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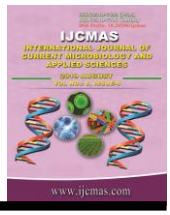

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Bacteriological Profile and Antibiogram of Uropathogens-A Retrospective Analysis

D.W. Deshkar[1*], J.V. Narute[1] and V.D. Somvanshi[2]

Department of Microbiology, Zydus Medical College and Hospital, Dahod, Gujrat-389151, India

**Corresponding author*

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A B S T R A C T

In the context of the present clinical scenario urinary tract infections are to be dealt with most frequently. The non judicious haphazard use of antibiotics is to be blamed for coming into existence of resistant microorganisms. A myriad of microorganisms cause urinary tract infections. Moreover the antibiotic susceptibility pattern of the isolated uropathogens is changing continuously. Hence this study is undertaken with the objective, to study the microbial profile and to analyze the antibiotic susceptibility patterns of bacterial strains isolated from the patients with urinary tract infections (UTI). Here this study is a retrospective analysis of culture reports of urine samples. This study was undertaken at Microbiology laboratory of tertiary hospital. Age, gender, organisms isolated and their susceptibility pattern is contained in the data procured from the laboratory register. The overall prevalence of UTI in relation to both the genders was about 45.4%. Among 550 urine samples collected, 250 samples revealed the significant bacterial growth, comprising 76 (30.4%) samples from males and 174 (69.6%) samples from females. Among 250 cultured isolates, *Escherichia coli* was the most common 100 (40%) followed by *Klebsiella spp.* 65 (26%), *Proteus spp*. 20 (8%), *Pseudomonas spp*. 24 (9.6%), *Staphylococcus aureus* 16 (6.4%), *Citrobacter spp*. 15 (6%), *Enterobacter* 5 (2%), *CONS* 5 (2%).The sensitivity pattern revealed Chloramphenicol 72.09%, Levofloxacin 60.46%, Amikacin 46.51%,Polymyxin B 41.86%Tigicyclin 34.58%, Gentamycin 34.39%, Nitrofurantoin 32.56%, Co – trimoxazole 27.90%, Azithromycin 27.90%, Ampicillin-Sulbactum 25.58, Pipercillin – Tazobactum 25.50%, Tetracycline 20.93%, Ciprofloxacin 13.95% Ceftriaxone, Cefepime, Ceftazidime 4.65%, Meropenem 2.32%, Amoxicillin Clavulinic acid 2.32%. It is mandatory on the part of clinicians and microbiologists to study the routine sensitivity as well as resistance pattern of the isolated microorganisms and to analyze the antibiogram of the hospital. It will help in desiring the empirical treatment of UTI. This is of utmost importance to prepare the antibiotic policy of the hospital. The study shows high rate of resistance to Ceftriaxone, Cefepime, Ceftazidime, Meropenem, Amoxicillin clavulinic acid by uropathogens precluding use of these antibiotics in the treatment of UTI, whereas sensitivity to Chloramphenicol, Amikacin, Nitrofurantoin, recommends their use in the treatment of UTI as concerned with this hospital.

Introduction

A urinary tract infection is an infection in any part of your urinary system – kidneys, ureters, bladder and urethra. The lower urinary tract - the bladder and the urethra are often involved. UTI are caused by bacteria, fungi and rarely by viruses. Females suffer from UTI routinely than the men because of the shortness of their urethra, anal proximity of their urethra, coitus, corpulence, diabetes and family background. *E.coli* from the gut is the cause of 80 – 85 % UTI, followed by *Klebsiella, Proteus, Pseudomonas, Staphylococcus aureus, Citrobacter*. The microbes specifically enter the bladder via the urethra[1, 2]. However the infection may also occur through the lymph. The bacteria traverse from bowel to urethra and no sooner do *E.coli* enter the bladder than they attach to its wall by forming a biofilm that helps them to elude from host immune response.

Escherichia coli are most frequent microorganism, succeeded by *Klebsiella* and *Proteus spp.* The presence of gram positive organism like *Staphylococcus aureus* is increased[2].

The increased drug resistance among isolated bacterial uropathogens is increasing and posing an emerging public health problem. The susceptibility pattern of isolated microorganisms from UTI patients changes from place to place. The worst thing is that the antibiotic is started even before the culture and sensitivity report.

The current updated knowledge of causative organisms of UTI and their antimicrobial susceptibility pattern is very important to ensure specific and appropriate empirical treatment. This study was undertaken by keeping in mind the increased antimicrobial resistance among bacterial isolates causing UTI and this study was carried out at a teaching hospital from western Maharashtra in order to study the spectrum of microorganisms responsible for UTI and their resistance pattern to analyze the antibiogram[1, 2].

About 150 million patients develop UTI annually, most often females than males. They occur most frequently between sexually active groups i.e. 16 to 35 years with frequent recurrences. Urinary tract infections are one of the contributors of hospital acquired infections.

The main aim of this study to isolate various bacterial pathogens present in the urine and to determine their sensitivity and resistance pattern against the commonly used antibiotics.

The main objectives of this study includes, to isolate microorganisms causing UTI. and to study antibiotic susceptibility and resistance pattern of isolated microbes. Also prepare Antibiogram and to make antibiotic policy and assist in commencement of specific treatment.

Materials and Methods

Study design

This is a retrospective study about UTI carried out at the teaching Hospital in Western Maharashtra. This study includes the analysis of urinary culture and sensitivity reports in Microbiology laboratory. The data comprised of age, sex of the patients, the organisms isolated and their antibiotic susceptibility pattern were collected from the laboratory registers, after approval from the ethical committee of the institute and the written consent from the patients. The data was collected and entered into the excel sheet and the statistical analysis was done.

Culture and identification

Urine samples were collected in clean, dry, sterile, wide mouth glass container by instructing the patients to collect midstream sample. The samples were plated on Blood agar and MacConkey Agar by semi quantitative plating method using the calibrated loop technique (0.001ml).and were incubated aerobically at 37^0C overnight.

Plates showing growth suggestive of significant bacteruria, with colonies containing colony counts exceeding 10^5cfu/ ml, were subjected to standard biochemical tests for identification.

Antimicrobial Susceptibility Tests

The antimicrobial sensitivity testing by Kirby – Bauer disc diffusion method.[8] The diameters of zones of inhibition of bacterial growth formed the basis of interpretation as 'Sensitive' or 'Resistant' as recommended by the manufacturer[5,6,7]. Antimicrobial sensitivity tests were carried out on bacterial isolates considered to be significant. The antibiotics included in our study were amoxiclav (20/10mcg), Ampicillin Sulbactum (10/10mcg), Amikacin (30mcg), Co – trimoxazole (25/23.75mcg), Ciprofloxacin (5mcg), Levofloxacin (5mcg), Nitrofurantoin (300mcg), Gentamycin (10mcg), Cefepime (30mcg), Ceftriaxone (30mcg), Ceftazidime (30mcg), Polymyxin B (2mcg), Pipercillin/ Tazobactum (100/10mcg), Meropenem (10mcg), Tetracycline (30mcg), Chloramphenicol (30mcg), Tobramycin (10mcg), Tigicyclin (30mcg), Vancomycin (30mcg). The sensitivity and resistant pattern of these isolates were recorded and studied and subjected to statistical analysis.[7, 8, 9, 10]

Results and Discussion

The prevalence of UTI in both male and female together was revealed to be 45.45%. Among 550 urine samples 250 urine samples were showing the significant bacterial growth, which include 76 (30.40%) samples from males and 174 (69.60%) samples from females. Table 1 shows the distribution of samples. Out of 550 samples collected 300 (54.55%) were sterile i.e. there was no growth observed in the samples.

Table 2 reveals the age and sex wise distribution of the positive urine cultures. The most common age group involved in UTI amongst males was above 45 years 36(14.40%), and amongst females 31 – 45 years – 86 (34.40%).[10, 11, 12, 13]

Table 3 shows the organisms isolated for UTI. *Escherichia coli* was the most common organism 100 (40%) amongst 250 samples succeeded by *Klebsiella spp.* 65(26%), *Proteus spp.* 20 (8%), *Pseudomonas spp* 24 (9.6%), *Citrobacter spp.* 15 (6%), *Enterobacter* 5 (2%), *Staphylococcus aureus* 16 (6.4%), *CONS* 5 (2%).

Table 4 shows sex wise distribution of the organisms that were isolated from urine samples of UTI. The most common organism isolated was *Escherichia coli* in males 30 (12%) and in females 70 (28%). The antibiotic sensitivity pattern was analyzed for all the bacterial isolates.

Table No. 5 is representative of overall antibiotic sensitivity pattern of urinary bacterial isolates. Chloramphenicol, Amikacin, Levofloxacin, Pipercillin Tazobactum, Nitrofurantoin, Gentamycin, Tigicyclin, Co – trimoxazole were seen to be the agents with higher sensitivity of various uropathogens. Overall sensitivity pattern revealed considerable resistance to Meropenem, Ceftazidime, Ceftriaxone, Amoxicillin – Sulbactum, Cefepime.[15, 16, 17]

This is a retrospective study about UTI carried out at the teaching Hospital in

Western Maharashtra. This study includes the analysis of urinary culture and sensitivity reports in Microbiology laboratory.

Table.1 Distribution of Study Group (N = 250)

Sr.No.	Male	Female	Total
1	76 (30.40%)	174 (69.60%)	250

Table.2 Age and Sex wise distribution of Isolated Organisms

Sr.No.	Age Group	Male %	Female %	Total %
1	< 18 years	8 (3.20%)	6 (2.40%)	14 (5.60%)
2	18 – 30 Years	6 (2.40%)	28(11.20%)	34 (13.60%)
3	31 – 45 Years	26(10.40%)	86(34.40%)	112(44.80%)
4	> 45 Years	36(14.40%)	54(21.60%)	90 (36%)
		76(30.40%)	174(69.60%)	250(100%)

Table.3 Organisms Isolated from urine samples from UTI patients

Sr.No.	Organisms Isolated	No. of samples	Percentage (%)
Gram Negative Organisms			
1	*Escherichia coli*	100	40%
2	*Klebsiella spp.*	65	26%
3	*Proteus spp.*	20	8%
4	*Pseudomonas spp.*	24	9.6%
5	*Citrobacter spp.*	15	6%
6	*Enterobacter*	5	2%
Gram Positive Organisms			
7	*Staphylococcus aureus*	16	6.4%
8	*CONS*	5	2%

Table.4 Sex wise organisms isolated from urine samples of UTI

Sr.No.	Organisms Isolated	Male (%)	Female (%)	Total (%)
1	*Escherichia coli*	30 (12%)	70 (28%)	100 (40%)
2	*Klebsiella spp.*	20 (8%)	45 (18%)	65 (26%)
3	*Proteus spp.*	6 (2.40%)	14 (5.60%)	20 (8%)
4	*Pseudomonas spp.*	6 (2.40%)	14 (5.60%)	20 (8%)
5	*Citrobacter spp.*	4 (1.60%)	11 (4.40%)	15 (6%)
6	*Enterobacter*	1 (0.4%)	4 (1.60%)	5 (2%)
7	*Staphylococcus aureus*	7 (2.8%)	13 (5.20%)	20 (8%)
8	*CONS*	2 (0.8%)	3 (1.20%)	5 (2%)
Total		76 (30.40%)	174 (69.60%)	250 (100%)

Table.5 Percent distribution of drug sensitivity of isolated organisms (N=250)

Sr. No.	Antibiotics	E.coli		Klebsiella spp.		Proteus spp.		Pseudo-monas spp.		Citro-bacter spp.		Entero – bacter spp.		Staph. aureus		CONS	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	Amikacin (Ak)	100	46.51	65	23.80	20	35	20	60	15	86.66	5	20	20	50	5	40
2	Azithromycin (Az)		27.90		28.57		50		45		20		00		50		52
3	Chloramphenicol (C)		72.09		51.14		50		50		86.66		40		40		32
4	Ceftriaxone (Ctx)		4.65		00		00		00		00		00		20		12
5	Ciprofloxacin (CIP)		13.95		14.28		20		35		13.33		00		50		60
6	Amoxicillin Clavulinic acid(AMC)		2.32		00		10		00		00		20		72		62
7	Co – trimoxazole (Cot)		27.90		9.52		25		05		33.33		00		50		30
8	Cefepime (CPM)		4.65		00		00		10		00		00		12		7
9	Pipercillin Tazobactum (PIT)		25.50		19.04		65		40		53.33		60		20		10
10	Levofloxacin (Le)		60.46		61.90		90		70		86.66		20		40		30
11	Gentamycin (G)		34.39		23.80		40		50		66.66		20		60		60
12	Nitrofurantoin (Nf)		32.56		9.52		25		10		00		00		10		6
13	Meropenem (MRP)		2.32		00		00		00		00		20		70		75
14	Tobramycin (Tob)		18.60		4.76		15		50		73.33		00		10		8
15	Tetracycline (T)		20.93		4.76		20		10		46.66		20		40		38
16	Ceftazidime (Caz)		4.65		00		15		15		13.33		00		36.84		32
17	Tigicyclin (Tgc)		34.58		4.76		30		05		13.33		00		18		10
18	Ampicillin Sulbactum (AS)		25.58		00		10		20		46.66		00		48		42
19	Polymyxin B (PB)		41.86		66.66		30		55		66.66		20		--		--
20	CTR		4.65		9.52		50		05		26.66		00		--		--
21	Vancomycin (V)		--		--		--		--		--		--		70		70

The data comprised of age, sex of the patients, the organisms isolated and their antibiotic susceptibility pattern were collected from the laboratory registers, after approval from the ethical committee of the institute and the written consent from the patients.[18, 19, 20] Globally the trend of antibiotic sensitivity has changed and there is higher incidence of resistance to antibiotics being developed by the isolated uropathogens. The prevalence of UTI was found to be 45.45% in this study which correlates with various studies carried out. It correlates with the study of Devanand *et al.*, (53.82%).

Our study revealed a high prevalence of UTI in females (69.60%) as compared to males (30.40%) which correlates with other studies which demonstrated that the frequency of UTI is more in females than males due to close proximity of female urethral meatus to the anus and also the length of female urethra is shorter. The higher incidence of UTI in the present study was found between the age

group 31 – 45 yrs in females. In males the incidence of UTI was found to be higher in persons above 45 years, due to prostate enlargement. Similar observations were deduced by Smita *et al.,* and Devanand *et al.,*

The present study revealed that the Gram negative bacilli contributed the most in UTI (90%) of the total bacterial isolates while the Gram positive bacteria accounted for 10% cases of UTI. *Escherichia coli* accounted for 40% cases of UTI followed by *Klebsiella sp.* which was the cause for UTI in 26% of the cases. This was consistent with the other studies including that was carried by Sibi *et al.,* (2011). The other bacterial isolates as causative agent for UTI were *Proteus sp.*(8%), *Pseudomonas sp.*(8%), *Citrobacter sp.*(6%), *Enterobacter sp.*(2%) The Gram positive bacteria isolated from urine samples from the patients of UTI included *Staphylococcus aureus* (8%), *CONS* (2%).In the contrary to our study Tambekar *et al.,* in 2006 encountered *Pseudomonas aeruginosa* to be the most commonly encountered causative agent for UTI. [21, 22, 23]

In this present study the most commonly encountered bacterial isolate from patients of UTI was *E.coli* which was most sensitive to Chloramphenicol, Levofloxacin, Amikacin, Gentamycin, Polymyxin B Tigicyclin and Nitrofurantoin while they were resistant to Ceftazidime, Ampicillin – Sulbactum Cefepime, Amoxicillin clavulinic acid. *Klebsiella sp.* was most sensitive to Polymyxin B, followed by Levofloxacin, Chloramphenicol. They were resistant to Nitrofurantoin, Amoxicillin clavulinic acid and Ampicillin Sulbactum. *Proteus sp.* isolates were sensitive to Levofloxacin, Pipercillin Tazobactum, followed by Gentamycin. They were resistant to Tobramycin, Nitrofurantoin, Ceftazidime, Ceftriaxone, and Cefepime. *Pseudomonas* isolates were sensitive to almost antibiotics except Amoxicillin clavulinic acid, Cefepime, Ceftazidime, Ampicillin sulbactum.*Citrobacter* isolates were sensitive to most of the antibiotics except Nitrofurantoin, Ceftriaxone, Cefepime, Meropenem, and Tigicyclin. The isolates of *Enterobacter sp.* were sensitive to Pipercillin Tazobactum, Chloramphenicol, Amikacin, but they were resistant to most of the antibiotics. Lack of proper use of Antimicrobial agent and its widespread prevalence in the community may be attributed for the multidrug resistance in most of the uropathogens. The frequency of ESBL producers was 28%.[24, 25]

Gram positive isolates including *Staph.aureus* and *CONS* were sensitive to most of the antibiotics.

In conclusion, it is mandatory to study the routine sensitivity as well as resistance pattern of the isolated microorganisms and to analyze the antibiogram of the hospital. It will help in desiring the empirical treatment of UTI. This is of utmost importance to prepare the antibiotic policy of the hospital. The study shows high rate of resistance to Ceftriaxone, Cefepime, Ceftazidime, Meropenem, Amoxicillin clavulinic acid by uropathogens. The precluding use of these antibiotics in the treatment of UTI, whereas sensitivity to Chloramphenicol, Amikacin, Nitrofurantoin, recommends their use in the treatment of UTI as concerned with this hospital.

Ethical issue

A due permission from ethical committee was obtained for using and analyzing the data.

References

1. Kalpana S. Hegadi, S.S. and Ramesh K. Characterization and antimicrobial susceptibility testing of

uropathogens.The from urinary tract infections, *Int. J Curr Microbiol Appl Sci*. 2015;4(2): 1010 – 16.

2. Ghadge, D.P., Muley, V.A., Sharma J. and Bhore A.V. Bacteriological profile and antibiogram of Urinary Tract Infections at tertiary care hospital, *National Journal of Laboratory medicines*.2015; 7(5): 146 – 152.
3. Shahista Bano, Sarfaraz A Tunio, Ameer Afzal Menom, Hakim Detho, Rozina Bano, Kalpanakumari. Evaluation of antibiotic susceptibility patterns of uropathogens circulating in Hydrabad, Pakistan. *Khyber Med. Univ J*. 2014; 6(3): 110 – 115
4. Humayun, T. Iqbal A. The Culture and Sensitivity Pattern of Urinary Tract Infections in Females of Reproductive Age Group, *Ann. Pak. Inst. Med. Sci*. 2012; 8(1): 19 – 22.
5. Gajamer V R, et.al. Detection of antibiotic resistance pattern with ESBL producers and MRSA among uropathogens at tertiary health care centre, North Bengal. *International Journal of Pure and Applied Bioscience*. 2015; 3(2): 522 – 533.
6. Hari P, *et al.* Antibiotic sensitivity profile of different uropathogens in a tertiary care centre in Nepal. *Journal of Nepal Association of Medical Laboratory Science*, 2012; 11(1): 19 – 33.
7. Gadwohl's clinical laboratory methods and diagnosis. Volume 2, Part VII, page 1136 – 1139.
8. Baur AW, Kirbi WMM, Sherris JC, Truck M, Antibiotic susceptibility testing by a standard single disk method, *Am J clin Pathol*. 1966; 45: 493 – 96.
9. Mahajan D and Bulle P A. Microbiological Profile and Antibiogram of Bacterial Isolates Causing Urinary Tract Infection in Tertiary Care Hospital, *Journal of Dental and Medical Sciences.* 2016; 15(9):145 – 149.
10. Sarsu V.P and Ramlatha S. Bacteriological Profile and antibiogram of urinary tract infection at a tertiary care hospital. *International Journal of Medical Microbiology and Tropical Diseases*, 2017: 3(3): 106 – 112.
11. Katiyar R., Deorukhkar S. and Siddiqui AU. Bacteriological profile and antibiogram of uropathogens with special reference to extended spectrum beta lactamases (ESBL) detection in gram negative bacilli. *Indian Journal of Basic and Applied Medical Research*, 2016;5(2): 290 – 299.
12. Yadav M, Pal R, Damrolien S and Khumanthem S. Microbial spectrum of urinary tract infections and its antibiogram in a tertiary care hospital. *International Journal of Research in Medical Sciences*, 2017; 5 (6): 2018 – 2022.
13. Angami S, Jamir N, Chandra P and, Chandra A. Urinary tract infection, its causative microorganism and antibiotic Susceptibility in Nagaland. *Archives of Medicine and Health Sciences*, 2015; 3(1): 40 – 43.
14. Girishbabu R J, Prakash H V. Bacteriological Study of Urinary Tract Infections with special reference to Extended Spectrum Beta Lactamase producing *Escherichia coli* and *Klebsiella pneumonia*. *J Pharm Biomed Sci.*, 2013; 31: 1080 – 1085.
15. Kumar AR and Kalpana S Prevalence and Antimicrobial Susceptibility Pattern of *Escherichia coli* Causing Urinary Tract Infection *Int. J Pharm Bio Sci*, 2013; 4(4): 927 – 936.
16. Shah L J, Vaghela GM, Mahida H. Urinary Tract Infection: Bacteriological and its antibiotic susceptibility in western India. *NJMR*, 2015; 5(1); 1562 – 65.
17. Ghadage DP, Muley VA,Sharma J and Bhore AW. Bacteriological Profile and Antibiogram of Urinary Tract Infections

at a Tertiary Care Hospital. *National Journal of Laboratory Medicine*, 2016; 5(4): 20 – 24.
18. Gupta PK and Raut P. Myriad Presentation of UTI in A Private Clinic. *National Journal of Medical and Dental Research*, 2017; 5(3): 204 – 207.
19. Pardeshi P. Prevalance of urinary tract infections and current scenario of antibiotic susceptibility pattern of bacteria causing UTI. *Indian Journal of Microbiology Research*, 2018; 5(3): 334 – 338.
20. Pondei K, Orutugu L and Pondel J. Current microbial and culture sensitivity pattern of urinary tract infection in a private hospital setting in Bayelsa State, Nigeria. *International Research Journal of Microbiology*, 2012;3 (9): 393 – 398.
21. Chatterjee N, Chatterjee C, Ghosh S and Mukhopadhya M. Pattern of Urinary Antibiograms in a Tertiary Care Hospital. *Eastern India.Journal of The Association of Physicians of India* 2016; 64: 1 – 5.
22. Puri J, Mishra B, Mal A, Murthy NS, Thakur A, Dogra V, *et al.* Catheter associated urinary tract infections in neurology and neurological units. *J Infect*, 2002; 44: 171 – 5.
23. Joshi S, Rashid MK, Joshi HS. Study of Antibiotic Sensitivity Pattern in Urinary Tract Infection at a tertiary Hospital. *NJIRM*, 2011; 2: 43 – 6.
24. Sood S, Gupta R. Antibiotic resistence pattern of community acquired uropathogens at a tertiary care hospital in JAIPUR, Rajasthan. *Indian J Community Med*. 2012: 37: 39 – 44.
25. Poovendran P, vidhya N, murugan S. Antimicrobial susceptibility pattern of ESBL and Non ESBL producing uropathogenic*Escherichia coli*(UPEC) and their correlation with biofilm formation. *Int.J Microbiol Res*. 2013; 4(1): 56 – 63.

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