th day of enrolment) ($p > 0.05$). Statistically non-significant results were found for urinary tract infection clinical symptoms (which include perineal irritation and pelvic pressure) there was no significant results found between experimental group₁ and experimental group₂ from D1 (after 48 hours of catheterization) to D7 (7th day of enrolment) ($p > 0.05$). Statistically non-significant results found for Urine routine (pus cells, epithelial cells, bacteria, cast, RBC cells) between experimental group₁ and experimental group₂ ($p > 0.05$) and there was no significant results found for the presence of epithelial cells within experimental group₁ ($p = 0.10$) from 48 hours of catheterization till 7th day of enrolment. There was statistically significant difference was found within experimental group₂ for the presence of epithelial cells ($p = 0.013$) from 48 hours of catheterization till 7th day of enrolment. Thus the null hypothesis is rejected for epithelial cells *i.e.* there will be

no significant difference on occurrence of Urinary Tract Infection among the experimental group₁ and experimental group₂. Statistically non-significant results found for urine culture between experimental group₁ and experimental group₂ after 48 hours of catheterization ($p=1$) and on 7th day of enrolment ($p=1$) and also non-significant results were found within the experimental group₁ ($p= 0.330$) and experimental group₂ ($p= 0.224$) from 48 hours of catheterization till 7th day of enrolment. Thus null hypothesis is accepted according urine culture report. *I.e.* there will be no significant difference on occurrence of Urinary Tract Infection among the experimental group₁ and experimental group₂. After 7th day of enrolment experimental group₁ (10% Betadine) was showing Urinary tract infection in 4 (26.7%) patients whereas in experimental group₂ (0.9% Normal saline) only 3 (20%) patients had Urinary tract infection. After 7th day of enrolment experimental group₁ (10% Betadine) was infected with Streptococcus, Candida SP and E.Coli organism and in experimental group₂ (0.9% Normal saline) was infected with Streptococcus and E.Coli organism only.

Discussion

The finding of present study revealed that statistically non-significant results were found for urinary tract infection clinical sign (body temperature, pulse rate, suprapubic tenderness, pus discharge, pus discharge, haematuria, bad odor), clinical symptoms (perineal irritation, pelvic pressure), urine routine and urine culture ($p>0.05$) except for the presence of epithelial cells in urine routine ($p=0.013$) within the experimental group₂ from D1 (48 hours of catheterization) till D7 (7th day of enrolment). After 7th day of enrolment experimental group₁ (10% Betadine) was showing Urinary tract infection in 4 (26.7%) patients whereas in experimental group₂ (0.9% Normal saline) only 3 (20%) patients had Urinary tract infection. Hence difference was there in urine culture report but it was non-significant. After 7th day of enrolment experimental group₁ (10% Betadine) was infected with Streptococcus, Candida SP and E.Coli organism and in experimental group₂ (0.9% Normal saline) was infected with Streptococcus and E.Coli organism only. Previous experience of being catheterized, in experimental group₂, most of patients *i.e.* 12 (80%) were not any previous experience of being catheterized and remaining patients *i.e.* 3 (20%) patients had previous experience of being catheterized.

Conclusion

The finding of present study concluded that statistically non-significant results were found for urinary tract infection clinical sign (body temperature, pulse rate, suprapubic tenderness, pus discharge, pus discharge, haematuria, bad odor), clinical symptoms (perineal irritation, pelvic pressure), urine routine and urine culture ($p>0.05$) except for the presence of epithelial cells in urine routine ($p=0.013$) within experimental group₂ from D1 (48 hours of catheterization) till D7 (7th day of enrolment). After 7th day of enrolment experimental group₁ (10% Betadine) was showing Urinary tract infection in 4 (26.7%) patients whereas in experimental group₂ (0.9% Normal saline) only 3 (20%) patients had Urinary tract infection. Hence difference was there in urine culture report but it was non-significant. After 7th day of enrolment experimental group₁ (10% Betadine) was infected with Streptococcus, Candida SP and E.Coli organism and in experimental group₂ (0.9% Normal saline) was infected with Streptococcus and E.Coli organism only. Therefore, Betadine 10% and Normal saline 0.9% both can be recommended for catheter care in reducing the occurrence of urinary tract infection.

Conflict of interest

None

Source of funding

Self

Ethical considerations

A written permission was taken from concerned institutional Ethics committee of Hospital and University. The patient/attendants were explained about the study and its objectives in their language and written consent was taken from them. Anonymity of the patients and confidentiality of information was maintained. It was ensured that study did not affect the participants in any way.

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