Uro-pathogens Isolated and its Antibiotic Sensitivity in Cancer Patients in a State Cancer Institute of Gujarat

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Summary

Urinary tract infection (UTI) is common cause of nosocomal infection in hospital. There is increased morbidity due to prolong catherization and immunocompromised status in cancer patients. Most of UTIs are treated empirically, which may lead to frequent misuse of antibiotics. So, knowledge of infection epidemiology and their resistance pattern in institute will help physicians to select optimal empirical treatment in cancer patients. Retrospective analysis of the culture and sensitivity was performed for one year. Standard procedures were followed for culture and sensitivity. The identification and sensitivity testing were performed by automated ID and AST system. Bactria isolated from Enterobacteriaceae group in non-catheterized urine sample (NCU) shows sensitivity to amikacin followed by gentamicin, imipenem and nitrofurantoin. Whereas, isolates from catheterized urine sample (CU) are sensitive to amikacin, followed by nitrofurantoin, gentamicin, imipenem, etc. Non-lactose fermenting Gram negative bacilli isolated from NCU have showed sensitivity to gentamicin followed by amikacin, meropenem etc. Similarly, non-lactose fermenting Gram negative bacilli from CU are sensitive to amikacin, gentamicin, piperacillin/ tazobactam, etc. Funguria was due to Candida spp. which showed sensitivity to amphotericin -B, caspofungin, 5-flurocytocin, etc. UTI is a burden on health care leading to morbidity and increased stay in hospital. Since it is the second most common quality indicator for HAI, guidelines for prevention must be strictly adapted.

Keywords: Urinary tract infection, Non-catheterized urine, catheterized urine, Cancer, Antibiotic susceptibility, Vitek-2 compact.

Introduction

Urinary tract infections (UTI) can be an infection of kidney, ureters, bladder or urethra, and usually presents with fever and burning micturition. The bacteria spread to the bladder from urethra (ascending infection) and the infection spread can also occur through hematogenic route and lymphatic route (descending infection). Mid-stream urine is sterile and germ free in normal person.

UTI is second most common cause of hospital acquired infections and it account for 20-30%.[1] Annually, worldwide more than 150 million people suffer from UTI[-2,3] In different parts of India prevalence rate ranges from 15 to 30 %. E. coli is most common and predominant pathogen causing UTI.[4] Gram positive bacteria like Enterococcus, Staphylococcus especially coagulase negative staphylococci and Streptococcus agalactiae are also responsible for UTI.[5] There is female predominance which is suggested by different clinical studies.

In cancer patients there are symptoms of fever, burning micturition, chills and rigors and there is increased morbidity due to catheterization as well as immunocompromised status, and they land up in bacteriuria or candiduria.[1]

Most of UTIs are treated empirically, which may lead to frequent misuse of antibiotics.[3] So, knowledge of infection, epidemiology, causative agents and their resistance pattern in institute will help physicians to select optimal empirical treatment. Extensive use of antimicrobial agents has extensively resulted in development of antibiotic resistance, which has become a major health problem. The antibiotic resistance pattern varies from place to place and even in short period of time.[6,7] Therefore, this retrospective data analysis aims at knowing the causative organisms of UTI, their antibiotic sensitivity and recommend the ideal antibiotics for the treatment for patients.

Methods and Materials

This retrospective observational study was carried out in Department of Microbiology of The Gujarat Cancer Research Institute, a State Cancer Center of India. Analysis of the culture and sensitivity was performed for one year from June 2018 to June 2019. Approval of Institutional review board was taken for this study and there were no ethical issues related to this study.

Urine was collected in cases having symptoms of urinary tract infections after giving proper instructions to collect mid-stream urine and urine from catharized urine tube after having taken sterile precautions. Patient's details and demographic details were noted. There were 1210 urine samples which were from both types of collection. Semi-Quantitative method was used to report significant bacteriuria. In the laboratory the standard procedures were followed for culture and sensitivity. The identification and sensitivity testing were performed by automated ID and AST systemfromVitek-2 compact, from the company Biomerieux.

There were 1067urine samples which were

Table 1: Prevalence rate of UTI

Type of sample	Total samples	Significant growth	%
NCU	1067	319	29.8
CU	143	63	44.05
Total samples	1210	382	31.5

Table 2: Age and gender wise prevalence of UTI (%)

Age groups (yrs.)	Male		Female		Total (%)
	NCU	CU	NCU	CU	
0-14	13.9 (6/43)	0	17.46 (6/34)	0 (0/1)	15.38 (12/78)
15-44	23.68 (27/114)	75 (6/8)	28.24 (61/216)	47.37 (18/38)	29.79 (112/376)
45-60	29.52 (31/105)	63.64 (7/11)	31.02 (103/332)	38.78 (19/49)	21.33 (160/497)
>60	47.25 (43/91)	42.86 (6/14)	31.82 (42/132)	31.82 (7/22)	37.84 (98/259)
Total	30.31 (107/353)	57.58 (19/33)	29.7 (212/714)	40 (44/110)	31.57 (382/1210)

Table 3: Department wise prevalence of UTI (%)

Department	OP		IP		Total (%)
	NCU	CU	NCU	CU	
Gynecology	31.12 (107/343)	46.67 (14/30)	31.86 (43/135)	34.92 (22/63)	32.57 (186/571)
Surgery	48.11 (51/106)	56 (7/8)	38.75 (31/80)	40 (8/20)	45.33 (97/214)
Medicine	28.26 (26/92)	66.67 (2/3)	14.21 (26/183)	50 (6/12)	4.83 (60/290)
Pediatrics	25.93 (7/27)	0	8.33 (4/48)	0 (0/1)	14.47 (11/76)
Radiotherapy	66.67 (12/18)	100(1/1)	100 (2/2)	50 (1/2)	69.57 (16/23)
Neurology	5 (3/16)	50 (1/2)	36.36 (4/11)	100 (1/1)	30 (9/30)
Orthopedic	66.67 (2/3)	0	33.33 (1/3)	0	50 (3/6)
TOTAL	34.38 (208/605)	56.82 (25/44)	24.03 (111/462)	38.38 (38/99)	31.57 (382/1210)

collected from non-catheterized patients and 143 were catheterized patients. All ID AST reports were generated by using WHONET software and analyzed. The data was then converted into excel and charts and figures were created.

Out of total 1210 processed samples, there were1067 (88.18%) non-catheterized urine (NCU) and 143(11.82%) catheterized urine (CU). Table 1 shows the infection rate of UTI in both the type of samples. Age and gender wise prevalence of UTI is described in table 2. Table 3 shows department wise prevalence of UTI in cancer patients. Table 4 shows distribution of isolated pathogens isolated in UTI.

The pathogenic Gram-negative bacilli of Enterobacteriaceae group in NCU shows sensitivity to amikacin (65.3%) followed by gentamicin (53.5%), imipenem (46.7%), nitrofurantoin (41%), aztreonam (36.4%), piperacillin/tazobactam (33.2%), trimethoprim/sulfamethoxazole (32.8%), cefepime (31.3%). Whereas, isolates from CU are sensitive to amikacin (46.9%), followed by nitrofurantoin (43.5%), gentamicin (31.2%), imipenem (31%), etc. (Table 5)

As per table 6 the non-lactose fermenting Gram negative bacilli isolated from NCU have shown sensitivity to gentamicin (46.5%) followed by amikacin (46.2%), meropenem (45.8%), cefepime (42.9%), imipenem (41.9%), etc. Similarly, non-lactose fermenting Gram negative bacilli 15(3.93%) from CU are sensitive to amikacin (69.2%), gentamicin (50%), piperacillin/tazobactam, ceftazidime, cefepime equally showed 41.7% sensitivity, and imipenem showed 36.4%.

Gram-positive cocci isolated from NCU

Table 4: Distribution of pathogens isolated in UTI

Pathogens	MSU		CU		TOTAL	
	TOTAL	(n=319)%	TOTAL	(n=63)%	Grand Total	(n=382)%
GNB(LF)						
Escherichiacoli	131	41.07	19	30.16	150	39.27
Klebsiella pneumoniae ss. Pneumoniae	56	17.55	13	20.63	69	18.06
Enterobacter aerogenes	12	3.76	3	4.76	15	3.93
Enterobacter cloacae	7	2.19	0	0	7	1.83
Enterobacter aerogenes	1	0.31	1	1.59	2	0.52
Klebsiellasp.	1	0.31	0	0	1	0.26
Total GNB(LF)	208	65.19	36	57.05	244	63.87
GNB(NLF)						
Pseudomonas aeruginosa	17	5.33	8	12.7	25	6.54
Pseudomonas sp.	13	4.08	4	6.35	17	4.45
Acinetobacter baumannii	8	2.51	0	0	8	2.09
Burkholderia cepacian	6	1.88	1	1.59	7	1.83
Proteus mirabilis	3	0.94	0	0	3	0.79
Sphingomonas paucimobilis	3	0.94	0	0	3	0.79
Acinetobacter sp.	1	0.31	0	0	1	0.26
Acinetobacter junii	1	0.31	0	0	1	0.26
Acinetobacter lwoffii	1	0.31	0	0	1	0.26
Pseudomonas putida	1	0.31	1	1.59	2	0.52
Proteus rettgeri	0	0	1	1.59	1	0.26
Salmonella sp.	1	0.31	0	0	1	0.26
Total GNB(NLF)	55	17.23	15	23.82	70	18.31
GPC						
Enterococcus faecium	11	3.45	2	3.17	13	3.4
Staphylococcus haemolyticus	4	1.25	0	0	4	1.05
Staphylococcus epidermidis	2	0.63	1	1.59	3	0.79
Staphylococcus hominis	3	0.94	0	0	3	0.79
Staphylococcus aureus	2	0.63	0	0	2	0.52
Staphylococcus xylosus	1	0.31	0	0	1	0.26
Total GPC	23	7.21	3	4.76	26	6.81
FUNGUS						
Candida glabrata	14	4.39	3	4.76	17	4.45
Candida tropicalis	13	4.08	3	4.76	16	4.19
Candida albicans	6	1.88	3	4.76	9	2.36
Total Fungus	33	10.35	9	14.28	42	11

showed same sensitivity (55.9%) to linezolid and teicoplanin, followed by nitrofurantoin (54.5%), trimethoprim/sulfamethoxazole (50%), vancomycin (48.5%), etc. And those that isolated from CU are sensitive to trimethoprime/sulfamethoxazole (100%) followed by teicoplanin (50%), vancomycin (20%), penicillin G (16.7%), nitrofurantoin (16.7%) etc.

When compared with other non-lactose fermenting bacilli like Acinetobacter spp, Burkholderia sp, Shingomonas and Salmonella, the antibiotic sensitivity of Pseudomonas species was little different. On the whole (Table 8) there was less sensitivity to all the anti-pseudomonal drugs.

Funguria was due to Candida species like Candida albicans and Non-albicans (C. Glabrata and C. tropicalis) was present. They were 77.8-93.9% sensitivity to amphotericin-B, 75-88.9% sensitive to caspofungin, 89.3 – 100 % sensitive to 5-flurocytocin, 85.7-86.4 to fluconazole, 87.5-88.9 % sensitive to micafungin and 88.9-93.9% to voriconazole. (Table 9)

Discussion

UTI is the most common bacterial infection among the patients admitted in the hospital. In the present retrospective study1210 urine samples were analyzed. There was 29.9%and 44.06 % NCU and CU samples respectively which showed infection. According to Sarasu et al[8] and Vyawahara et al[1] had

Table : Percentage sensitivity of tribe Enterobacteriaceae

ENTEROBACTERIACEAE	% Sensitivity	
Antibioticname	**NCU**	**CU**
Ampicillin	5.6	0
Amoxicillin/Clavulanicacid	20.9	10
Piperacillin/Tazobactam	33.2	10.3
Cefuroxime	13.4	0
Cefotaxime	20	0
Cefepime	31.3	6.9
Imipenem	46.7	31
Aztreonam	36.4	0
Ciprofloxacin	15.8	12.9
Levofloxacin	6.7	0
Lomefloxacin	20	0
Trimethoprim/ Sulfamethoxazole	32.8	10.3
Nitrofurantoin	41	43.5
Gentamicin	53.5	31.2
Amikacin	65.3	46.9

Table 6: Percentage sensitivity of NLF

NLF	% Sensitivity	
Antibioticname	**NCU (n=55)**	**CU (n=15)**
Piperacillin/Tazobactam	33.3	41.7
Ticarcillin/Clavulanicacid	33.3	25
Ceftazidime	22.5	41.7
Cefepime	42.9	41.7
Imipenem	41.9	36.4
Meropenem	45.8	33.3
Gentamicin	46.5	50
Amikacin	46.2	69.2
Ciprofloxacin	26.7	23.1
Levofloxacin	26.8	25

Table 7: Percentage sensitivity of GPC

GPC	% Sensitivity	
Antibioticname	**NCU (n=23)**	**CU (n=3)**
PenicillinG	20.6	16.7
Gentamicin	41.7	0
Ciprofloxacin	5.9	0
Levofloxacin	12.1	0
Trimethoprim/ Sulfamethoxazole	50	100
Nitrofurantoin	54.5	16.7
Linezolid	55.9	100
Vancomycin	48.5	20
Teicoplanin	55.9	50
Tetracycline	38.2	0

30% and 37.7% UTI, respectively. Lunagaria et al reported 19.98 % UTI.[9] The infection rate was more in our set up when compared to their data.

There was females predominance in our study analysis which is similar to the observation of Sarasu et al[8] for NCU. Whereas in the study done by Vyawahara et al[1] there was male preponderance.

Table 8: Percentage sensitivity of Pseudomonas spp

PSEUDOMONASspp	% Sensitivity	
Antibioticname	**NCU (n=31)**	**CU (n=13)**
Piperacillin/Tazobactam	19.2	41.7
Ticarcillin/Clavulanicacid	23.1	27.3
Ceftazidime	14.8	36.4
Cefepime	32.1	41.7
Imipenem	27.6	36.4
Meropenem	31	27.3
Gentamicin	34.5	50
Amikacin	42.9	75
Ciprofloxacin	19.2	25
Levofloxacin	17.9	18.2

Table 9: Percentage sensitivity of FUNGUS

Fungus	% Sensitivity	
Anti-Fungalname	**NCU**	**CU**
AmphotericinB	93.9	77.8
Caspofungin	75	88.9
5-Fluorocytosine	89.3	100
Fluconazole	86.4	85.7
Micafungin	87.5	88.9
Voriconazole	93.9	88.9

E. Coli was the common isolated uro-pathogen from NCU as well as CU. Though other common organisms causing infections was Klebsiella and Enterobacter (LF). Amongst non-lactose fermenters were Pseudomonas, Acinetobacter spp, Burkholderia, Proteus, Sphingomonas. Amongst the GPO, we had Enterococcus and Staphylococcus-commonly isolated from both type of sample. Similar results were shown by other workers like Sarasu et al[8] for NCU and the results of catharized urine was similar to the study of Vyawahara et al.[1]

It is also concluded that the Enterobacteriaceae organisms were sensitive to amikacin, gentamicin, and piperacillin/tezobactam. The carbapenem antibiotics sensitivity (46%) to Gram negatives was reduced when compared to other study (79%). Quinalones were less effective. GNBs were ineffective to Beta-lactams and beta-lactamase inhibitor (BL-BLIs). GNBs showed MDR to Cephalosporin group of antibiotics in both NCU and CU.

Gram positive cocci showed sensitivity to linezolid and teicoplanin followed by nitrofurantoin, trimethoprim/sulfamethoxazole, vancomycin in NCU and CU. Most of the GN Bacilli (Enterobacteraeceae) are ESBL, Carbapenemase, MBL producers and thus, resistance to many antibiotics. Carbapenem-resistant Enterobacteriaceae are of particular concern as they

are increasingly reported globally and few treatment options are available for these types of infections. Acinetobacter spp. strains resistant to carbapenems have increased in prevalence and present a serious treatment challenge to clinicians. Therefore, drug of choice still recommended is amikacin and nitrofurantoin as there is clinical clearance of pathogens. It is also recommended to stop usage of quinolones for three months and suppress its use.

Conclusions

UTI is a burden on health care services leading to morbidity and increased stay in hospital. In our study UTI is more common in female patients and more prevalence is seen in 45-60 year age group. The most common bacteria responsible is Escherichia coli in both NCU and CU. Constant surveillance is essential to monitor emergence of antimicrobial resistance in these organisms. Since it is the second most common quality indicator of HAI, guidelines for prevention must be strictly adapted.

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