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CATHETER ASSOCIATED URINARY TRACT INFECTION IN INTENSIVE CARE UNIT IN A TERTIARY HOSPITAL IN CENTRAL INDIA

Microbiology

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KEYWORDS:

INTRODUCTION

Urinary tract infections (UTIs) account for about 30%-40% of all hospital associated infections and are important since they increase mortality, morbidity, duration of hospital stay and health costs 1-3. The most important risk factor for developing a UTI is urinary catheterization. It is estimated that 15%-25% of all the patients hospitalized in health centers undergo urinary catheterization at least once during their hospital stay and it is reported that the frequency of urinary catheterization has increased in the past 20 years. Patients admitted to intensive care units (ICU) are the most appropriate candidates for UTIs due to their more frequent necessity of urinary catheterization and longer duration of catheter use [1,3,4].]Bacteriuria or candiduria is almost inevitable in nearly half of the patients who require an indwelling urinary catheter for more than 5 days [5,6]. Asymptomatic bacteriuria constitutes a major pool of the antibiotic-resistant strains of pathogens in any hospital, with critical care units (CCUs) accounting for the majority of them [7,8]. Catheter associated urinary tract infection (CAUTI) is also a major cause of hospital-acquired bacteremia 6 and even asymptomatic bacteriuria may be associated with enhanced in-hospital mortality rates [9].

Aims and objectives:

The present study was undertaken with the following aims and objectives

1). To detect the CAUTI rate of Intensive care unit at GMC,Nagpur .
2). To isolate different organisms from CAUTI cases and to evaluate the antibiotic sensitivity pattern of those isolates.

Material & Methods :

The study was conducted in the Department of Microbiology, Government Medical College & Hospital, Nagpur from January 2016 to April 2017.The study population consisted of all the patients admitted in Medical Intensive Care Unit and Surgical Intensive Care Unit (SICU) , Government Medical College & Hospital, Nagpur who had undergone urinary catheterization. The urine samples of catheterized patients who developed symptoms of UTI while catheter in situ i.e clinically suspected CAUTI were immediately inoculated and streaked onto nutrient agar, 5% sheep blood agar and MacConkey agar (Hi-Media, India). Plates were incubated aerobically at 37°C for 24 hours10. Isolated organisms were processed and identified according to standard bacteriological techniques11. Antibiotic susceptibility testing was performed by Kirby-Bauer disk diffusion technique [12].The drugs used were as per the CLSI 2013 guidelines[13].All the staphylococcal isolates were subjected to determination of methicillin resistance by cefoxitin disc diffusion method [13]. The CDC criteria were used to define the case as case of CAUTI [14]. The approval of Institutional Ethics committee, Government Medical College & Hospital , Nagpur was obtained.

Surveillance

On a daily basis, data were collected by the infection control teams prospectively from all the patients admitted to the ICUs by means of specifically designed for the device-associated-infection definitions and CAUTI rate was calculated as per the guidelines provided by the CDC-NNIS[14]

Device-days consisted of the total number of urinary catheter (UC)-days.

CAUTI rate was calculated by the following formula as per the guideline provided by the CDC-NNIS[14]

Formula–

$$\text{CAUTI} = \frac{\text{Total number of CAUTI cases}}{\text{Total number of UC-days}} \times 1000$$

Results :

Out of total 759 of patients catheterised in medical intensive care unit (MICU) and surgical intensive care unit(SICU) during study period, 38 patients developed CAUTI thus giving a CAUTI rate of 5 % .Total number of catheter days during the study period in MICU and SICU was 5781 thus giving a CAUTI rate of 6.57 per 1000 catheter days.

Different organisms isolated from CAUTI cases were as shown in table 1

Table 1 : Different organisms isolated from CAUTI cases

S.no	Organism isolated (n=83)	Number (%)
1	E.coli	12 (31.57)
2	Klebsiella	10 (26.31)
3	Staphylococcus aureus	04((10.52)
4	MRSA	02(5.26)
5	Enterococcus	04(10.52)
6	Pseudomonas aeruginosa	06(15.78)
	Total	**38(100)**

The antibiotic resistance pattern of Gram negative bacilli (GNR) isolated from CAUTI cases was as shown in table 2

Table 2 : Antibiotic resistance pattern of GNR isolated from CAUTI cases

S. no	Organism	Antibiotics tested(%)										
		Nf	Nx	Ac	Ce	Cn	CAZ	CFZ	PT	G	Ak	Ip
1	Pseudomonas aeruginosa (n=14)	06 (42.85)	06 (42.85)	14 (100)	14 (100)	14 (100)	14 (100)	14 (100)	09 (64.2)	04 (28.5)	03 (21.42)	02 (14.28)
2	E.coli (16)	03 (18.75)	08 (50)	16 (100)	16 (100)	08 (50)	16 (100)	16 (100)	09 (56.25)	04 (25)	04 (25)	02 (12.5)

3	**Klebsiella (17)**	07 (41.17)	07 (41.17)	17 (100)	17 (100)	17 (100)	17 (100)	17 (100)	13 (76.47)	15 (88.23)	15 (88.23)	03 (17.64)
4	**Enterobacter (6)**	03 (50)	04 (66.66)	06 (100)	06 (100)	06 (100)	06 (100)	06 (100)	03 (50)	04 (66.66)	04 (66.66)	01 (16.66)

The only drug found effective against GNR was Amikacin and Imepenem.

NOTE : Nf- Nitrofuraontoin, Nx- Norfloxacin ,Ac-Amoxycillin-clavulanic acid,PT-Piperacillin-tazobactum, Ce- Ceftazidime,Cn-Cefoxitin,CAZ-Cefazoline,G-Gentamicin,A-Amikacin,Ip-Imepenem.

Table 3 : Antibiotic resistance pattern of enterococcus faecalis isolated from CAUTI cases

Organism	Antibiotics tested								
	P	**A**	**T**	**Nx**	**Nf**	**Fo**	**HLS**	**Va**	**Lz**
E.faecalis(4)	4 (100)	4 (100)	4 (100)	1 (25)	1 (25)	1 (25)	1 (25)	2 (50)	00

NOTE- Nf-Nitrofurontoin, Nx-Norfloxacin, P-Penicillin, A-Ampicillin,T-Tetracycline,

Fo-Fosfomycin,High level streptomycin,Va-Vancomycin, Lz-Linezolid

Table 4 : Antibiotic resistance pattern of staphylococcus aureus isolated from CAUTI cases

Organism	Antibiotics tested								
	P	**Cn**	**E**	**Cd**	**G**	**Ak**	**T**	**Of**	**Lz**
S.aureus (4)	4 (100)	2 (50)	4 (100)	4 (100)	1 (25)	0 (00)	0 (00)	2 (50)	00 (00)

NOTE- P-Penicillin, Cn- Cefoxitin, E-Erythromycin,Cd-Clindamycin, G-Gentamycin, Ak-Amikacin, T-Tetracycline, Of-Ofloxacin, Lz-Linezolid Out of these four staphylococci, 50 % of the strains were Methicillin resistant.

Discussion :

Critically ill patients in intensive care unit are at a higher risk of nosocomial infection due to multiple causes including disruption of barriers to infection by endotracheal intubation and tracheostomy, urinary bladder catheterization and central venous catheterization[15]. The most common reported nosocomial infection in ICUs is urinary tract infection, followed by pneumonia and primary blood stream infection[16].

Out of total 759 of patients catheterised in MICU and SICU during study period, 38 patients developed CAUTI thus giving a CAUTI rate of 5 % .Total number of catheter days during the study period in MICU and SICU was 5781 thus giving a CAUTI rate of 6.57 per 1000 catheter days. This finding is in accordance with Vonberg et al who reported 6.8 CA-UTI per 1000 device days in their study[17].

The most common organism isolated from CAUTI cases in the present study was E.coli (31.57%). Tao et al 2011 also reported E.coli as the most common organism causing CAUTI[18] . XC Bi et al 2009 also reported E.coli as the most organism isolated from CAUTI cases[19] . The only drug effective against GNR found in the present study was Amikacin and Imepenem. Hossain MD et al 2014 20 reported Amikacin as the only drug effective against GNR but they reported 60% resistance against Meropenem. Enterococcus faecalis showed 100 % resistance towards Penicillin, Ampicillin and Tetracycline. Staphylococcus aureus showed 100% resistance towards Penicillin, Erythromycin and clindamycin. Both the Gram positive cocci showed 100 % sensitivity to Linezolid.

Conclusion :

From the present study, it appears that new guidelines and treatment regimens need to be identified for CAUTI patients. It is expected that the results from studies similar to the present research will aid in the development of guidelines for the prevention of CAUTIs. With emerging knowledge on antibiotic resistance and health care-associated infection, guidelines need to be updated to reflect the need to prescribe narrow-spectrum agents when available and avoid empirical use of broad-spectrum antibiotics.

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