

ANTIMICROBIAL SUSCEPTIBILITY PATTERN OF ESCHERICHIA COLI ISOLATED FROM URINE SPECIMEN OF URINARY TRACT INFECTION PATIENTS

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ABSTRACT:

OBJECTIVES:

The present study is designed to assess the development of E coli resistance against different antibiotics and to determine their antimicrobial susceptibility pattern.

METHODOLOGY:

This cross sectional study shows antimicrobial susceptibility of 100 isolates of Escherichia coli (E coli) from urine samples of urinary tract infection (UTI) patients. The samples were cultured on CLED agar, and susceptibility checked with 24 antimicrobial drugs by Disc Diffusion Method.

RESULTS:

UTI due to E coli was more frequent in females (67%) compared to males (33%). The antibiotic susceptibility pattern was Amikacin (92.9%), Chloramphenicol (83.8%), Colistin (82%), Ertapenem (95.2%), Fosfomycin (98.2%), Gentamycin (91%), Imipenem (94.6%), Meropenem (95.2%), Piperacillin (98.8%), Tigecycline (97.6%), Cefazidime (53.9%). E coli showed resistance to the remaining 12 antibiotics including Moxifloxacin (68.3%), Cefobid (56.8%), Maxipime (61.7%), Levofloxacin (72.5%), Cotrimoxazole (64.7%), Co-amoxiclav (68.9%), Ciprofloxacin (71.3%), Cefuroxime (59.3%), Ceftriaxone (70.1%), Cefpirome (57.5%), Cefepime (59.3%) and Aztreonam (55.1%).

CONCLUSION:

These findings suggest that UTI due to E coli is more common in females than males and the bacterium showed highest sensitivity to Piperacillin and Fosfomycin and highest resistivity to Levofloxacin and Ciprofloxacin.

KEYWORDS: E Coli, Antibiotics, Urinary Tract Infection, Susceptibility, Resistance

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INTRODUCTION

Escherichia coli (E. coli) are facultative gram negative rod shaped anaerobic bacteria that colonize the gastrointestinal tract of human and animal as a normal flora, which is harmful to them. However, some strains have grown into pathogenic Escherichia coli by acquiring

virulence factors through plasmid, transposons, bacteriophages, and Pathogenicity Island. This pathogenic E coli can be categorized based on serogroups, pathogenicity mechanisms, clinical symptoms, or virulence factors^{1,2}. The main cause of urinary tract infection (UTI) is E. coli. It is the cause of almost 50% of hospital acquired UTIs and 85% of community acquired UTIs³⁻⁵. In addition to UTI, E. coli also causes peritonitis, hemolytic uremic syndrome (HUS), colitis, bacteremia, diarrhea and neonatal meningitis⁶. E coli are present in the gastrointestinal tract as a normal flora but when it gets into the urinary tract, it causes a serious infection called UTI. The strain of E. coli that causes UTI is called

uropathogenic *E. coli*: The virulence factors which are used by *E. coli* for attaching, invading and for injuring of the bladder are adhesions, toxin, iron acquisition factor, lipopolysaccharide capsules and other invasion. Transmission of the bacteria occurs in four ways; including poor personal hygiene, communal sponge, from mother to fetus via placenta, towel use and sexual intercourse⁷⁻⁹. The most common symptoms are burning with urination and having to urinate repeatedly in the absence of vaginal discharge and significant pain. Urinary tract infection can be categorized as cystitis, acute pyelonephritis or asymptomatic bacteriuria. Cystitis frequently involves bladder colonization. Acute pyelonephritis is the upper urinary tract disease causing kidney infection and can progress to bacteremia^{10,11}. Prevalence of UTI is less in males than females, because females have much shorter urethra than male. UTI is at higher rate in sexually mature peoples. Patients having frequent UTI show progressive resistance to antibiotics, making care selection of antibiotics and the complete course of treatment are essential. In the last three decades, there have been many reports on the unsuitable use of antimicrobial agents and the spread of bacterial resistance among microorganisms causing urinary tract infections^{12,13}. The present study is designed to assess the development of *E. coli* resistance against different antibiotics and to determine their antimicrobial susceptibility pattern among patients admitted at Burn and Plastic Surgery Center Hayatabad.

METHODOLOGY:

The study was conducted at Burn and Plastic Surgery Center Hayatabad from February 2021 to July 2021. A total of 100 samples were collected using random sampling technique. Urine samples were collected using a clean catch method for adults and urine bags for infants. The samples were carried to the microbiology laboratory of the hospital with least delay for culture sensitivity and resistance tests. In women, samples were collected after vulva washing with pure water. All samples were examined as quickly as possible after collection to evade decline of leukocytes. The urine samples were cultured on CLED agar to detect the microorganisms. About 0.001ml of urine specimen was inoculated on CLED agar by using germ free standardized wire loop. The cultured media were then incubated at 37°C for 24 hours. For media with no growth after 24 hours, incubation time was increased up

to 48 hours before declaring lack of bacterial growth. The figures of lonely bacterial colonies were counted and were multiplied by dilution aspect for the estimate of bacterial load per milliliter (ml) of urine specimen. Urine specimens with colony ≥ 105 CFU/ml were taken as 37 substantial growths (positive urine culture=105 CFC/ml). The substantial growth was recognized additionally using biochemical reactions. The Oxidase test was used to recognize enterobacteriaceae family, a lactose fermenter gram-negative rods from *Pseudomonas* family. Also it is used to separate *Pseudomonas* from *E. coli*. Further, an indole test was used for the identification of enterobacteriaceae. Antimicrobial susceptibility test was performed by disc diffusion procedure as per CLSI rules on Muller Hinton agar. Data was analyzed using SPSS 24.

RESULTS:

A total of 100 samples were randomly selected including 33 males and 67 females. Table 1 shows the frequency of UTI due to *Escherichia coli* in males and females. The males have less percentage of UTI due to *E. coli* than females.

Table 1: Gender Wise Percentage of *Escherichia Coli*

Frequency	Percent	Valid Percent	Cumulative Percent
Male	33	33	33
Female	67	67	100.0
Total	100	100	

Table 2 shows the age wise distribution of UTI due to *E. coli*. Patients aged between 46-65 years were more frequently affected (31%), followed by patients aged between 26-45 years (20%) whereas the patients aged between 66-85 years were least affected by UTI due to *E. coli*.

Table 2: Age Wise Percentage of UTI

Frequency		Percent	Valid Percent	Cumulative Percent
<6 Years	18	18	18	18
6-25 Years	18	18	18	36
26-45 Years	20	20	20	56
46-65 Years	31	31	31	87
66-85 Years	13	13	13	100
Total	100	100	100	

The antibiotic susceptibility pattern of E coli in UTI was evaluated against 24 different drugs. E coli showed high sensitivity to 12 antibiotics including Amikacin (92.2%), Cefoperazone (72.5%), Chloramphenicol (83.8%), Colistin (82%), Ertapenem (95.2%), Fosfomycin (98.2%), Gentamycin (91%), Imipenem (94.6%), Meropenem (95.2%), Piperacillin (98.8%), Tigecycline (97.6%) and Ceftazidime (53.9%). The resistance of E. coli to these drugs was Amikacin (7.8%), Cefoperazone (27.5%), Chloramphenicol (16.2%), Colistin (18%), Ertapenem (4.8%), Fosfomycin (1.8%), Gentamycin (9%), Imipenem (5.4%), Meropenem (4.8%), Piperacillin (1.2%), Tigecycline (2.4%) and Ceftazidime (46.1%).

The resistance of E. coli to the remaining 12 antibiotics was Moxifloxacin (68.3%), Cefobid (56.8%), Maxipime (61.7%), Levofloxacin (72.5%), Co-trimoxazole (64.7%), Co-amoxiclav (68.9%), Ciprofloxacin (71.3%), Cefuroxime (59.3%), Ceftriaxone (70.1%), Cefpirome (57.5%), Cefepime (59.3%) and Aztreonam (55.1%). Sensitivity to these antibiotics was Moxifloxacin (31.7%), Cefobid (43.1%), Maxipime (38.3%), Levofloxacin (27.5%), Cotrimoxazole (35.3%), Co-amoxiclav (31.3%), Ciprofloxacin (28.7%), Cefuroxime (40.7%), Ceftriaxone (29.9%), Cefpirome (42.5%), Cefepime (40.7%) and Aztreonam (44.9%).

Table 3: Antimicrobial Susceptibility Pattern of Escherichia Coli

Antibiotics	Resistance Percentage	Sensitive Percentage
Amikacin	7.8%	92.2%
Cefoperazone	27.5%	72.5%
Chloramphenicol	16.2%	83.8%
Colistin	18.0%	82.0%
Ertapenem	4.8%	95.2%
Fosfomycin	1.8%	98.2%
Gentamycin	9.0%	91.0%
Imipenem	5.4%	94.6%
Meropenem	4.8%	95.2%
Piperacillin	1.2%	98.8%
Tigecycline	2.4%	97.6%
Aztreonam	55.1%	44.9%
Cefepime	59.3%	40.7%
Cefpirome	57.5%	42.5%
Ceftazidime	46.1%	53.9%
Ceftriaxone	70.1%	29.9%
Cefuroxime	59.3%	40.7%
Ciprofloxacin	71.3%	28.7%
Coamoxiclav	68.9%	31.1%
Cotrimoxazole	64.7%	35.3%
Levofloxacin	72.5%	27.5%
Maxipime	61.7%	38.3%
Cefobid	56.8%	43.1%
Moxifloxacin	68.3%	31.7%

DISCUSSION:

The microbial invasion and subsequently multiplication in the urinary tract causes urinary tract infections. In this study a total of 100 UTI samples infected with E.coli were investigated and their antimicrobial susceptibility pattern was

determined. Females were more frequently infected with E coli and this is in agreement with the previous studies. The patients aged 46-65 years were more frequently infected by E coli and same results have been found earlier¹⁴⁻¹⁶. E.coli showed highest sensitivity to Amikacin, Ertapenem, Fosfomycin, Gentamycin, Imipenem, Meropenem, Piperacillin and Tigecycline and these results support the previous findings^{17,18}. The study further showed that E. coli was more resistant to Ceftriaxone, Ciprofloxacin, Co-amoxiclav, Cotrimoxazole, Levofloxacin, Moxifloxacin and Maxipime. The high degree of resistance of E.coli isolates to Ciprofloxacin is similar to findings in other studies^{19,20}. This is significant as Ciprofloxacin is probably the drug most prescribed empirically for urinary tract infections. E coli showed the same resistance and sensitivity to some drugs like Cefuroxime and Cefepime. E coli was more resistant to Levofloxacin (72.5%), Ciprofloxacin (71.3%) and Ceftriaxone (70.1%) while least resistant to Piperacillin (1.2%) and Fosfomycin (1.8%) and this further strengthens the previous reports.

CONCLUSION:

Our findings suggest that UTI due to E coli is more common in females than males. E coli shows different patterns of resistance and sensitivity to antibiotics in UTI and this signifies that misuse of antibiotics or excess use of antibiotics may make the E coli more resistant to antibiotics and further worsens the situation. Relatively drinking more water keeps you healthy.

RECOMMENDATIONS:

The study would prove helpful for suggesting appropriate antibiotics for specific infection based on culture sensitivity tests. On behalf of this research project, we recommend to the doctor's community, not start blind therapy directly without conducting the patient's culture sensitivity test.

CONFLICT OF INTEREST:None

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