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ORIGINAL RESEARCH ARTICLE

Antibiotic Susceptibility Patterns of Different Uropathogenic *Escherichia coli* (UPEC) Strains at a Tertiary Care Hospital

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ABSTRACT

Urinary tract infections are some of the most common infections experienced by humans particularly in adult women. A total of 166 urine samples were collected in sterile containers from patients attending tertiary care hospital, Coimbatore, South India, for antibiotic sensitivity pattern study in the Microbiology Department Laboratory, Dr. N. G. P. College of arts and science. One hundred forty-six bacterial species were isolated and among them 100 *Escherichia coli* were isolated representing the most frequent bacterial species accounting for highest percentage of infections. Out of 12 different antibiotic discs tested, the rates of antibiotic resistance were 90, 89, 88, 86, 73, 71 and 58% for amikacin, piperacillin/tazobactam, cotrimoxazole, amoxyclv, norfloxacin, ampicillin, and tobramycin respectively. In order to avoid renal complicacy and achieve successful treatment of urinary tract infections, updated information of antibiogram is essential.

Key words: Urinary tract infections, Uropathogens, Antibiotics, Antibiotic Sensitivity tests and Multi Drug resistance.

1. INTRODUCTION

Urinary Tract Infections (UTI's) pose a serious health threat with respect to antibiotic resistance and high recurrence rates. Generally, there is an agreement among the authors in the literature that the predominant uropathogens acquired from any source are Gram negative bacteria with *Escherichia coli* accounting for the highest prevalence in most instances [1]. Microorganisms responsible for urinary tract infection (UTI) such as *E.coli* have the ability to produce ESBLs in large quantities. These enzymes are plasmid borne and confer multiple drug resistance, making urinary tract infection difficult to treat [2].

In the recent past, the rapid development of multi-drug resistant bacterial strains of clinically important pathogens fetches the interest of scientists to develop newer broad spectrum antimicrobial agents [3]. The less availability and high cost of new generation antibiotics necessitates looking for substances from alternative medicines with claimed antimicrobial activity. A number of herbs with significant antimicrobial activity have been reported in different traditional literatures [4, 5].

In the present study were summarized the antibiotic susceptibility pattern of different uropathogenic *E. coli* strains.

2. MATERIALS AND METHODS

2.1. Collection of Samples

A total of 166 urine samples was collected from Urinary Tract Infection (UTI) patients attending tertiary care hospitals in and around Coimbatore and the specimens received during October 2009 to May 2010 were included in the analysis. Specimens were obtained using aseptic techniques to avoid contamination and were promptly transported to the laboratory in a sterile container in an ice-cold condition.

2.2. Isolation and Identification of Uropathogenic *Escherichia coli* (UPEC)

The test organism is confirmed as *E.coli* as per standard identification procedures suggested by Colle *et al.* [6]. By the preliminary tests and confirmatory tests, the organism showed gram negative rod by Gram's staining, and the remaining results were slightly motile, ability to grow at 37°C, appearance of pink color colonies Hichrome UTI agar, green metallic sheen colonies

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on EMB agar, pink colored colonies on MacConkey agar plate, Indole and Methyl red showed positive results, VP and Citrate Utilization test shows negative result, Oxidase negative.

2.3. Antimicrobial Susceptibility Testing

Antimicrobial susceptibility test used for the 100 strains isolates of *E. coli*. The following antibiotic disks were used; Ampicillin (10µg), Imipenem (10µg), Gentamicin (30 µg), Amikacin (30µg), Tobramycin (10µg), Erythromycin (10µg), Cotrimoxazole (25µg), Tetracycline (30µg), Norfloxacin (10µg), Amoxycillin/Clavulanic acid (20/10(30µg), Chloramphenicol (30µg), and Piperacillin/Tazobactam (100/10µg).

3. RESULTS AND DISCUSSION

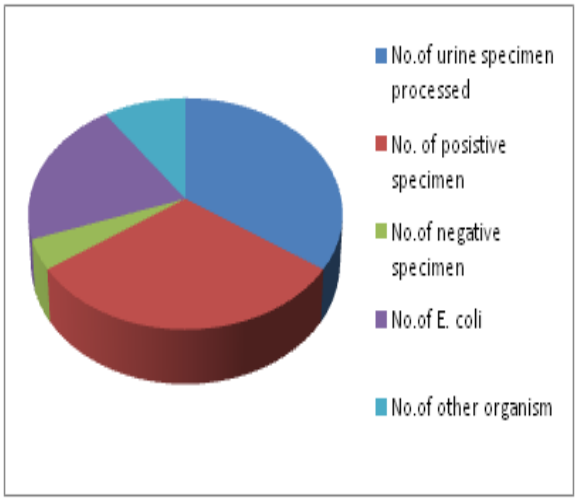
3.1. Isolation Rate

Of the 166 urine specimens of urinary tract infection processed 146 (88%) specimens showed culture positive and the rest 20 (12.0%) were negative **(Table 1)**. Among the isolates, 100 aerobic Gram negative *E. coli* (68.5%) were identified **(Fig 1)**. Fatemeh Fallah *et al*. [7] have reported that microorganisms isolated from urine cultures were *E. coli* in 27 (75%), *Enterococcous* in 3 (8.3%), *Staphylococcus epidermidis* in 3 (8.3%), *Kingella spp*. in 1 (2.8%), and *Candida albicans* in 2 (5.6%) patients. According to Sabahat and Perween [8], Three hundred and forty five urinary pathogens belonging to 6 different genera of gram negative bacteria isolated from urine specimens, viz., *Escherichia coli* (270), *Klebsiella pneumoniae* (51), *K. ozaenae* (3), *Proteusmirabilis* (5), *Pseudomonas aeruginosa* (10), *Salmonella typhi* (1), *S. paratyphi* A (2), *S. paratyphi* B (1) and *Serratia marcescens* (2), respectively [8]. In the present study, 100 out of the 146 uropathogens (68.5%) were found to be *E. coli*. Gowsami *et al*. [9]; Supriya *et al*. [10] and Kebira *et al*. [11] have reported that 64.3, 49.8 and 24% of isolates are identified as *E. coli* among other uropathogenic organisms. The result of the present study shows *E. coli* as the predominant microorganism among the uropathogens.

Table 1: The overall status of the cultural urine specimens

No. of urine specimens processed	166
No. of positive specimens	146 (88%)
No. of negative specimens	20 (12.0%)
No. of *E. coli*	100 (68.5%)
No. of other organisms	46 (31.5%)

Figure 1: Urine samples collected and processed



3.2. Antibiotic Sensitivity Testing by Kirby-Bauer's -Disc Diffusion Method

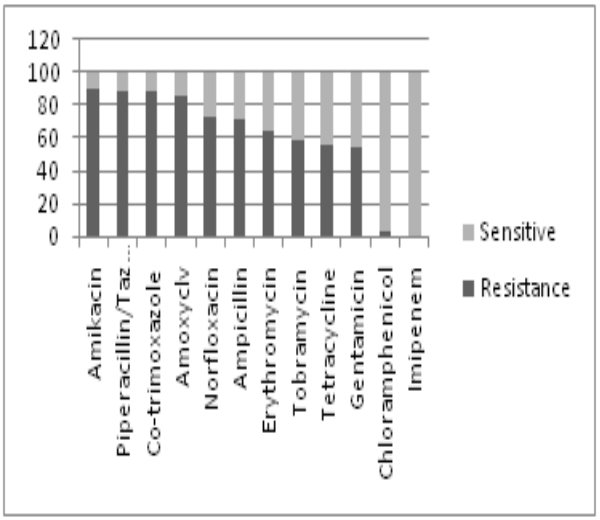
All the 100 *E. coli* isolates were subjected to antibiotic sensitivity tests **(Table 2)**. The resistant pattern of amikacin, piperacillin/tazobactam, co-trimoxazole, amoxyclv, norfloxacin, ampicillin, erythromycin, tobramycin, tetracycline, and gentamicin were found to be in the order of 90, 89, 88, 86, 73, 71, 64, 58, 56, and 54% respectively. The susceptibility was found to be 97 and 100% for chloramphenicol and imipenem **(Fig 2)**.

Tetracycline and gentamicin, constitutes the reasonable option for treatment of UTI as 44 and 46% were sensitive to these antibiotics respectively. Imipenem was found to be the drug of choice for treatment of UTI caused by *E. coli*. In a retrospective study in India, Suman *et al*. [12] have reported that 54% of the strains were sensitive to gentamicin followed by tobramycin (50%), co-trimoxazole (44%) and ciprofloxacin (44%), where as in the present study, the uropathogenic *E. coli* were less susceptible to the tested antibiotics. Supriya *et al*. [10] have reported that 82 and 79.6% of *E. coli* were resistant to co-trimoxazole, and ampicillin. Similar results were observed in the present study indicating maximum resistance to these drugs. *E. coli* with integrons are significantly more likely to exhibit multi drug resistance (MDR) to gentamicin, chloramphenicol, ampicillin, tetracycline and nalidixic acid [13].

Table 2: Antimicrobial susceptibility patterns of Uropathogenic *E. coli* isolates

Antibiotics	Resistance	Sensitive
Amikacin	90%	10%
Piperacillin/Tazobactam	89%	11%
Co-Trimoxazole	88%	12%
Amoxyclv	86%	14%
Norfloxacin	73%	27%
Ampicillin	71%	29%
Erythromycin	64%	36%
Tobramycin	58%	42%
Tetracycline	56%	44%
Gentamicin	54%	46%
Chloramphenicol	3%	97%
Imipenem	-	100%

Figure 2: Antimicrobial susceptibility patterns of Uropathogenic *E. coli*



3.3. Multi drug resistance pattern of Uropathogenic *Escherichia coli* (UPEC)

In the current work, it was found that more than 75% of *E. coli* isolates were resistant to more than six antibiotics, which implies that an alternative choice of antibiotic is the need of the hour to combat *E.coli* associated with urinary tract infection **(Table 3)**. Certain virulence factors like hemolysin production and presence of fimbriae in *E. coli* may be associated with urovirulance [14]. Despite the widespread availability of antibiotics, UTIs remain the most common bacterial infections in human populations [15]. *E. coli* as the commonest cause of UTI exhibiting high antibiotic resistance among the strains, emphasize the need for judicious use of antibiotics. In chronic UTI, a slow growing *E. coli* with atypical colony morphology and multiple drug resistance (MDR) strain was reported by Trilzsch *et al.* [16]. Gram-negative bacteria express various types of resistance. Intrinsic resistance is a result of co-operation of outer membrane barrier and multidrug efflux pumps. Some Gram-negative bacteria posses drug specific efflux pumps, which mediate resistance to certain classes of anti bacterials. More recent antibacterial such as fluoroquinolones and broad-spectrum β lactams are likely to select for over production mutants of these pumps and make bacteria resistant to practically all classes of antibacterial agents [17].

Table 3: Multidrug resistance patterns of Uropathogenic *E. coli*

No. of resistant drugs	No. of isolates (n=100)	Resistance (%)
≥ 5	88	88 %
≥ 6	79	79%
≥ 7	63	63%
≥ 8	49	49%
≥ 9	29	29%
≥ 10	14	14%

4. CONCLUSIONS

Based on the findings of this study, it is concluded that acute uncomplicated UTI affects a large proportion of the population. The study confirmed *Escherichia coli* to be a major uropathogens. The study further detected results of this study indicate a need for continued surveillance of antimicrobial resistance among uropathogens causing UTI, so as to increase positive outcomes of clinical interventions.

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