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THE PRESENT TREND OF ANTIBIOTIC SUSCEPTIBILITY PATTERN OF UROPATHOGENS IN A TERTIARY CARE TEACHING HOSPITAL OF RURAL UTTAR PRADESH

Microbiology

Dr Seema Bose* Professor & Head, Department of Microbiology, Hind Institute of Medical Sciences, Safedabad, Uttar Pradesh, India *Corresponding Author

Dr Sameena Jawaid PG Student, Department of Microbiology, Hind Institute of Medical Sciences, Safedabad, Uttar Pradesh, India

Dr Gaurav Vishal PG Student, Department of Microbiology, Hind Institute of Medical Sciences, Safedabad, Uttar Pradesh, India

Dr Anjali Agarwal Associate Professor, Department of Microbiology, Hind Institute of Medical Sciences, Safedabad, Uttar Pradesh, India

KEYWORDS

INTRODUCTION –

Urinary tract infection is one of the commonest infectious diseases in a hospital set up. It is third most common infection reported in India.[1,2,3] Emergence of multidrug resistant (MDR) bacteria is a matter of grave concern worldwide. It poses a serious challenge to control infections in a health care facility. Every year, approximately 150 million patients suffer from urinary tract infection globally. Understanding of etiological uropathogens and their antibiotic sensitivity pattern is essential for a particular region at a particular time period. Empirical therapy and discontinuation of antibiotic without medical advice is a common practice in a rural set up. This causes emergence of drug resistant bacteria.[4,5] Therefore, this study was undertaken to detect antibiotic resistant uropathogens from indoor patients and their antibiotic sensitivity pattern.

MATERIAL AND METHODS

This was a prospective, cross- sectional study. The study period was 6 months. This study was carried out in a tertiary care teaching hospital situated in rural Uttar Pradesh, India.

Study population - The clinically suspected cases of urinary tract infections admitted in this hospital were included in the study. The criteria for inclusion of patients clinically suspected of having UTI were following: >38°C temperature, urgency, frequency and suprapubic tenderness. In the microbiology laboratory, UTI was diagnosed by presence of more than 3 pus cells/ high power field in un centrifuged urine samples, more than 10^5 colony forming unit/ml of centrifuged urine and isolation of not more than two organisms on culture[4].

The urine samples were collected from clean – catch mid stream urine or from sampling of indwelling catheter with the help of a sterile syringe. Urine samples were inoculated on blood agar and MacConkey's agar and incubated at 37^0 Celsius for 18 to 24 hours. Identification of culture isolates was done as per standard protocols.[5,6]

Antibiotic: Antibiotic susceptibility test of all the isolates from clinical urine samples were done using modified Kirby Bauer disk diffusion method. (7) Antibiotic disks used for this study were following: ampicillin (10µ g), ceftazidime (10µ g), Amikacin (30µg), Netilmycin (30µg), ciprofloxacin (5µ g), ticarcillin (75µ g), cefepime (30µ g), piperacillin/tazobactam (100/10µ g), Imipenem (10µ g), colistin (10µ g), polymyxin B (50µ g), nitrofurantoin (300µ g), vancomycin (30µ g), cefoxitin (30µ g), tigecycline (15µ g), amoxicillin/clauvulanic acid (20/10µ g) and fosfomycin (200µ g). Antibiotic sensitivity test was done following clinical and laboratory standard institute (CLSI) guidelines.[7,8] Control strains used for the study were the following: *Escherichia coli* (ATCC 25922), *Klebsiella pneumoniae* (ATCC 13883), *Enterococcus faecalis* (ATCC 29212), *Pseudomonas aeruginosa* (ATCC 27853) and *Staphylococcus aureus* (ATCC 25923).

All the media, biochemicals and antibiotic discs were procured from Hi- Media, Pvt Ltd, India.

All the clinical isolates were screened for Extended spectrum beta lactamases, using cefoxitin (CTX) and ceftazidime (CAZ) discs in combination with clauvulanic acid. Positive findings were confirmed by Ezy MIC™ strip available from Hi- Media, Pvt Ltd, India. [9]

Metallo beta lactamases production by clinical isolates were done by 2 methods: carbapenem- EDTA combined disc method and IPM – EDTA E-test or MBL E test strip available from Hi- Media, Pvt Ltd, India. The tests were conducted as per instructions of manufacturer. [10]

Known ESBL producer and MBL producer were used as control.

RESULTS-

Table 1. Distributions of bacterial isolates from positive urine culture (n = 419)

Bacterial isolates	Total Number	Percentage
Escherichia coli	198	47.25
Enterococcus faecalis	88	21
Klebsiella pneumoniae	63	15.03
Pseudomonas aeruginosa	55	13.15
Staphylococcus aureus	15	3.57

The highest number of uropathogens was *Escherichia coli* 198(47.25%) followed by *Enterococcus faecalis* 88 (21.00%), *Klebsiella pneumoniae* 63 (15.03%), *Pseudomonas aeruginosa* 55 (13.15%) *and Staphylococus* aureus 15 (3.57%).

Table 2. Antimicrobial sensitivity pattern of uropathogens Isolates. (Total number of isolates from clinical urine samples- 419)

Antibiotics	E.coli n= 198	E.faecalis n= 88	K.pneumoniae n=63	P.aeruginosa n= 55	S.aureus n=15
Ampicillin	0	0	-	0	0
Amoxicillin/ clauvulanic acid	-	50(56.81%)	-	-	12 (80%)
Amikacin	192 (96.96%)	42(47.72%)	41(65.07%)	42(76.36%)	15 (100%)
Vancomycin	-	44(50%)	-	-	15 (100%)
Ceftazidime	189(95.45%)	42(47.72%)	0	25(45.45%)	7 (46.99%)
Cefoxitin	182(91.91%)	41(46.59%)	0	18(32.72%)	15 (100%)
Ticarcillin	80(40.40%)	-	20(31.74%)	18(32.72%)	-
Ciprofloxacin	85(42.92%)	44(50%)	20(31.74%)	18(32.72%)	7 (46.99%)

Cefepime	182(91.91%)	34(38.63%)	32(50.79%)	17(30.90%)	8 (53.33%)
Piperacillin/Tazobactam	192(96.96%)	-	19(30.15%)	25(45.45%)	-
Tigecycline	196(98.98%)	44(50%)	62(96.82%)	52(94.54%)	15 (100%)
Fosfomycin	198(100%)	80(90.90%)	60(95.23%)	55(100%)	15 (100%)
Imipenem	189((95.45%)	-	50	40(72.72%)	-
Colistin	-	-	-	55(100%)	-
Polymyxin B	-	-	-	55(100%)	-
Nitrofurantoin	192(96.96%)	88(100%)	55(87.31%)	55(100%)	15 (100%)

Urinary isolates showed high susceptibility against Tigecycline, Nitrofurantoin and Fosfomycin. Colistin and Polymyxin B were only used against *Pseudomonas aeruginosa* and found to be 100% sensitive.

DISCUSSION –

Urinary tract infection is the third most common infection in India.[11] Every year; approximately 150 million populations suffer from UTI globally. Urine culture and microscopy are considered as a gold standard for detection of Urinary tract infection. [12]

In our study, commonest uropathogens was *Escherichia coli* 198(47.25%) followed by *Enterococcus faecalis* 88 (21.00%), *Klebsiella pneumoniae* 63 (15.03%), *Pseudomonas aeruginosa* 55 (13.15%) and *Staphylococus aureus* 15 (3.57%). similar pattern were observed by other researchers also.[13]

Production of Metallo beta lactamase (MBL) by the microorganisms causes Imipenem resistance and increases the mortality rate of infected patients. Therefore, timely identification of MBL producing strains and strict isolation of patients, prevent further spread of MBL producing genes to other gram-negative bacteria. Nitrofurantoin is an excellent drug against *Enterococcal* urinary tract infection and other microorganisms causing lower urinary tract infection. It has been used for past many years and still shows very little resistance. It is both bacteriostatic and bactericidal and resistant mutants are very rare. No cross-resistance was reported between Nitrofurantoin and other antibiotics. It is effective against both *E. faecalis* and *E. facium* including most of the *VRE*.[14] Nitrofurantoin can be given in early pregnancy also. [15,16]

In our study, 27 (13.64%) *E.coli* were ESBL producers, followed by 17(26.98%) *K. pneumoniae.* We also noticed that 18 (32.72%) *P.aeruginosa* and 12(6.06%) *E.coli* were MBL producers. All ESBL and MBL producing strains of isolates from urine samples were multidrug resistant. These findings were similar to the studies conducted by other researchers. [16,17,18,19]

Due to high incidence of MDR uropathogens, the use of older antibiotics like nitrofurantoin and fosfomycin has increased in clinical practice. Reversal of susceptibility to Nitrofurantoin and fosfomycin is probably due to non-usage of these drugs for a long period.

Fosfomycin is used as a single oral dose in case of uncomplicated urinary tract infection. Fosfomycin inhibits enolpyruvyl transferase that is essential for any microorganism having muramic acid in its cell wall. Fosfomycin resistance is mainly due to mutation and plasmid mediated. According to Martin et al, disk diffusion method is not a suitable method to detect fosfomycin sensitivity and for that, minimum inhibitory concentration of the drug should be assessed. [19,20,21]

In our study, Nitrofurantoin and fosfomycin were found to be very useful for the treatment against MDR uropathogens, even in Gram-positive cocci. This finding was supported by other studies also. [16,20,21,22]

CONCLUSION –

Microscopy, urine culture and antibiotic sensitivity of causative organisms are still main strategy for treatment UTI. Geographical variation may occur from place to place and time to time. Shift of antibiotic resistance pattern from one drug to other should be recorded at regular interval. A proper antibiotic policy should be made by every health – care facility to prevent indiscriminate use of antibiotics and emergence of MDR uropathogens.

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