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Symptomatic Catheter Associated Urinary Tract Infection in Icus and Post Operative Ward at a Tertiary Care Centre, Hyderabad

Dr. S Ruth Ramya[1], Dr. N Sridevi[2*], Dr. G Jyothi Lakshmi[3]

[1]Post Graduate, [2]Assistant professor, [3]Professor and HOD, Department of Microbiology, Osmania Medical College, 5-1-876, Turrebaz Khan Rd, Troop Bazaar, Koti, Hyderabad, Telangana 500095, India

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***Corresponding author:** Dr. N. Sridevi

Abstract **Original Research Article**

Purpose: Catheter associated urinary tract infections (CAUTI) are one of the major concerns of nosocomial infection, which lead to significant mortality, morbidity and additional hospital stay. The objective is to study the incidence of CAUTI, to isolate the pathogens and detect their antibiotic sensitivity pattern. ***Material and Methods****:* It is a prospective study of 1 year, conducted from January 2018 to December 2018, at tertiary care centre, Hyderabad. The demographic data of catheterized patients is collected from the ICU and post operative wards, as per criteria given by CDC. The urine from the symptomatic patients was collected from the catheter and processed in Microbiology laboratory. The pathogens were isolated and susceptibility to antibiotics was tested. ***Results****:* The CAUTI rate in Neurosurgical ICU was 0, Respiratory ICU was 6.966, Acute surgical care was 1.55 and Post operative ward was 1.33. The isolated organisms are Escherichia coli, Klebsiella, Enterococci, Staphylococcus aureus and Candida species. ***Conclusion***: The incidence of CAUTI in ICUs and Post operative ward is low. The rates are less than 5 and 10 per 1000 catheter days. This can be attributed to good preventive practices and empirical usage of antibiotics in ICUs and POW.

Keywords: Catheter-associated urinary tract infection, Health-care associated infections, Intensive care units, post operative ward, critical illnesses, CAUTI rate.

INTRODUCTION

Health-care-associated infections (HAI) which are more often Device associated are deemed to be the most frequent adverse event threatening patients recovery Worldwide [1]. Urinary tract infections (UTIs) account for 20-50% of all HAI occurring in the intensive care unit (ICU) [2]. Catheter-associated urinary tract infection (CAUTI) occurs frequently in critical illnesses with significant morbidity, mortality, and additional hospital costs [3]. CAUTI as defined by CDC is an UTI where an indwelling urinary catheter was in place for more than 2 calendar days on the date of event, with day of device placement being Day 1, and an indwelling urinary catheter was in place on the date of event or the day before. If an indwelling urinary catheter was in place for more than 2 calendar days and then removed, the date of event for the UTI must be the day of discontinuation or the next day for the UTI to be catheter-associated [4]. The indications of urinary catheterization in the management of critically ill patients are many. Various micro-organisms are introduced into the urethra while the catheter is inserted through the sheath of exudates surrounding the catheter or intraluminally from the tube or collection bag. Infection mainly occurs due to colonization and device biofilm formation. Bacteriuria and candiduria develop in up to 25% of patients requiring urinary catheter for more than 7 days [5, 6]. This study was undertaken to assess the incidence of CAUTI, to identify the common organism associated with it and detect the antibiotic sensitivity pattern of isolated organisms in intensive care units.

MATERIAL AND METHODS

It is a prospective study, conducted over a period of one year from January 2018 to December 2018 at Osmania General Hospital, Hyderabad. The demographic data of catheterized patients is collected from the Neurosurgical and respiratory ICUs, post operative ward, Acute surgical care. Total number of Patient days and catheter days were calculated, diagnosis of Symptomatic CAUTI was made as per CDC guidelines that is, a catheterized patient is said to be suffering from catheter-associated urinary tract infection (CAUTI) if he/she develops one or more of the following conditions that is fever (temp $\geq$ 38°C)

without any other known cause, urgency or suprapubic tenderness [4]. The Urine is collected from such patients with indwelling urinary catheter under strict aseptic precautions using a sterile needle and syringe from the distal end of catheter tube into the sterile universal container and transported to the microbiology laboratory with minimum delay. Patients with symptoms of UTI prior to the catheterization were excluded. The samples were processed by the standard laboratory procedure [7]. The collected urine was subjected to wet mount and Semi quantitative Culture on Blood Agar and Mac Conkey Agar and incubated at 37^0C for 18-24 hrs. Culture showing more than 10^5 colony-forming units or more per ml of urine, with not more than two types of organism was considered as culture positive. The Organisms were identified by their colony morphology, gram stain and biochemical reactions. Antimicrobial susceptibility testing was done by Kirby-Bauer disk-diffusion method on Muller-Hinton agar. CAUTI rate was calculated by using the formula:

CAUTI Rate = The no of CAUTIs for a location/The no of Urinary Catheter Days for a location **x** 1000.

RESULTS

During the study period of 12 months(January 2018 - December 2018), a total 6,108 were admitted into Neurosurgical ICU (NSICU), Respiratory ICU (RICU), Acute surgical care (ASC) and Post operative ward (POW) and 5912 patients among them were catheterized, 230 were found to be symptomatic. Out of 230 urine samples processed 29 showed growth on culture and fulfilled CDC crietria to ascertain them as CAUTI. The overall CAUTI rate in these wards was 1.769. And the Pathogens isolated from 29 culture growths were Escherichia coli-12, Klebsiella species-7, Enterococcus species-6, Staphylococcus aureus-1 and Candida species-3. The percentage of isolates is shown in Chart-1. Antibiotic Sensitivity percentage of the Gram negative Isolate is shown in Chart-2 where all are sensitive to Imipenem, few are sensitive to the combination drugs and marked resistance was noted to commonly used antibiotics. The Cauti rate of RICU, ASC, POW for the year 2018 was 6.966, 1.55 and 1.33 respectively (Table-1). Monthly Cauti rate for these wards is shown in Table-2.

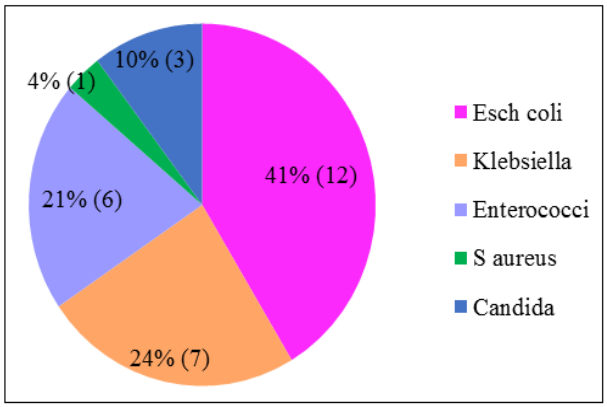

Chart-1: Percentage and number of the Pathogens isolated.

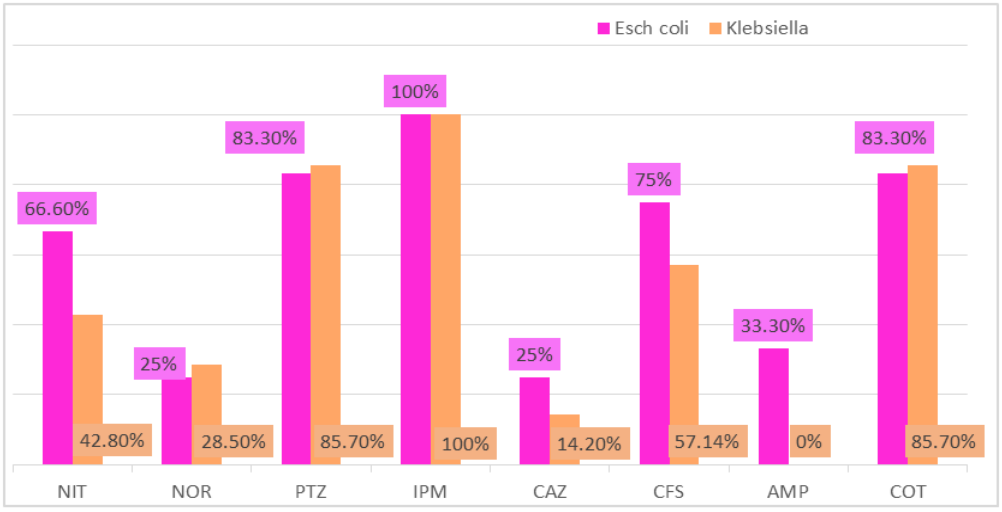

Chart-2 : Sensitivity percentage of Gram negative Isolates to various antibiotics

Table-1: CAUTI rate for NSICU, RICU, ASC, POW for the year 2018

Ward	Patient days	Catheter days	Symptomatic	No of Isolates	CAUTI rate
NSICU	3512	912	6	0	0
RICU	1493	1292	82	9	6.966
ASC	5524	5162	73	8	1.550
POW	12633	9022	77	12	1.330
Total	23162	16388	230	29	1.769

Table-2: Monthly CAUTI rate in RICU, ASC, and POW

Month	RICU			ASC			POW		
	Sympto-matic	No of Isolates	CAUTI rate	Sympto-matic	No of Isolates	CAUTI rate	Sympto-matic	No of Isolates	CAUTI rate
Jan	9	1	12.5	4	1	2.380	9	0	0
Feb	3	1	10	4	0	0	4	1	1.42
March	8	1	8.33	5	1	2.66	7	1	1.66
April	12	1	12.7	9	1	2.5	9	2	2.22
May	6	1	12.3	6	1	2	7	1	1.11
June	5	0	0	4	0	0	2	1	1
July	5	0	0	8	1	2.4	5	0	0
Aug	7	0	0	5	1	2.36	10	1	1.05
Sept	6	0	0	5	1	2.2	5	1	1.03
Oct	5	1	11.11	6	0	0	7	2	3.33
Nov	8	1	8.33	4	0	0	5	1	1.60
Dec	8	1	8.33	13	1	2.105	7	1	1.54
Total	82	9	6.966	73	8	1.550	77	12	1.33

DISCUSSION

Globally urinary catheter is considered as single most important predisposing factor for Urinary Tract Infections if aseptic precautions are not followed while insertion of Catheter, as it serves as portal of entry for the pathogen [1, 6]. Catheter associated colonization is usually asymptomatic, which resolves spontaneously after the removal of the catheter, in healthy patients whereas in susceptible patients, colonization persists and leads to infection and complications such as prostatitis, epididymitis, cystitis, pyelonephritis and septicemia due to Gram-negative bacteremia particularly in high-risk patients [4, 8, 9].

In the present study, out of 6,108 cases admitted in Neurosurgical ICU (NSICU), Respiratory ICU (RICU), Acute surgical care (ASC) and Post operative ward (POW), 5912 patients were catheterized. The CAUTI rate was 6.966 in RICU, 1.55 in ASC and 1.33 in POW which are less than 5/1000 catheter days except for RICU. This might be due to active infection control, strict adherence to preventive practices and empirical antimicrobial usage. In a metanalysis done by Benedetta *et al*., [1], for catheter-related urinary-tract infections in adults CAUTI rate varied from 1.4 and 23.0 per 1000 urinary catheter-days.

The overall Cauti rate for these intensive care units was 1.769, the rate is less as all the patients included in the study were put on empirical antibiotic therapy. Similar results were seen in the studies done by Ding *et al*., [3], Singh S *et al*., [8], Kazi *et al*., [10] and Vinoth M *et al*., [12] which showed Cauti rate less than 5.

In the current study CAUTI rate was higher in RICU (6.966) compared to other ICUs and wards this might be due to prolonged stay of patients as the morbidity rate is high in them. This is similar to study conducted by Wang L *et al*., [11] with CAUTI rate of 8.9 in RICU.

In the present study, the most common organisms causing UTI were Escherichia coli (41%), followed by Klebsiella (24%), indicating higher infection rate with enterobacteriace members which can lead to Gram negative septicaemia in morbid patients. The results are correlating with the studies done by Ding *et al*., Kazi *et al*., Bagchi *et al*., and Vinoth M *et al*., [3, 10-12]. The percentages of the common isolates in these studies are shown in Table 3. High resistance was observed in Gram negative organisms for commonly used antibiotics in the present study. However Imipenem and combination of Piperacillin and Tazobactam appeared to be effective. Similar results were seen in to study conducted by Vyawahare *et al*., in 2015 [6].

Table-3: Percentages of the most common isolates in various studies

Study (Year)	Escherichia coli	Klebsiella species	Enterococcus species
Present Study (2018)	41%	27%	21%
Ding *et al*., (2018) [3]	46.7%	18%	13.2%
Vinoth M *et al*., (2017) [12]	22%	18%	4%
Bagchi *et al*., (2015) [11]	34.85%	19.7%	6.06%
Kazi *et al*., (2015) [10]	30.5%	30.5%	-

In the present study, Candida species was isolated in 10% of all the isolates, which implies that candidaemia can be the cause of mortality among these patients and measures must be taken to avoid such events by periodical testing and switching to anti-fungal drugs by perforrning anti-fungal susceptibility test. Studies conducted by Bagchi *et al*., [10] and Kamath *et al*., [13] has isolated Candida as causative organism of CAUTI but did not provide data about the anti-fungal susceptibility thus limiting to know the effective anti-fungal drug for these nosocomial infections caused by fungi.

CONCLUSION

The urinary tract of catheterized patients is highly susceptible to severe infection by varied microbiological etiology. Antibiotic sensitivity pattern of the pathogen involved is also low. This along with existing underlying condition increases hospitalization, medication, morbidity and also adds to the financial burden. Therefore, it is imperative to carry out microbiological testing to determine etiology and ascertain effective antibiotics. Emphasis should also be made on reducing the duration of catheterization in order to reduce the incidence of catheter-related UTI. The incidence of CAUTI in ICUs and Post operative ward in this study is low. This can be attributed to good preventive practices and empirical usage of antibiotics. However ward CAUTIs cannot be taken into account and they need to be studied to give over all CAUTI rate of the Hospital.

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