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Original Research Article

Infection surveillance analysis of catheter associated urinary tract infections in obstetrics and gynecology department of a tertiary care hospital of Central India

Mudita Jain[1], Rituja Kaushal[2]*, Malini Bharadwaj[1]

[1]Department of Obstetrics and Gynecology, [2]Department of Community Medicine, LNMC and RC, Kolar, Bhopal, Madhya Pradesh, India

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***Correspondence:**
Dr. Rituja Kaushal,
E-mail: dr.rituja@gmail.com

ABSTRACT

Background: The prevalence of catheter associated urinary tract infections (CAUTIs) in the catheterized patients in acute care settings (catheter used for <7 days) is 3%-7%, in patients who require a urinary catheter for >7 days, it is up to 25% and it approaches 100% after 30 days. As device related hospital acquired infections are imposing major threats in surgical realm of medical sciences, this study was undertaken with the objective to asses catheter related urinary tract infections magnitude.
Methods: This study was undertaken in a tertiary care setting of Obstetrics and Gynecology Department of a Central Indian city. It is a prospective study conducted over a full year span from April 2016 to March 2017.
Results: CAUTI was calculated as 8.95 per thousand catheter days for the whole study period. Out of the total number of 18 urinary isolates, *E. Coli* and *Enterococcus* species were more commonly implicated.
Conclusions: In order to restraint the enigma, a multidisciplinary integrated approach including periodic training sessions for all health care workers based on bundled care interventions supervisory checklists etc. is needed. Aseptic techniques along with IDSA (Infectious disease society of America) guidelines/other similar protocols are recommended to bring down overall prevalence. Prudent use of antibiotics is to be accorded as per antibiotic stewardship program to combat drug resistance.

Keywords: Bhopal, Bundled care, CAUTI, Infection surveillance, Obstetrics and Gynecology unit

INTRODUCTION

The prevalence of catheter associated urinary tract infections (CAUTIs) in the catheterized patients in acute care settings (catheter used for <7 days) is 3%-7%, in patients who require a urinary catheter for >7 days, it is up to 25% and it approaches 100% after 30 days.[1, 2]

About 17% of the healthcare associated bacteremia are from urinary sources, with an associated mortality of approximately 10%.[2] The rootstock of the pathogens which cause CAUTIs are either endogenous, i.e., via meatal, rectal or vaginal colonization or exogenous, i.e., via the contaminated hands of the healthcare personnel or via contaminated equipment. Microbial pathogens can enter the urinary tract either by the extra-luminal route, along the outside of the catheter, or by the intra-luminal route along the internal lumen of the catheter from the contaminated collection bag or from the catheter drainage tube junction.

As the duration of the catheterization increases, there is the formation of a biofilm which renders the bacteria resistant to antimicrobials and difficult to treat. CAUTIs comprise perhaps the largest institutional reservoir of

nosocomial pathogens, the most important of which are multidrug-resistant Enterobacteriacae, other than Escherichia coli, such as Klebsiella, Enterobacter, Proteus, and Citrobacter; Pseudomonas aeruginosa; A. baummannii; Enterococci and Staphylococci and Candida spp.[2]

Urinary Tract Infections (UTIs) are defined by using symptomatic urinary tract infection (SUTI) criteria or asymptomatic bacteraemic UTI (ABUTI) criteria. UTIs that are catheter-associated (i.e., in which the patients have an indwelling urinary catheter at the time of or within 48 hours before the onset of the event) are reported by using diagnostic criteria as per the CDC guidelines.[2]

Surveillance and supervision programs which involve bundled care intervention (infection control practices) in hospitals do bring the rates of CAUTIs down. About 17%-69% of the CAUTIs may be prevented by taking the recommended infection control measures.[3] So after considering above mentioned facts and figures this study was undertaken with following objectives.

Objectives of present study were to calculate yearly CAUTI rates in the Obstetrics and Gynecology unit of the hospital, to impart bundled care interventions based infection control training sessions (periodically) to health care workers and to recognize the microbiological profile of CAUTI associated pathogens.

METHODS

It was a prospective observational study carried out at Obstetrics and Gynecology department of a 760 bedded tertiary care hospital of Central India. Whole department is divided into 3 units under various consultants.

Study population were IPD patients of all 3 units of Obstetrics and Gynecology department with indwelling urinary catheter. Study was conducted for a period of 1 year (from April 2016 to March 2017). All the patients following inclusion criteria were included in the study.

Denominator data was gathered from hospital infection control registers of the respective units. Numerator data was picked from bacteriology register of microbiology laboratory of the hospital. All the positive patients were verified retrospectively and were assessed as per WHO/CDC/NHSN guidelines.

Side by side training sessions based on bundled care interventions supervisory checklist and other infection prevention methods were imparted to the health care workers. Due infection preventive care was taken during pre, intra and post-operative stay of the patient in the hospital. The laboratory evidence such as TLC/DLC, culture reports (repeat isolation of same bacterial strain), and other investigations like previous urological findings were correlated with the clinical findings such as temperature, pulse rate, blood pressure, and any other specific symptoms to assess infection or colonization. Antibiotic susceptibility testing was carried out following Clinical Laboratory Standards Institute (CLSI) guidelines using the Kirby-Bauer method.[4-6]

The patients who were studied for diagnosis of CAUTI had an indwelling catheter in situ or indwelling catheter removed <7 days of onset of symptoms or symptoms appearing 48 h after insertion of catheter. A diagnosis of symptomatic UTI was made when patient had at least one of the following signs or symptoms with no other recognizable cause: Fever ≥38.8°C, urgency, frequency, dysuria, or suprapubic tenderness and patient had a positive urine culture, that is, $\geq 10^5$ microorganisms/ml of urine with no more than two species of microorganisms. The diagnosis of asymptomatic bacteriuria was made when patient had an indwelling urinary catheter within 7 days before the culture and patient had a positive urine culture, that is, $\geq 10^5$ microorganisms/ml of urine with no more than two species of microorganisms and patient with no fever (38.8°C), urgency, frequency, dysuria, or suprapubic tenderness. In our study, for diagnosis of CAUTI, asymptomatic bacteriuria was included as all the patients had Foley's catheter in situ.[4-6]

Inclusion criteria

All female IPD patients belonging to various age groups of above mentioned departments with indwelling urinary catheters admitted in various units in the study duration. All those IPD patients with available baseline data and who were in routine surveillance for the various surgeries were included.

Exclusion criteria

All those IPD patients who had indwelling catheters inserted in some other hospital and were shifted in our study setting for further management purposes. All those patients who were not fitting the WHO/CDC/NHSN definition of CAUTI patients. All those patients who were not the part of follow up.

Statistical analysis

CAUTI per thousand catheter days formula= [Total number of laboratory confirmed UTI cases ÷Total number of indwelling urinary catheter days] × 1000.

Microsoft Excel worksheets were used for calculation purposes.

RESULTS

From April 2016 to March 2017 there were total 5851 IPDs in Obstetrics and Gynecology department with total

29,472 days. Average length of stay calculated was approximately 5 days per patient.

Table 1: Distribution of catheter associated urinary tract infections per thousand catheter days on monthly basis in Obstetrics and Gynaecology department.

Name of month	No. of Foleys catheter days	Laboratory confirmed urinary tract infections	Catheter associated urinary tract infection rate per thousand catheter days
April 2016	201	03	14.9
May 2016	168	02	11.90
June 2016	184	03	16.30
July 2016	125	01	8
August 2016	108	01	9.25
September 2016	111	03	27
October 2016	180	01	5.55
November 2016	137	00	0
December 2016	270	01	3.70
January 2017	271	00	0
February 2017	114	01	8.77
March 2017	141	02	14.18

Table 2: Distribution of microbiological profile as per type of operative procedures performed in Obstetrics and Gynecology unit.

Month and Year	Name of operative procedure performed on monthly basis	No. of operations done respectively	Total	Microbiological profile of organisms isolated in laboratory confirmed urinary tract infections
April 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	10+9+0+1+0+47	67	*Enterococcus, Enterococcus, Enterococcus sp.*
May 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	8+12+2+5+0+29	56	*Streptococcus gp.* D, CONS
June 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	6+12+0+1+0+38	57	*E. Coli, E. Coli, E.Coli*
July 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	7+7+0+4+0+47	65	*E. Coli*
August 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	5+12+0+1+0+32	50	*E. Coli*
Sept 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	10+6+1+5+0+45	67	MRCONS, *E. Coli, Proteus*
Oct 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	3+4+2+0+0+37	46	*Enterobactor*
Nov 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	5+1+1+1+1+32	41	-
Dec 2016	TAH+VH+TLH+NDVH+laprotomies+LSCS	4+5+1+1+0+43	54	*E. Coli*
Jan 2017	TAH+VH+TLH+NDVH+laprotomies+LSCS	6+6+2+0+1+39	54	-
Feb 2017	TAH+VH+TLH+NDVH+laprotomies+LSCS	6+6+2+0+0+24	38	*E. Coli*
March 2017	TAH+VH+TLH+NDVH+laprotomies+LSCS	10+6+0+2+0+37	55	MRCONS, *Enterococcus sp.*
		Total = 650	650	

TAH-Total abdominal hysterectomy, VH-Vaginal hysterectomy, TLH-Total laparoscopic hysterectomy, NDVH-Non descent vaginal hysterectomy, LSCS- Lower segment cesarean section

Types of surgeries (obstetrics and gynecology) taken under consideration for the purpose of study were total abdominal hysterectomies (TAHs), vaginal hysterectomies (VHs), non-descent vaginal hysterectomies (NDVHs), various laparotomies and caesarian sections.

All of the 650 patients had indwelling urinary catheter and total number of Foley's catheterization days were 2010. The number of UTI episodes were found to be 18 (2.76%) among the patients who had indwelling urinary catheter. In addition, CAUTI was calculated as 8.95 per thousand catheter days for the whole study period. Out of the total number of 18 urinary isolates, E. Coli and Enterococcus species were more commonly implicated.

Commonly isolated microbial pathogens (frequency wise) in our setting were *E. Coli* >*Enterococcus sp* >*Streptococcus sp.* D >CONS >MRCONS >*Proteus*.

In our OPD, IPD and ICU settings antibiotic sensitivity profile for urinary isolates (gram negative bacilli and gram-positive cocci) has shown more sensitivity for

Nitrofurantine in comparison to Norfloxacin and Nalidixic acid (over the whole study span).

DISCUSSION

The relative higher incidence of CAUTI could be because of non-vigilant health worker's care. Implemented CAUTI bundled care plan are periodically being monitored along with sterile urine sampling techniques in our setting. The nurses in our setting take care of catheter in the form of cleaning of catheter entry site and several inches of the tubing daily and after every bowel movement, emptying of urobags after fixed period of time, keeping the urobags always below the bladder, etc. along with other aseptic precautions.[7] In addition as per surgical care improvement project, all surgeries are preceded by one hour prior prophylactic antibiotic doses. In present study it was observed that foleys catheter are generally removed within 2-3 days after surgery until and unless contraindicated. Lack of these practices increases the morbidity and escalates the cost of treatment; thus, the infection control team should strictly reinforce use of proper standard and contact precautions, barrier and task nursing, the importance of aseptic techniques and hand washing.

Two studies conducted in 2001 and 2006 reported that short duration of urinary catheter after surgery was safe and overall postoperative urinary problems (symptoms, UTI) were reduced significantly.[8] Avoiding catheterization after hysterectomy in stable patients prevents certain complications such as UTI, promotes early ambulation and reduces hospital stay. UTI also increases morbidity, hospital stay and extra costs to patients.

In present study catheter induced bacteria rate was 8.95% which is much less than studies of same set up in India conducted by Mahim Khoshariya et al (27%) in 2015 at Bhopal and in 2015-16 at Bareilly (40.47%).[9,10]

In present study, rate of bacteuria was more when duration of catheterization increased, bacteriuria rate was maximum when duaration was more than 3-4 days. Similarly, study done by S Nivedita found that catheter associated bacteuria increases when duration of catheterization increases.[11]

Commonly isolated microbes in present study are *E. Coli* and *Enterococcus* respectively like Hootan TM et al.[12]

To reduce the laboratory workload considerably and for screening purposes pre and post catheterization urine samples are to be checked by bedside dipstick methods of high negative predictive value.[13]

In order to restraint the enigma, periodic training sessions for all health care workers based on bundled care interventions supervisory checklists are needed. Aseptic techniques along with IDSA (Infectious disease society of America) guidelines/other similar protocols are recommended to bring down overall prevalence. Prudent use of antibiotics in accordance to antibiotic stewardship program is required to combat drug resistance.

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