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# Antimicrobial Susceptibility Pattern of Escherichia coli from Suspected Patients of Urinary Tract Infections.

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**ABSTRACT**

**Introduction:** Escherichia coli the most prevalent organism which causes urinary tract infections in both hospital acquired and community acquired setups. Due to misuse and extensive use of antibiotics, resistance to antimicrobial agents are increasing worldwide, which is the cause of complicated and uncomplicated urinary tract infections.

**Objective:** The main aim and objective of this study is to detect the susceptibility of antimicrobial agents against clinical isolates of Escherichia coli from the patients suspected with urinary tract infections.

**Study Design:** Prospective study

**Place and Duration of Study:** This prospective study was conducted at Indus Medical College Tando Muhammad Khan's Department of Pathology and Microbiology for six months from September 2020 to February 2021.

**Material and methods:** It was prospective cross – sectional study performed at Department of Microbiology Indus Medical College Tando Muhammad Khan. It was conducted for a period of 6 months. A total of 103 positive urine samples were studied from suspected patients of UTI. The susceptibility of antimicrobial agents was detected using Kirby-Bauer disc diffusion method.

**Results:** Among 103 isolates, 61 (59.22%) were female and 42 (40.77%) were male. Mean age of patients was 42.2 years. Sensitive susceptibility of isolates were: Imipenum (99%), Amikacin (98%), Nitrofurantoin (92.2%), Ceftazidime (80.5%), Aztreonam (77.6%), Norfloxacin (55.3%), Ciprofloxacin (55.3%), Nalidixic acid (29%), Cotrimoxazole (27%), Piperacillin (19.4%), Ampicillin (13.6%) and Keflax (9.7%).

**Conclusion:** E. coli was sensitive against Imipenum, Amikacin and Nitrofurantoin. Although other antibiotics showed variable sensitivity patterns. Use of appropriate antibiotic according to sensitivity of microorganism is very important to reduce to resistance microorganisms against antimicrobial agents.

**Keywords:** Escherichia coli, urinary tract infections, isolates, sensitivity, resistance.

## Introduction:

Most common bacterial infections caused by Escherichia coli are urinary tract infection. It influences around 150 million people every year globally. Among all pathogens causing urinary tract infections, Escherichia coli is most common uropathogen responsible for uncomplicated and complicated urinary tract infections.[1,2] In elderly patients, increased incidence of urinary tract infections is due to their immune status and anatomical and physiological changes which links with their aging process.[3,4] Escherichia coli are categorized into Enterotoxigenic, Enteropathogenic Enterohemorrhagic, Enteroinvasive, Nephropathogenic and Enteroadherent Escherichia coli. Apart from causing urinary tract infections, it is also responsible for cystitis, pneumonia, pyelonephritis and meningitis. Production of beta haemolysing by E coli is considered to be one of the pathogenic E coli's virulence factors. Escherichia coli produce two types of haemolysins. One is alpha – haemolysin (soluble) which is found in cell – free culture supernatant. The production of alpha haemolysin is regulated by transmissible plasmid. The other, beta – haemolysin is the cell bound haemolysin. The effect of temperature, osmolarity and anaerobiosis enhance the production of haemolysin in haemolytic strains isolated from urinary tract infection.[5–8] Early treatment of urinary tract infection by treatment by effective antibiotic is very important for prevention of complicated consequences. All patients with urinary tract infections especially children are treated empirically before the availability of urine culture report. Sensitivity and resistance to various antimicrobial agents varies according to geographical distribution. Therefore, knowledge of sensitive

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pattern of common organisms causing urinary tract infections is necessary according to local epidemiological studies.[9]

The aim and objective of this study was to detect the sensitivity pattern of E. coli isolated from patients suspected with urinary tract infections.

**Methodology**

This was a prospective cross – sectional study performed at Indus Medical College Tando Muhammad Khan's Department of Pathology and Microbiology for six months (2020 to February 2021). A total of 103 patients with positive culture for E coli were selected for the study. All patients with urinary tract infections symptoms such as dysuria, haematuria, urinary incontinence or had a lot of urination were involved in the study. Patients who recently (last 3 months) had catheterization, urethral instruments, antibiotics or perineal surgery were excluded from the study.

All patients were provided sterile containers that were wide – mouthed – leak-roof. Mid – stream morning urine samples from all patients were collected. All sterile containers containing urine specimens were transported immediately to microbiology department for c/s. For inoculation 1 ul disposable plastic loop was used to transfer sample of about 1 uI on culture media (Blood agar and CLED agar) in our routine set up, from uncentrifuged sample of urine. Streaked plates were then kept in incubator at 35°C for 24 hours. Only specimens which showed the growth of $>10^5$ cfu/mL at the end of 24 hours, were considered positive. Growth of two types of organisms was not included for this study. Diagnostic criteria were: lactose fermenter, indole positive, methyl-red positive, motile, and citrate negative, performed for confirmation. The susceptibility testing performed by making the suspension of E coli colony with McFarland turbidity standard, and inoculated with sterile cotton swab on Muller Hinton agar plates. After drying the plates, antibiotic discs were placed on the inoculated plates. Under aerobic conditions for 24 hours, these plates were incubated at 35°C. These plates were examined for zones of inhibition around each disc of antibiotic after 24 hours. By the use of standard ruler each zone around the discs was measured to nearest millimetre. By using standard chart issued by the disc manufacturer, the zone size of each drug was categorized as sensitive, intermediate or resistant. All data were analysed using SPSS 21.0.

**Results**

Total of 103 isolates were selected for the study. Out of them, 61 patients (59.22%) were female and 42 (40.77%) were male (Male to female ratio 1: 1.45) (Figure 1). The age was ranged from 16 to 70 years (mean 42.2 years). The sensitivity pattern of isolates was as follows (Table 1): Out of 103, 102 (99%) isolates were sensitive to Imipenem. 101 (98%) were sensitive to Amikacin, 95 (92.2%) were sensitive to Nitrofurantoin, 83 (80.5%) were sensitive to Ceftazidime, 80 (77.6%) were sensitive to Aztreonam, 57 (55.3%) were sensitive to Norfloxacin, 57 (55.3%) were sensitive to Ciprofloxacin, 30 (29%) were sensitive to Nalidixic acid, 28 (27%) were sensitive to Cotrimoxazole, 20 (19.4%) were sensitive to Piperacillin, 14 (13.6%) were sensitive to Ampicillin and 10 (9.7%) were sensitive to Keflex.

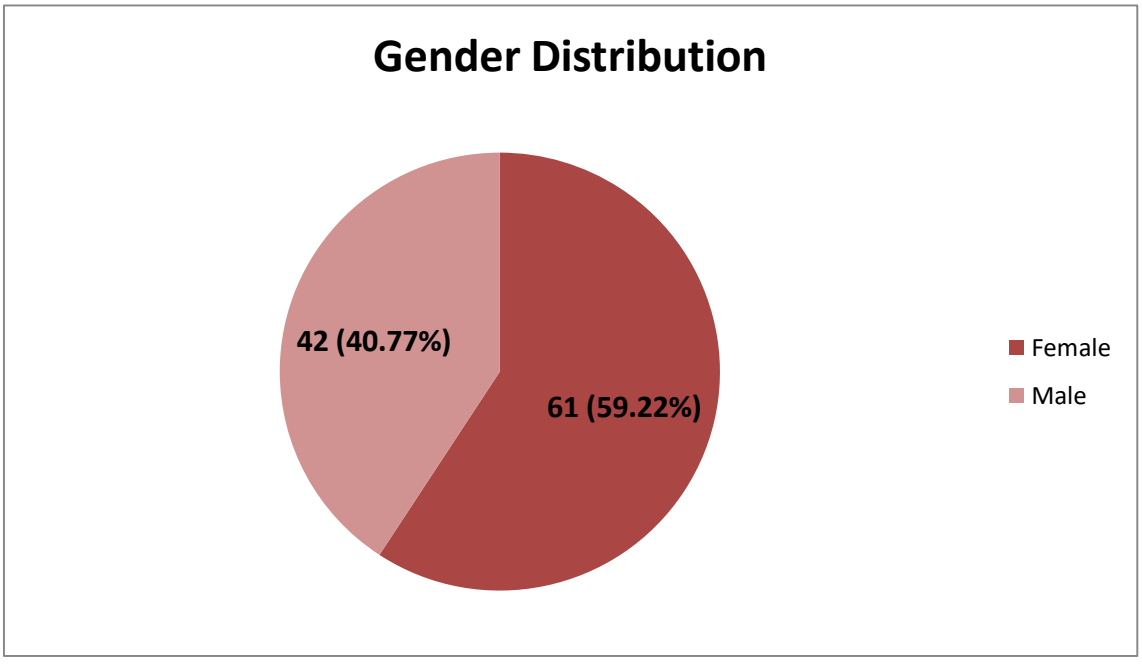


**Figure 1: Gender Distribution (n=103)**

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**Table 1: Sensitivity Pattern of Clinical Isolates of Urine Specimens (n=103)**

| S. No. | Antimicrobial agent | Total isolates | Sensitive (number) | Sensitive (%) |
|---|---|---|---|---|
| **01** | Imipenem | 103 | 102 | 99% |
| **02** | Amikacin | 103 | 101 | 98% |
| **03** | Nitrofurantoin | 103 | 95 | 92.2% |
| **04** | Ceftazidime | 103 | 83 | 80.5% |
| **05** | Aztreonam | 103 | 80 | 77.6% |
| **06** | Norfloxacin | 103 | 57 | 55.3% |
| **07** | Ciprofloxacin | 103 | 57 | 55.3% |
| **08** | Nalidixic acid | 103 | 30 | 29% |
| **09** | Cotrimoxazole | 103 | 28 | 27% |
| **10** | Piperacillin | 103 | 20 | 19.4% |
| **11** | Ampicillin | 103 | 14 | 13.6% |
| **12** | Keflex | 103 | 10 | 9.7% |

**Discussion:**

Escherichia coli is the most prevalent organism which causes urinary tract infections. However, its frequency, sensitivity and resistance pattern varies according to geographical distribution.[9] Our study showed high sensitivity of Imipenem, Amikacin and Nitrofurantoin. Although, resistance pattern was found in Keflex, Ampicillin, Piperacillin and Cotrimoxazole. Sohail et al showed the resistance pattern of UTI isolates in Punjab. He showed that E coli was very sensitive to Cephradine (95%), Amikacin (91%) and Nalidixic acid (91%). Though, they were resistance to Amoxicillin, Ampicillin and Aztreonam. (10) Bashir et al performed a study in Rawalpindi and he showed that the Meropenem. Piperacillin-Tazobactum and Cefoperazone – Salbactum were the most sensitive drugs. (11) Although in our study, piperacillin was not effective against E coli in isolates. Sabir et al showed in his study from Lahore that E coli was highly resistant to Penicillin, Amoxicillin and Cefotaxime. Although they were sensitive to Norfloxacin, Amikacin and Tazocin. (12) Ahmed et al showed in his study from Mansehra that isolates were highly resistance to Ampicillin, Tetracycline, and Erythromycin. (13) Ali et at performed his study in Potohar region and showed that isolates were highly resistance to Cotrimoxazole and Cephalothin. Although they were sensitive to Nitrofurantoin, Tetracycline and Carbapenem. (14)

Delpech et al showed in his study from Argentina that clinical isolates were resistance to Ampicillin, Nalidixic acid and Ciprofloxacin. Though resistance to Carbapenems was not found in his study. (3) Cordoba et al showed his study from Denmark that highest resistance was found in Ampicillin in both complicated and uncomplicated UTI patients. (15) Sales et al showed his study from Iran and showed that isolates were highly sensitive to Imipenum, Nitrofurantoin, and Amoxicillin. Although Ampicillin was highly resistant. (16) Alanazi et al showed in her study from Saudi Arabia that E. coli was highly resistance to Ampicillin, and Cotrimoxazole. (17) Shanthi et al performed a study in India and showed that isolates were resistant to Gentamycin, Cotrimoxazole, Ciprofloxacin, Norfloxacin and Cefotaxime. Although Nitrofurantoin and Amikacin were sensitive. (18)

Different antimicrobial agents showed variety of sensitivity and resistant pattern in clinical isolates of E coli from local and international areas. Though many antibiotics such as Nitrofurantoin, Ampicillin and Amikacin were sensitive in majority of cases but their incidence is variable according to geographical areas. The resistance to Ampicillin is increasing globally. The routine and expanded prescribing of antibiotics for treating urinary tract infections in developing countries, patient self-medication, and the optimum concentration/dose of the drug and the quality of antimicrobial agents are the reasons for the increase in antibiotic resistance.(10)

**Conclusion**

Escherichia coli, the most common gram negative microorganism causing infection in urinary tract showed highest sensitivity against Imipenem, Amikacin and Nitrofurantoin. Isolates in different geographical regions have different type of sensitivity pattern. So use of appropriate antibiotic should be used as per findings of local studies performed by culture and sensitivity to avoid the resistance of microorganisms.

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