

## STUDY OF ANTIBIOTIC RESISTANCE PATTERN TO URINARY PATHOGENS IN A TERTIARY CARE HOSPITAL IN CENTRAL INDIA



## Microbiology

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## ABSTRACT

**Introduction-** Urinary tract infections (UTI) are the second most common infections after the infections of the respiratory tract. In almost all cases of UTI, empirical antimicrobial treatment initiates before the laboratory results of urine culture are available; thus antibiotic resistance may increase in uropathogens due to frequent use of antibiotics.

**Materials and Methods -** All the urine samples of clinically suspected of UTI cases received in the Department of Microbiology, Government Medical College & Hospital, Nagpur were processed by standard bacteriological procedures and the isolate was subjected to antibiotic sensitivity testing.

**Results-** A total number of 283 urine samples were processed, out of which 71 (25.08 %) urine samples were culture positive. The most common organism isolated was E.coli (43.66 %). A very high level of resistance was observed among Gram negative urinary isolates against  $\beta$  lactam antibiotic and cephalosporins. The only drug effective against GNR found in the present study was Amikacin and Imepenem. Gram positive cocci were sensitive to vancomycin and linezolid.

**Conclusion-** Routine monitoring of susceptibility patterns is necessary. This will help in the empirical treatment of UTI to the clinicians and also for the preparation of antibiotic policy of the individual institute. This will avoid the indiscriminate use and ultimately prevent the further development of antimicrobial resistance.

## KEYWORDS:

## Introduction -

Urinary tract infections (UTI) are the second most common infections after the infections of the respiratory tract<sup>1</sup>. UTI is the most common in patients with diabetes and in those with structural and neurological abnormalities which interfere with urinary outflow. Nosocomial UTI is also common following catheterization and cystoscopy. The manifestations of UTI may vary from mild asymptomatic cystitis to pyelonephritis and septicemia<sup>2</sup>. Gram-negative organisms are the most common pathogens involved in UTI, but almost all known pathogens have been incriminated as possible causative agents for UTI<sup>3,4</sup>.

In almost all cases of UTI, empirical antimicrobial treatment initiates before the laboratory results of urine culture are available; thus antibiotic resistance may increase in uropathogens due to frequent use of antibiotics<sup>5</sup>. Increasing resistance in bacterial pathogens is of world-wide concern. The prevalence of antimicrobial resistance in patients with UTI is increasing and can vary according to geographical and regional location<sup>6</sup>.

For this reason, knowledge of the etiological agents of UTIs and their antimicrobial resistance patterns in specific geographical locations may aid clinicians in choosing the appropriate antimicrobial empirical treatment. Therefore the present study was undertaken to find out the prevalence of UTI and to determine the antimicrobial susceptibility patterns of commonly used antibiotics at our Institution.

## Material and methods :

All the urine samples of clinically suspected of UTI cases received in the Department of Microbiology, Government Medical College & Hospital, Nagpur during June 2011 to April 2012 were immediately inoculated and streaked onto blood agar and MacConkey agar (Hi-Media, India). Plates were incubated aerobically at 37°C for 24 hours<sup>7</sup>. Isolated organisms were processed and identified according to standard bacteriological techniques<sup>8</sup>. Antibiotic susceptibility testing was performed by Kirby-Bauer disk diffusion technique<sup>9</sup>. The antibiotic discs for testing were used as per CLSI guidelines<sup>10</sup>.

## Results:

A total number of 283 urine samples were processed, out of which 71 (

25.08 %) urine samples were culture positive.

Table 1 : Different organisms isolated from UTI cases

S.no	Organism isolated (n=71)	Number (%)
1	E.coli	31 (43.66)
2	Klebsiella pneumoniae	17 (23.94)
3	Pseudomonas aeruginosa	07 (9.85)
4	Citrobacter spp.	07 (9.85)
5	Staphylococcus aureus	06 (8.45)
6	Enterococcus faecalis	03 (4.22)
	Total	71 (100)

The most common organism isolated was E.coli (43.66 %) followed by Klebsiella pneumoniae (23.94 %).

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

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

S.no	Organism	Antibiotics tested (%)										
		Nf	Nx	Ac	Ce	Cn	CAZ	CFZ	PT	G	Ak	Ip
1	E.coli (n=31)	14 (45.16)	14 (45.16)	31 (100)	31 (100)	31 (100)	30 (96.77)	30 (96.77)	22 (70.97)	11 (35.48)	09 (29.03)	05 (16.12)
2	Klebsiella pneumoniae (n=17)	05 (29.41)	8 (47.05)	17 (100)	16 (94.11)	08 (47.05)	17 (100)	16 (94.11)	07 (41.17)	04 (23.52)	04 (23.52)	02 (11.76)

3	Pseudomonas aeruginosa (n=07)	03 (42.85)	03 (42.85)	07 (100)	07 (100)	07 (100)	07 (100)	06 (85.71)	5 (71.42)	6 (85.71)	6 (85.71)	01 (14.28)
4	Citrobacter spp.(n=07)	03 (42.85)	04 (57.14)	06 (85.71)	06 (85.71)	06 (85.71)	06 (100)	06 (85.71)	03 (42.85)	04 (57.14)	04 (57.14)	01 (14.28)

**NOTE** - Nf- Nitrofurantoin, Nx- Norfloxacin ,Ac-Amoxycillin-clavulanic acid,PT-Piperacillin-tazobactam, Ce- Cefazidime,Cn-Cefoxitin,CAZ-Cefazoline,G-Gentamicin,A-Amikacin,Ip-Imepenem.

**Table 3 : Antibiotic resistance pattern of staphylococcus aureus isolated from UTI cases**

Organism	Antibiotics tested									
	P	Cn	E	Nf	G	Ak	Nx	Of	Lz	
S.aureus (n=6)	6 (100)	2 (33.33)	6 (100)	2 (33.33)	1 (16.66)	0 (00)	2 (33.33)	2 (33.33)	0 (00)	0 (00)

**NOTE**- P- Penicillin, Cn- Cefoxitin, Nf- Nitrofurantoin E-Erythromycin,G- Gentamycin, Ak-Amikacin, Nx-Norfloxacin, Of-Ofloxacin, Lz- Linezolid.

**Table 4 : Antibiotic resistance pattern of enterococcus faecalis isolated from UTI cases**

Organism	Antibiotics tested									
	P	A	T	Nx	Nf	Fo	HLS	Va	Lz	
E.faecalis(3)	3 (100)	3 (100)	3 (100)	1 (25)	1 (25)	1 (25)	1 (25)	0 (00)	0 (00)	0 (00)

**NOTE**- P-Penicillin, A-Ampicillin,T-Tetracycline,

Nf-Nitrofurantoin, Nx-Norfloxacin, Fo-Fosfomycin,High level streptomycin,Va-Vancomycin, Lz-Linezolid

**Discussion** - Gram-negative organisms are the most common organisms causing UTIs, and they collectively account for more than 75% of cases. The spectrum of uropathogens isolated from urine samples in this study is very similar to the studies done in different regions of India and also that reported in the literature 11. Escherichia coli is the most common uropathogen accounting for 43.66% of cases. The incidence of E. coli as a causative pathogen in India varies from 48% to 65% as reported by various studies done earlier 12,13. Klebsiella is the second most common uropathogen accounting for 23.94% of cases. The incidence of Klebsiella as uropathogen varies from 8% to 26%<sup>12,13</sup>.

A very high level of resistance was observed among Gram negative urinary isolates against β lactam antibiotic and cephalosporins in the present study. The only drug effective against GNR found in the present study was Amikacin and Imepenem. This finding coincides well with various studies by other authors 14,15,16,17. From all the studies, it is evident that the uropathogens are least resistant to amikacin and imipenem. This may be due to the less common use of these injectable antibiotics.

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. The same drugs effective against Gram positive cocci is also reported by Shalini et al 2011 17 and Mandal et al 2012<sup>18</sup>

**Conclusion** –

Routine monitoring of susceptibility patterns is necessary. This will help in the empirical treatment of UTI to the clinicians and also for the preparation of antibiotic policy of the individual institute. This will avoid the indiscriminate use of antibiotics and prevent the further development of antimicrobial resistance.

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