



## Prevalence and antibacterial susceptibility pattern of Urinary Tract Infection Causing Human Pathogenic Bacteria

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### ABSTRACT

Toxigenic strains of *Escherichia coli* are common enteric. The present study was conducted to detect common pathogens of urinary tract infection (UTI) and their susceptibility pattern to the commonly used antimicrobial agents in local scenario. Urinary tract infection is one of the common clinical conditions in the patients presenting to the clinics and hospitals. Despite the widespread availability of antibiotics, it remains the most common bacterial infection in the human being. Detection of common pathogens and their antimicrobial susceptibility pattern is mandatory for effective treatment. In the present study, 40 urine samples were collected from adult patients were analyzed for Multidrug Resistant (MDR) strain isolation and identified. The MDR strains were identified by the Kirby Bauer method following the definition of the National Committee of Clinical Laboratory Standards. Out of total 40 samples, 32 (80%) samples grew potential pathogens causing UTI. *Escherichia coli* were the predominant 10 (31.25%) isolates causing UTI, followed by *Staphylococcus aureus* -8 (25%), *Pseudomonas aeruginosa*- 5 (15.62%), *Proteus mirabilis* -5 (15.62%), *Klebsiella pneumoniae* -2 (6.25%) and *Serratia marcescens* – 2 (6.25%). The mean sensitivity of the antibiotics was Tetracyclin (76.66%), Penicillin (70.83%), Ciprofloxacin (60%). *S. aureus* showed 75% resistance to Methicillin, Oxacillin and Vancomycin. Uropathogens are sensitive to Norfloxacin, Co-trimoxazole and Ofloxacin. High prevalence of drug-resistant urinary tract pathogens, particularly to Tetracyclin, Penicillin and Ampicillin among local patients suggests cautious use of antibiotic therapy for the treatment. Finally, we suggest that empirical antibiotic selection should be based on knowledge of the local prevalence of bacterial organisms and antibiotic sensitivities rather than on universal guidelines.

**Keywords:** Prevalence, Susceptibility, UTIs, Disc Diffusion, Uropathogens, Sensitivity.

### 1. INTRODUCTION

Urinary tract infection (UTI) is one of the most common infections encountered and treated worldwide. Despite the widespread availability of antibiotics, urinary tract infection (UTI) remains the most common bacterial infection in the human population. Antibiotics are usually given empirically before the laboratory results of urine culture are available. To ensure appropriate therapy, current knowledge of the organisms that cause UTI and

their antibiotic susceptibility is mandatory. [1] Due to rising antibiotic resistance among uropathogens, it is important to have local hospital based knowledge of the organisms causing UTI and their antibiotic sensitivity patterns. The spectrums of etiologic agents causing urinary tract infections and their antimicrobial resistance pattern have been continuously changing over the years, both in community and in hospitals. [2] UTI is frequently

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encountered in patients with diabetes and in those with structural and neurological abnormalities, which interfere with urinary flow. The prevalence of antimicrobial resistance in both out and hospital patients with UTI is increasing and can vary according to geographical and regional location. [3] Drug resistance of pathogens is a serious medical problem, because of very fast arise and spread of mutant strains that are insusceptible to medical treatment. The emergence of antibiotic resistance in the management of UTIs is a serious public health issue, particularly in the developing world where apart from high level of poverty, ignorance and poor hygienic practices, there is also high prevalence of fake and spurious drugs of questionable quality in circulation. Knowledge of etiological agents of UTIs and their sensitivities to available drugs is of immense value to the rational selection and use of antimicrobial agents and to the development of appropriate prescribing policies. [4] This study help for gaining knowledge about the type of pathogens responsible for UTIs and their susceptibility patterns may help the clinicians to choose the right empirical treatment.

## 2. MATERIAL & METHODS:

A total of 40 urine samples were collected in sterile containers from suspected urinary tract infected cases from different hospitals from Nagpur region. Identification of bacterial pathogens was made on the basis of Gram reactions, morphology, biochemical characteristics and cultural characteristics. Isolates were tested for antimicrobial susceptibility by Kirby Bauer's Method [5] on Muller Hinton agar using the readymade antibiotics supplied by Hi-media Ltd, Mumbai. Antibiotics used for Gram-negative bacilli were Ciprofloxacin, Sparfloxacin, Gentamincin, Streptomycin, Tobramycin, Ampicillin, Norfloxacin, Tetracyclin, Penicillin, Ofloxacin, Ceftriaxone and Co-trimoxazole. For *Staphylococcus aureus* - Penicillin, Oxacillin, Vancomycin and Methicillin were also used. The results were interpreted as per Clinical and Laboratory Standard Institute.[6] The Multiple Antibiotic Resistance indices (MARI) were calculated as follows: MAR index for isolates = [Number of antibiotics to which the isolate is resistance / Number of antibiotics tested]. While MAR index for an antibiotics = [Number of antibiotics resistance to the isolates / (Number of antibiotics x Number of isolates)]. [7]

## 3. RESULTS & DISCUSSION:

This study undertaken to evaluate the prevalence and susceptibility patterns of bacterial strains isolated from patients diagnosed with UTIs in different local hospitals. A total of 40 urine specimens were collected from patients suspected of having UTI, out of which a total number of 32 showed significant bacterial growth. The bacteria

isolated were *Escherichia coli*, the predominant 10 (31.25%) isolates causing UTI, followed by *Staphylococcus aureus* -8 (25%), *Pseudomonas aeruginosa*- 5 (15.62%), *Proteus mirabilis* -5 (15.62%), *Klebsiella pneumoniae* -2 (6.25%) and *Serratia marcescens* – 2 (6.25%) (Table No. 1). *E. coli* was the predominant bacteria found in our study, similar result was found by S. Manikandan et. al (2011) [8] showed that *E.coli* was 31.5% predominant in their study. The multiple antibiotic resistant indices (MARI) calculated for *E. coli* was 0.61, 0.69 and 0.46 (Table No. 2, Fig. 1). This study was correlate with the study of D.H. Tambekar et.al., (2006)[7] who found that the MARI of *E.coli* was 0.85, 0.52 and 0.38. *E. coli* was highly resistant to Gentamicin (90%, MARI – 0.069), Ciprofloxacin (80%), Penicillin (80%, MARI – 0.061) and Ceftriaxone (80%, MARI – 0.061). The overall rate of resistance against *E.coli* was worldwide reported which was similar with the study of Mandal *et al.* (2001) [9] showed *E. coli* as the commonest cause of UTI and antibiotic resistance was high among the strains, which emphasize the need for judicious use of antibiotics. Certain virulence factors like haemolysin production and presence of fimbriae in the *E. coli* may be associated with urovirulence.

Sr. No.	Bacterial Isolates (32)	Percentage
1.	<i>E.coli</i> (10)	31.25%
2.	<i>Staphylococcus aureus</i> (8)	25.00%
3.	<i>Pseudomonas aeruginosa</i> (5)	15.62%
4.	<i>Proteus vulgaris</i> (5)	15.62%
5.	<i>Klebsiella pneumoniae</i> (2)	6.25%
6.	<i>Serratia marcescens</i> (2)	6.25%
	<b>Total</b>	<b>100 %</b>

Table 1: Percentage of UTI isolate among the pathogens

The MAR Indices for *S. aureus* was 0.46, 0.30 and 0.23, D. H. Tambekar et. al., (2006) who found that MARI for *S.aureus* was 0.61. *S. aureus* showed 75% resistance to Methicillin, Oxacillin, Vancomycin, Gentamincin, Tetracyclin and Penicillin and their MAR indices for antibiotics was found to be 0.057 (Table No. 3). The MAR indices for *Ps. aeruginosa* were 1.0, 0.8 and 0.6, *Ps. aeruginosa* was highly resistant to Ampicillin (100%) antibiotics with MARI was 0.076 whereas this organism also 80% resistance to Ceftriaxone, Gentamincin, Norfloxacin and Tetracyclin with MAR index was 0.061. The highest MAR indices for *Proteus vulgaris* were found to be 0.46 and these bacteria was resistance to

Tobramycin (80%) antibiotic. This bacteria also showed high resistant to Ciprofloxacin, Sparfloxacin and Penicillin.

local prevalence of bacterial organisms and antibiotic sensitivities rather than on universal guidelines.

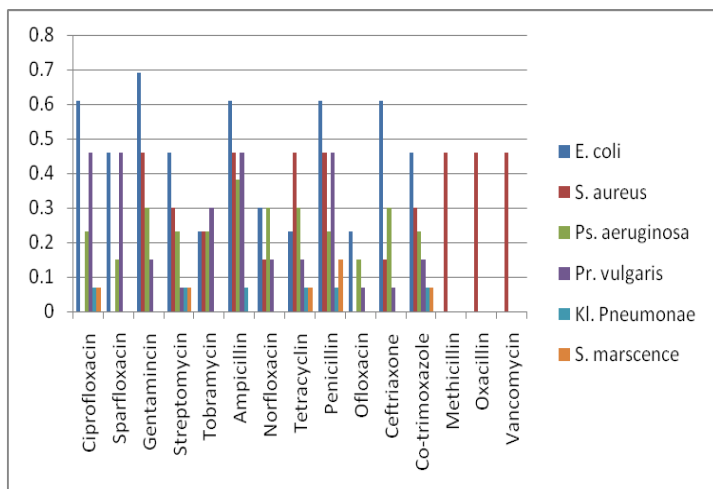


Figure 1: Graphical representation of MAR index of bacterial isolates

This study showed some similarities with the study of Kolawale AS et. al (2009)[10]. *Kl. Pneumoniae* and *Serratia marscences* showed similar results with antibiotics resistance. Both the bacteria were 50% resistance to 4 to 5 antibiotics (Table No. 2) whereas *Serratia marscences* showed 100% resistance to Penicillin antibiotics with their MAR index 0.076. This study was comparable with the study of El-Mahmood Muhammad Abubakar (2009)[11]. However in the present study Co-trimoxazole, Ofloxacin, Norfloxacin and Sparfloxacin remain the most effective drugs against pathogens isolated from the subjects with urinary tract infection. The data presented in this and in previous studies may be of enormous value for use to determine trend in antibacterial sensitivities, to formulate local antibiotic policies to compare local with national and international data and above all, to assist clinicians in the rational choice of antibiotic therapy and to prevent misuse, or over use of antibiotics.

#### 4. CONCLUSION:

The bacterial susceptibility and resistance profile of all isolates in this study have shown that Co-trimoxazole, Ofloxacin, Norfloxacin and Sparfloxacin remain the most effective drugs against pathogens. The present study confirms that bacterial resistance would be a greatest problem in the country. Finally, we suggest that empirical antibiotic selection should be based on knowledge of the

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Conflict of Interest: None Declared