

# The Study Of Urinary Tract Infections And Antibiogram Of Uropathogens In And Around Ahmadnagar, Maharashtra.

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## Citation

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## Abstract

**Background and Objectives:** Urinary tract infections (UTI) are one of the most commonly occurring infections in hospitals. But micro organisms causing UTI vary in their susceptibility from place to place and from time to time. This study was designed to determine the prevalence and antibiotic susceptibility patterns of common urinary bacterial isolates in and around Ahmadnagar, Maharashtra. **Methods:** Seven hundred and ninety five urine specimens from clinically suspected UTI patients were examined by Semi quantitative culture method and their antimicrobial sensitivity patterns were determined by Kirby-Bauer disc diffusion technique. **Results:** In total one hundred ninety five pathogenic isolates (isolation rate 24.52%) were obtained with the maximum isolation rate in between 21-40 years age group of patients. The rate of culture positivity in females was 63.6% (124/195), whereas in males it was 36.4% (71/195). Among the isolates E. coli was the predominant isolate (72.3%) followed by Klebsiella spp (13.33%), Pseudomonas aeruginosa (5.64%), Proteus spp. (3 %) and Citrobacter spp, Candida albicans, S faecalis, Staph aureus approximately 1-2% each. Sensitivity tested against various antimicrobials showed maximum sensitivity against Imipenem (94.3%), Cephotaxime, Cefepime, Amikacin in order of sensitivity. Substantial resistance was shown to Gatifloxacin by almost all important gram negative isolates, which is one of the newly introduced fluoroquinolones and resistance to third generation cephalosporin, Ceftazidime was also noticed. **Interpretation:** Females predominated over males in both incidence as well as in rate of culture positivity. The aetiology of UTI was similar to previously established, known pathogens with E. coli accounting for more than 70 percent infections. The antibiogram of different isolates observed emphasizes the judicious usage of antibiotics. **Conclusion:** We conclude that maintaining a record of culture results and the antibiogram may help clinicians to determine the empirical and / or specific treatment based on the antibiogram of the isolate for better therapeutic outcome.

## INTRODUCTION

Urinary tract infection (UTI) which is defined as presence and active multiplication of microorganisms within the urinary tract is one of the commonest bacterial infections seeking treatment in clinical practice. Although a variety of etiology is involved with UTI, E. coli and other coliforms account for large majority of naturally acquired urinary tract infections. They are the frequent cause of nosocomial infections in many hospitals.<sup>1,2</sup> Bacteriological investigations of UTI are not complete without an antibiotic sensitivity test of the isolate. Microorganisms causing UTI vary in their susceptibility to antimicrobials from place to place and time to time. The present study was undertaken to study the prevalence of urinary tract infections among the patients attending Vikhe Patil Medical College, Hospital, Ahmadnagar. This is the first report of such kind from this institute.

## MATERIALS AND METHODS

### STUDY POPULATION

A total of 795 patients clinically suspected of having urinary tract infection were involved. The study group comprised of 505 females and 290 males with age range of zero to sixty years.

### COLLECTION OF SAMPLE

The patients were properly instructed on how to collect the sample and under aseptic conditions Clean Catch Mid Stream specimen of urine was collected from each patient. In case of children the specimen was collected by suprapubic aspiration and was immediately transported to laboratory for further processing. The name, age and sex were clearly mentioned on the universal container containing specimen.

### PROCESSING OF SPECIMEN / CULTURE

A modified semi-quantitative technique using a standard

calibrated bacteriological loop of urine was performed to transfer the 0.01 ml of urine sample on Blood agar and MacConkey agar media. After allowing the urine to be absorbed into the agar, the plates were then inverted and incubated at 37°C for 18-24 hrs. The colony count was done using semi quantitative method. A significant bacterial count was taken as count equal to or in excess of 10<sup>5</sup> per milliliter.

## IDENTIFICATION OF ISOLATES

Pure isolates were identified as described by Collee et al<sup>3</sup> using morphological, cultural and biochemical characters.

## ANTIBIOTIC SUSCEPTIBILITY TESTING

An antibiogram was done by agar disc diffusion technique as described by Bauer et al<sup>4</sup>. Appropriate antibiotic discs were tested depending upon whether the organism was gram positive or gram negative. Interpretation of results was done based on the diameter of the zone.

## RESULTS

A total of 795 samples were received and examined over a time period of one and half year. The positivity of urinary tract infections was found to be 24.5% (195/795) as depicted in Table No. I. There was absence of growth in 600 (75.5%) samples. The study population comprised of 505 (63.5%) females while 290 (36.5%) were males as shown in Table III. This difference is statistically significant (p < 0.05). The overall positivity of urine cultures is exhibited in Table IV. The rate of culture positivity in females was 63.6% (124/195), whereas in males it was 36.4% (71/195) as depicted in Table II. Age and sex wise distribution of total patients attending the laboratory for the diagnosis of urinary tract infections is shown in Table III. Amongst females, age group 21-30 years followed by 11-20 and 31-40 years and amongst males age group 31-40 were predominant age groups in terms of incidence.

Age and sex wise distribution of positive urine cultures is presented in Table IV. Comparatively higher positivity was observed in the age group of 41-50 (10.8%) compared to age group of 31-40 (8.20%) amongst the males subjects, and overall female subjects predominated over males in terms of urine culture positivity (especially age group 21-30 with 20.5% positivity) except in the age group of 41-50 years.

When the culture of urine specimens was done on MacConkey agar and Blood agar media, it was observed that the majority of the isolates were of the gram negative bacilli with *Escherichia coli* (72.3%) being predominant pathogen

followed by *Klebsiella* spp (13.3%), *Ps. aeruginosa* (5.64%), *Proteus* spp (3.07), *Citrobacter* spp. (1.53), *Enterobacter* spp. (0.51) as depicted in Table V. Amongst the total of seven gram positive isolates, 3 (1.5%) were of *Candida albicans* and 2 each of *Streptococcus faecalis* and *Staph epidermidis*.

Among the antimicrobials tested, Imipenem (92.7%), Cefepime (54.7%), Cephotaxime (48.43%) followed by Amikacin (43.8%) formed the major antibiotics.

Individual antimicrobial sensitivity pattern is shown in Table VI. There was varying sensitivity pattern shown by each organism for the same antimicrobial. Amongst the highest isolated organism i.e. *E. coli* showed highest sensitivity to Imipenem (94.3%), followed by Cefepime (51.0%) and Amikacin (41.9%). The second most in order of isolation which is *Klebsiella* spp. too showed highest sensitivity to Imipenem (88.5%). Besides Gatifloxacin, Nalidixic acid, Norfloxacin etc. Ampicillin was the antibiotic to which maximum resistance was noticed by all major isolates.

### Figure 1

Table I: Positivity of urinary isolates among a total of 795 samples

Total number of samples	Culture positive		Culture negative	
	Number	%	Number	%
795	195	24.5	600	75.5

### Figure 2

Table II: Distribution of male & female subjects among positive cultures

Total number of samples	Among Culture positive			
	Male		Female	
	Number	%	Number	%
195	71	36.4	124	63.6

### Figure 3

Table III: Age & sex wise distribution among total urine cultures

S. No.	Age (years)	Male		Female	
		No.	%	No.	%
1.	0-10	31	3.89	39	4.90
2.	11-20	34	4.27	94	11.8
3.	21-30	46	5.78	140	17.6
4.	31-40	73	9.18	80	10.06
5.	41-50	61	7.67	67	8.42
6.	51-60	32	4.02	57	7.16
7.	> 60 years	13	1.63	28	3.52

**Figure 4**

Table IV: Distribution of positive urine cultures in different age groups and sexes

S. No	Age (years)	Male		Female	
		No positive	%	No. positive	%
1	0-10	3	1.53	5	2.56
2	11-20	4	2.05	22	11.28
3	21-30	10	5.12	40	20.51
4	31-40	16	8.20	29	14.87
5	41-50	21	10.76	13	6.66
6	51-60	13	6.66	14	7.17
7	> 60 years	4	2.05	1	0.51
	Total	71	36.4	124	63.6

**Figure 5**

Table V: Distribution of total microbial isolates obtained from UTI subjects

S. No	Gram positive (n=7)			Gram negative (n=188)		
	organism	No.	%	Organism	No.	%
1.	<i>Staph. epidermidis</i>	2	1.02	<i>E. coli</i>	141	72.3
2.	<i>S. faecalis</i>	2	1.02	<i>Klebsiella spp.</i>	26	13.3
3.	<i>Candida albicans</i>	3	1.53	<i>Ps. aeruginosa</i>	11	5.7
4.				<i>Proteus spp.</i>	06	3.0
5.				<i>Citrobacter spp.</i>	03	1.6
6.				<i>Enterobacter spp.</i>	01	0.51
	<b>Total</b>	<b>7</b>	<b>3.6 %</b>	<b>Total</b>	<b>188</b>	<b>96.4 %</b>

**Figure 6**

Table VI: Antibiotic sensitivity pattern for the total microbial isolates (n = 195)

S. No	Name of antibiotic	No	%
1.	Amikacin (Ak/30)	84	43.8
2.	Ampicillin (A/10)	13	6.8
3.	Cefepime (cpm/30)	105	54.7
4.	Ceftazidime (Ca/30)	25	13.0
5.	Chloramphenicol (C/30)	71	37.0
6.	Cephalothin (Ch/30)	17	8.9
7.	Cephotoxime (Ce/30)	93	48.5
8.	Co-trimoxazole (CO/25)	23	12.0
9.	Gatifloxacin (Gf/5)	32	16.7
10.	Gentamycin (G/10)	64	33.3
11.	Imipenem (I/10)	178	92.7
12.	Nalidixic acid (Na/30)	13	6.8
13.	Nitrofurantoin (Nf/300)	45	23.5
14.	Norfloxacin (Nx/10)	27	14.1

**DISCUSSION**

Urinary tract infections are one of the most commonly diagnosed infections in our hospital and probably in every hospital set up. Micro organisms causing UTI vary in their susceptibility to antimicrobials from place to place and from time to time<sup>5</sup>. The percent positivity for urinary cultures was found to be 24.5% (195 out of 795 samples). One possible explanation behind such low positive isolation rate may be that most of these patients present with pyrexia and the urine forms a part of the septic work. Perhaps a screening urinalysis like microscopy, dipstick or nitrate test which will detect Bacteriuria may help to chose only positive specimens to be sent for culture. Similar findings were observed by other workers as well where they have reported even lesser

isolation rate of around 17%<sup>5</sup> whereas in another report the authors have reported 44.29% isolation rate<sup>6</sup>.

The prevalence of UTI occurred more in females than in males. Of the 195 isolates obtained, 124 were from females while 71 were from males. These results also agree with other reports, which showed that UTIs are more frequent in females than males during adulthood<sup>7,8,9</sup>. Males in the age group of 41-50 formed major group followed by 31-40, and 51-60 with positive urine cultures. In females however more incidences were found in the age group of 21-30 followed by 31-40 and 11-20. It seems in females the incidence seen was more at earlier age compared to that in males, where the incidence was more at more advanced age. In older men, the incidence of UTI may increase due to prostatic obstruction or subsequent instrumentation. Normally UTI in males younger than 50 years is unusual. However in our study, the number of patients studied above 60 years age group were comparatively less, hence a definitive conclusion could not be drawn. But when individually, the age group of above 60 years age is considered then out of 13 males studied, 4 yielded positive urine culture (30.76%), which goes in accordance to the findings reported by Rao et al.<sup>10</sup> Somewhat similar findings were reported by Mbata Theodore<sup>12</sup> in prison inmates in Nigeria. They have reported an isolation rate of 56.7% in the age group of 52-60, although with less number of patients (2/3).

UTIs are caused by a variety of microorganisms, including both gram positive and gram negative ones. The etiology of UTI has been regarded as well established & reasonably consistent. In our study *Escherichia coli* (72.3%) was predominant isolate followed by *Klebsiella spp.* (13.33%) and *Ps. aeruginosa* (5.64%), *Proteus spp.* (5.64%) respectively. This finding agrees with other reports which indicated that gram negative bacteria mostly *E. coli* & *Kleb. pneumoniae* are the commonest pathogens isolated in patient with urinary tract infections.<sup>11-18</sup>

AST was performed by Kirby Bauer disc diffusion technique on bacterial isolates. The most useful antibiotics in this study were Imipenem, Cefepime, Cephotoxime, Amikacin, Nitrofurantoin, Chloramphenicol notably. Ampicillin, Gatifloxacin, Gentamycin, Nalidixic acid, Norfloxacin antibiotics which were used, had shown resistance. Similar findings were observed by many workers around the world.<sup>12-18</sup> The possible explanation behind the resistance showed to these antibiotics, may be because these antibiotics have been in use for a long period and must have been

abused and as a result the organisms must have developed mechanisms of circumventing their mode of action. The study showed that the Co-trimoxazole, Nalidixic acid, Norfloxacin are the drugs most commonly used for inpatients, which is reflected by the noticeable resistance shown by *E. coli* isolates to these antibiotics.

Two alarming findings seen in the study were that, the substantial resistance shown to Gatifloxacin by almost all important gram negative isolates, which is one of the newly introduced fluoroquinolones and resistance to third generation cephalosporin, Ceftazidime.

The study has showed that susceptibility pattern is necessary to obtain sensitivity reports before start of antibiotic treatment in cases of suspected UTI. The knowledge of antimicrobial pattern of routinely isolated uropathogens in that particular area may provide guidance to clinicians regarding the empirical treatment of UTI when therapy must be started before laboratory reports are available. We conclude that laboratories should encourage accurate bacteriological record keeping of urinary isolates and their antibiogram for better management of these cases.

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