

## The Study of Urinary Tract Infections and Antibiogram of Uropathogens in Tertiary Care Hospital at Shimoga Institute of Medical Sciences, Shimoga.



### Microbiology

**KEYWORDS:** Urinary tract infection; Antimicrobial susceptibility; Uropathogens

<b>Hanumantharaju MV</b>	Postgraduate Department of Microbiology SIMS, Shimoga, Karnataka.
<b>Halesh LH</b>	Professor and Head, Department of Microbiology, SIMS Shimoga
<b>Siddesh KC</b>	Associate Professor, Department of Microbiology, SIMS Shimoga
<b>Mallikarjun Koppad</b>	Assistant Professor, Department of Microbiology, SIMS Shimoga
<b>Premalatha DE</b>	Assistant Professor, Department of Microbiology, SIMS Shimoga
<b>Prakash N</b>	Assistant Professor, Department of Microbiology, SIMS Shimoga

### ABSTRACT

*Background: Urinary Tract Infection is one of the most common bacterial infections seen in clinical practice particularly in developing countries. The causative agents for Urinary tract infection vary from place to place and they also vary in their susceptibility and resistance patterns.*

*Objectives: Study is to determine the etiological bacterial pathogens of UTI and to determine the antibiotic sensitivity pattern of isolates*

*Material and Methods: A total of 855 urine samples from OPD and IPD patients of Microbiology SIMS, Shimoga. These samples were subjected to culture and susceptibility test with use of standard bacteriological techniques as described by CLSI guidelines*

*Results: 30.90% of the total urinary samples showed significant bacterial growth. 12 different bacterial species isolated. Among these, E.coli (30.29%) was significantly the most predominant followed by Enterococcus species (18.24%), Staphylococcus saprophyticus (13.35%), Klebsiella pneumoniae (9.12%) and others.*

*E.coli is highly sensitive to amikacin (81.72%) followed by imipenem (89.24%) and Piperacillin (89.24%)*

*Conclusion: This study will be continued to include more number of samples to determine sensitivity and resistance pattern of bacterial isolates in UTI*

### INTRODUCTION

Urinary tract infections are the most common infections in clinical practice. One of the most prevalent problems faced by health care services is the increasing prevalence of antimicrobial resistance. Urinary tract infection (UTI) are among the most common bacterial infections affecting humans throughout their lifetime. They are the frequent cause of morbidity in outpatients as well as most frequently involved in the cause of nosocomial infection in many hospitals.<sup>2</sup>

Most of the UTI are caused by Gram negative bacteria like Escherichia coli, Proteus species, Klebsiella species sp. Pseudomonas aeruginosa, Acinetobacter, Serratia and Morganella morganii. UTI also caused by Gram positive bacteria like Enterococcus, Staphylococcus especially coagulase negative staphylococci and Streptococcus agalactiae.<sup>3</sup>

UTI is much more common in women than in men due to anatomical and physiological reason; by virtue of its position urogenital tract is more vulnerable to bacterial infections caused by both internal and external flora.<sup>2</sup>

The prevalence of antimicrobial resistance among urinary pathogens has been increased worldwide due to aberrant use of antibiotics in practice.<sup>4</sup> Urinary tract infections are often treated with different broad spectrum antibiotics, one with narrow spectrum of activity may be appropriate because of emerging concerns about infection with resistant organisms and antimicrobial susceptibility testing of the urinary pathogens constitutes the basis for antibiotic therapy. However in view of the increasing bacterial resistance, regular monitoring of resistance pattern is necessary to improve guidelines for empirical antibiotic therapy.<sup>2</sup>

Hence this study was done to find out the common bacteria causing and to determine the antibiotic susceptibility pattern of the urinary pathogens causing UTI over one year period from a

tertiary care hospital attached to Shimoga institute of medical sciences, Shimoga.

### Methods;

This study was done from January 2014 to December 2014 at the department of microbiology, Shimoga Institute of Medical Sciences, Shimoga.

A total of 855 clean catch midstream urine sample were collected in a wide mouthed sterile container from both outpatients and inpatients and processed in the Microbiology Laboratory. The urine sample were inoculated on both blood and MacConkey agar using calibrated loops for semi-quantitative method and incubated aerobically at 37°C for 24 hours

A specimen was considered positive for UTI if a single organism was cultured at a concentration of  $\geq 10^5$  cfu/ml. Colonial appearance and morphological characters of isolated bacteria was noted and isolated colonies were subjected to preliminary tests like Gram staining, motility by hanging drop, catalase test and oxidase test. These preliminary tests were followed by biochemical reactions for identification of the isolated organism. And the isolated organisms subjected for antibiotic susceptibility testing.<sup>5</sup>

### Antimicrobial susceptibility testing

Antimicrobial susceptibility testing was done by Kirby-Bauer disk diffusion method by using Mueller Hinton agar plates. Commercially available HiMedia discs were used. The bacterial suspension were made by inoculating 4-5 well isolated identical colonies in peptone water. After 2 hours of incubation the turbidity was standardized by using 0.5 McFarland standards.

By using a sterile swab a lawn culture was made on the Mueller-Hinton agar plates. The antibiotic discs were placed and inoculated plates were incubated at 37°C. The results were read after overnight incubation and compared with standard chart.

The following drug were used for Antibiotic sensitivity test, [According to CLSI guidelines]6

Amikacin (30µg), Gentamycin (10µg), Ciprofloxacin (5µg), Ceftriaxone (30µg), Norfloxacin (10µg), Ampicillin (10µg), Imipenem (10µg), Cefoxitin (30µg), Cefepime (30µg), ceftazidime (30µg), Piperacillin (100µg), Erythromycin (15µg), Clindamycin (2µg), Oxacillin (1µg), Linezolid (15µg) and Vancomycin(30µg).

**Statistical analysis**

**Results and Discussion**

A total of 855 samples were collected during the study period of which 523 (61.16%) were from female and rest 332 (38.83%) were from males. Pathogenic bacteria were isolated in 307 with a prevalence rate of (35.90%) The prevalence in female was 62.54% and the prevalence in male was 37.5%, which is shown in Table.1.

**Table.1: Sex wise distribution of prevalence of urinary tract infection**

Sex	Total samples	no. of	No. of Positive	Prevalence
Male	332		99	37.5%
Female	253		208	62.54%

Statistical Analysis;

**Table No. 2A shows agewise distribution of samples and their positivity.**

Age (years)	Positive Samples	Negative Samples	Total Samples
< 20	108(29.8%)	254(70.16%)	362(100%)
21-40	122(40.53%)	179(54.46%)	301(100%)
41-60	49(36.02%)	87(63.97%)	136(100%)
>61	28(50%)	28(50%)	56(100%)
Total	307(35%)	548(64%)	855(100%)

Urinary tract infections was most commonly seen in the age group of 21-40 years (54.46%). The age wise distribution of samples and their positivity is shown in table 2. Among females UTI was commonly seen in the age group of 21-40 years and in males it was common between 41-60 years.

Number of positives in relation to sex.

**Table No. 2B : shows number of positives samples in relation to sex.**

Age (years)	Male	Female	Total
< 20	35(32.4%)	73(67.59%)	108(100%)
21-40	28(22.95%)	94(77.04%)	122(100%)
41-60	24(48.97%)	25(51.02%)	49(100%)
>61	12(42.85%)	16(57.14%)	98(100%)
Total	99(32.24%)	208(67.76%)	307(100%)

E. coli was the most commonly isolated urinary pathogen (30.29%), followed by Enterococcus species (18.24%), Staphylococcus saprophyticus (13.35%) and Klebsiella species (9.12%). The isolation rates of other organisms are shown in table 3.

**Table.3 : Frequency of isolation of various urinary pathogens.**

Urinary pathogen isolated	Number (Percentage)
Escherichia coli	83 (30.29%)
Enterococcus species	56 (18.24%)
Staphylococcus saprophyticus	41 (13.35%)
Klebsiella pneumonia	28 (9.12%)
Staphylococcus aureus	23 (7.49%)
Pseudomonas aeruginosa	22 (7.16%)
Candida albicans	16 (5.21%)
Gram-negative nonfermentors	11(3.58%)
Proteus species	6 (1.95%)
Streptococcus pyogenes	4 (1.30%)
Acinetobacter species	3 (0.97%)

<b>Citrobacter species</b>	<b>2 (0.65%)</b>
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**Table. 4: Percentage of In Vitro Antibiotic Sensitivity pattern of most Frequently Isolated Microorganism**

Drugs	E.coli (%)	Enterobacter species (%)	Staphylococcus saprophyticus (%)	Klebsiella Pneumoniae(%)
Ampicillin/Salbutam	13.97	17.54	21.73	7.14
Amikacin	81.72	66	68.75	37.03
Gentamycin	29.03	30	63.41	44.44
Ciprofloxacin	21.12	19.29	14.63	75
Ceftriaxone	20.98	-	-	28.57
Clindamycin		63.41	63.41	
Norfloxacin	19.35	9.52	34.61	25.92
Cefepime	17.27	-	-	17.85
Imipenem	89.24			96.42
Cefoxitin			17.07	-
Linezolid	-	96.49	100	-
Vancomycin	-	87.71	87.80	-
Penicillin	-	18.18	7.01	-
Piperacillin	89.24			

E.coli are highly sensitive to Imipenem, Amikacin, and Pirceracillin and showed high resistance to Penicillin, Ampicillin/salbutam, Gentamycin.

**Discussion**

Effective management of patients suffering from bacterial UTIs commonly relays on the identification of type of organisms that caused the disease and selection of an effective antibiotic agent to the organism. Diagnosis of UTIs is a good example of the need for close cooperation between the clinician and the microbiologist.

In our study prevalence rate of infection of urinary pathogen was 35.90%, similar study by Hari.P.Kattel et al (2008) in which 26% of urine specimens showed significant bacterial growth.7

The prevalence of UTI are more in females when comparing to males. This correlates with other study by A.R.M. Momoh et al. in which 60.2% were females and 39.8% were males. Women are more prone to UTIs than men because of short urethra and is closer to anus.8

Among patients with UTI, females were most commonly in the age group between 21-40 years and males were between 41-60 years. This was in consistent with a study of Dr. Alka Nerukar et al.(2012) 4 in which 52.16% were in the age group 21-40 years, who concluded that most uncomplicated urinary tract infections occurs in women who are sexually active, with far fewer cases occurring in older women, those who are pregnant, and in men. In older men, the incidence of UTI may increase due to prostatic obstruction or subsequent instrumentation. This was in consistent with the study of S. Banerjee. et al(2009).9

E.coli was the predominant bacteria found in our study similar result was found by D. Durgesh et al (2012) showed that prevalence of E.coli was 31.5% predominant study. 10

The second isolated pathogen was Enterococcus faecalis, this correlates with other study of J. Shanathi et al (2012) in which 28.1% of Enterococcus faecalis was isolated as urinary pathogen.2

In our study E.coli was most resistant to Ampicillin, Penicillin and Gentamycin. It was most sensitive to and Amikacin(81.72%), Similar finding were seen in a study by Shamataj Kattalagere Razak , G. Vishwanath (2012).1 who concluded that the organisms showed resistance to older urinary antimicrobial agents such as Ampicillin which indicates that increased consumption of particular antibiotics can be the pathway to its resistance.

*Enterococcus faecalis* was most resistant to Norfloxacin, Penicillin, Ampicillin and Ciprofloxacin. It was most sensitive to Linezolid and Vancomycin.

*Staphylococcus saprophyticus* was resistant to Penicillin, Ampicillin, Ciprofloxacin and Cefoxitin. It was sensitive to Linezolid and Vancomycin.

*Klebsiella pneumoniae* was most resistant to Ampicillin, Cefoxitin and very much sensitive to Imipenem.

All the four isolated organisms susceptibility pattern showed in table 4.

### Conclusion

*E.coli* was the most frequent causative agent in UTI. Higher prevalence of UTI was seen in females. In females UTI was seen in patients between 21-40 years age group and in males it was seen in older age group between 41-60 years. Gram negative organisms were most commonly isolated organisms in UTI among which *E.coli* the most frequent agent. Urinary pathogens showed resistant to commonly used antibiotics like Ampicillin and Norfloxacin. On the basis of this study we can conclude that the resistance of commonly used antibiotics is very crucial. The antibiotic treatment should be limited to symptomatic UTIs and be initiated after sensitivity testing only. As drug resistance among pathogens in an evolving process, routine surveillance and monitoring studies should be conducted to help physician to start most effective empirical treatment

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