

Catheter Associated Urinary Tract Infections (CAUTI) and Antibiotic Sensitivity Pattern from Confirmed Cases of CAUTI in a Tertiary Care Hospital: A Prospective Study

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Received date: January 09, 2015, Accepted date: April 21, 2015, Published date: April 28, 2015

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Abstract

Background: Catheter associated urinary tract infections (CAUTI) are major concern as one of the nosocomial infections. The growing antibiotic resistance amongst the uropathogen isolated from CAUTI making difficult for its management.

Objectives: To bring down the incidence of CAUTI below 5 per 1000 catheter days and to know the antibiotic sensitivity pattern of uropathogens isolated from the confirmed cases of CAUTI.

Methods: During daily rounds infection control nurse collects all the demographic data from the catheterized patients. It is scrutinized for the signs and symptoms as per CDC criteria for confirmation as CAUTI.

Results: The overall incidence of CAUTI was 4.9 per 1000 catheterized days in the present study. The most common uropathogen was *E. coli* followed by *K. pneumoniae*. Very high antimicrobial resistance was found in *Pseudomonas aeruginosa* and *Acinetobacter* species in the present study.

Conclusion: The present study showed that if infection control practices are in place and monitored meticulously it is possible to keep the incidence rates within the benchmark set by the individual hospital. The most common practices shall include hand hygiene, close drainage system, aseptic method for insertion and catheter care along with daily need assessment with evidence based observations. This study showed moderate to high resistance in few uropathogens which is a concern for all.

Keywords: CAUTI; Incidence; Antimicrobial resistance; Uropathogens

Introduction

Hospital acquired infections (HAI) are the leading cause of morbidity and mortality throughout the world [1-5]. They directly reflect on the quality care of the hospital. Catheter associated urinary tract infections (CAUTIs) occur with high incidence if preventive protocols are not maintained [6-7].

The indwelling urinary catheter is an essential part of modern medical care and a variety of different indwelling urinary catheters are used for various purposes. Urinary catheters are inserted to monitor the various clinical parameters and in USA alone more than five million patients were put on catheters every year in acute-care hospitals and extended-care facilities [8].

Catheter associated urinary tract infections constitute 40%-50% of all hospital infections [9]. Due to these infections there is increase in the hospital stay of the patient along with increase in the use of higher antibiotics. The overall cost of health care also increases.

Multiple risk factors can affect the occurrence of CAUTI [10,11]. These include quality of aseptic technique, duration of catheterization, appropriate hand hygiene and care of catheter.

The present study was undertaken to assess the incidence of CAUTI in a large tertiary care hospital, to identify the common organisms associated with it and to detect the antibiotic sensitivity pattern in the isolated organisms from the cases of CAUTI.

Methods

This was a prospective study undertaken in the tertiary care hospital. Total 1380 catheterized patients were included from January 2013 to December 2013. Total numbers of catheterized days were 11655. Infection control nurse collected all the details like name of the patient, age, sex, date of catheterization, laboratory reports during her daily rounds. The diagnosis of CAUTI was done as per the CDC guidelines published in 2009. The selection criterion for the inclusion in the study was above 18 years and patients of both genders and who were put on Foley's catheter for at least 48 hours were included in the study. No past history related to any sexually transmitted diseases and immunocompromised status was noted.

Urine was collected as per the guidelines described earlier for culture and sensitivity with aseptic precautions and was transported immediately to the laboratory in a sterile container [12]. The unspun urine was subjected to gram stain, wet mount for the presence of pus cells and organisms. With the calibrated loop urine was cultured on blood agar media for quantitative analysis to assess the microbial counts. MacConkey agar media was also plated. The significant bacteriuria was 10^5 cfu/ml was taken into consideration while confirmation as CAUTI. The identification and antibiotic sensitivity was done by the disc diffusion test as recommended by CLSI guidelines [13-15].

The preventive practices which had been instituted in the institute includes the necessity of catheterization, discontinuation of catheterization if not indicated, maintenance of close drainage system, maintenance of aseptic technique while insertion of catheter, care of the catheter, maintenance of urobag below the waist level and strict adherence to five moments of hand hygiene. These preventive practices were strictly monitored by the infection control nurse in the daily rounds. The hand hygiene compliances were noted by using WHO form for individual moments.

Results

Out of 1380 catheterized patients, 34 developed CAUTI. The overall incidence was 4.59 per 1000 catheter days. The age and sex wise distribution of catheterized patients is shown in Table 1. Male patients were more than the female patients for catheterization. The month wise incidence of CAUTI is shown in Table 2. Catheterization days ranged from 2 days to 11 days. The most common uropathogens were *E. coli* (30.5%) and *Klebsiella pneumoniae* (30.5%) followed by *Pseudomonas aeruginosa* (16.6%) and *Candida* species (16.6%) from the cases of CAUTI.

Sr. No.	Age (years)	Male	Female
1	18 to 25	105	90
2	26 to 33	230	123
3	34 to 41	212	116

Name of uropathogen	Resistance pattern (%)													
	AMP	AM	IC	MRP	PIT	CZ	CAC	CAZ	GEN	CIP	AK	TOB	NET	CXM
<i>E. coli</i>	90	100	0	0	10	82	27	64	18	55	18	18	18	91
<i>K. pneumoniae</i>	100	100	0	18	36	100	45	73	64	100	36	45	36	100
<i>P. aeruginosa</i>	100	100	84	67	17	100	100	100	17	50	0	50	100	100
<i>Acinetobacter</i> species	100	100	0	100	100	100	100	100	100	100	100	100	100	100

AMP: Ampicillin; AM: Amoxicillin; IC: Imipenem; MRP: Meropenem; PIT: Piperacillin Tazobactam; CZ: Cefazolin; CAC: Ceftazidime Clavulanate; CAZ: Ceftazidime; GEN: Gentamicin; CIP: Ciprofloxacin; AK: Amikacin; TOB: Tobramycin; NET: Netilmicin; CXM: Cefuroxime

Table 3: Antibiotic resistance pattern of uropathogens isolated from catheter associated urinary tract infections (CAUTI) patients.

Discussion

Catheter associated urinary tract infections (CAUTIs) are serious health affecting problems in hospitalized patient [17]. The most common bacteria causing CAUTIs in hospitalized patients includes *E.*

4	42 to 49	208	95
5	50 above	149	52
Total		904	476

Table 1: Age and sex-wise distribution of catheterized cases.

Month	Prevalence (per 1000 catheter days)
Jan 2013	8.6
Feb 2013	4.07
Mar 2013	3.21
Apr 2013	3.3
May 2013	3.1
Jun 2013	4.34
Jul 2013	4.7
Aug 2013	4.6
Sep 2013	2.1
Oct 2013	5.7
Nov 2013	5.1
Dec 2013	6.3

Table 2: Month-wise incidence of catheter associated urinary tract infections (CAUTI).

Bacterial uropathogens isolated from patients with CAUTI revealed the presence of multidrug resistant pathogens [16]. Imipenem was the single best antibiotic for all pathogens except *Pseudomonas aeruginosa* where Amikacin was the drug of choice. The *Acinetobacter* species also showed very high resistance to all antibiotics except Imipenem (Table 3).

coli, *K. pneumoniae*, *P. aeruginosa*, *E. faecalis*, and *Candida* species [18,19].

The overall incidence of CAUTI was 4.59 per 1000 catheter days which were below the benchmark set by this hospital infection control committee (HICC) in the present study. Incidence is very low as

compared to other studies except for the months of January and December which was 8.6 and 6.3 respectively in the present study [20,21]. The reason of the fluctuation in the rate of incidence in few months might be due to the untrained staff without the proper knowledge and practice about the infection prevention practices. The other major reason includes prolonged catheterization as a major risk factor for the development of CAUTI. In the present institute training has been imparted regularly for practicing preventive protocols for reducing the CAUTI and continuous monitoring of compliance about hand hygiene. The attack rates were displayed and shared with the staff in the monthly meetings. However, there are other studies which had shown very high incidence of CAUTI in catheterized patients [22-26].

The high incidence might be due to various reasons such as the gender of the patient, infection prevention policies which includes aseptic task, catheter care, duration of catheterization, close drainage system etc. The infection prevention policies are stringent in this hospital which helped infection control team to keep low incidence of CAUTI in catheterized patients. This was achieved by frequent visits by infection control team members at different timings to catheterized patients daily to monitor the preventive bundles meticulously. The preventive bundles which were monitored during round include hand hygiene adherence, aseptic technique, close drainage system, placement of urobag below waist and catheter care etc.

The uropathogens isolated from CAUTI cases were found to be multidrug resistant. These findings correlate with various other studies [27-29] where multidrug resistant uropathogens were isolated. In the present study the most resistant uropathogens were *Pseudomonas aeruginosa* and *Acinetobacter* species. which showed the high resistance to multiple antibiotics including imipenem and meropenem.

Increase in the antibiotic resistance amongst the uropathogens indicates that they are hospital acquired and thus difficult to treat. This will be more dangerous if infection prevention practices are not followed during care of the catheterized patients. The chances of transmission of these multi drug resistant are high if health care workers do not follow preventive practices meticulously. In the present study the incidence is much lower because of continuous monitoring and training of the staff. This is achieved because of the active Infection control team and surveillance for non-compliances.

The present study showed the importance of strict adherence in preventive practices and monitored meticulously it is possible to keep the incidence rates within the benchmark set by the individual hospital. The most common practices shall include hand hygiene, close drainage, aseptic insertion and catheter care along with daily need assessment. This study showed moderate to high resistance in few uropathogens which is a concern for all.

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