

Frequency of Multi Drug Resistant E.coli Urinary Tract Infection Presenting to a Tertiary Care Hospital.

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Abstract

Background: Urinary tract infections (UTIs) are a severe public health problem and are caused by a range of pathogens, but most commonly by gram negative and gram positive organisms. High recurrence rates greatly increase the economic burden. This study was conducted to determine the frequency of multidrug resistant Escherichia Coli in patients with urinary tract infections.

Methods: Descriptive cross sectional study was conducted over 6 months among 146 patients presenting with E.Coli UTI. Urine culture and sensitivity was performed from the same laboratory and reported by a consultant microbiologist.

Results: Among the 146 patients, 65 (44.5 %) were male patients while 81 (55.5 %) were female patients. Mean age of our study cases was 46.87 ± 8.70 years. Of these 146 study cases, 90 (61.6 %) belonged to rural areas and 56 (38.4 %) belonged to urban areas. Diabetes was present in 31 (21.2 %), hypertension was present in 54 (37.0 %) and 27 (18.5 %) had chronic kidney disease. Mean body mass index was 26.23 ± 1.99 kg/m² and obesity was present in 27 (18.5 %). Mean disease duration was 3.43 ± 1.57 days and 90 (61.6 %) had duration of illness up to 3 days. Multi - drug resistant E. coli was noted in 69 (47.3%).

Conclusion: Almost half of our patients had MDR E.coli UTI and was significantly associated with increasing age, residential status, diabetes, hypertension, disease duration and obesity. Urine cultures are recommended to identify MDR in our community.

Key Words: Diabetes Mellitus, E Coli, Urinary Tract Infection, Multidrug resistance, culture.

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Introduction: About 150 million UTI episodes occur per year worldwide.¹ According to a study in Kohat district of Khyber Pakhtunkhwa, Pakistan, the prevalence of UTIs was seen as 11.6% with the frequency of 8.9% in males and 13.8% in females.² Though urinary tract infections are treatable, the accelerated rates of multi-drug resistant organisms lead to complications, treatment failure and increased rates of mortality and morbidity.³

Escherichia coli infections present as UTI, enteric infections and even involvement of extra intestinal organs. Uropathogenic Escherichia coli (UPEC) is the commonest organism causing community acquired UTI and in almost half of the hospital acquired UTI.^{4,5} UPEC has certain features that make them more virulent, such as adhesins, toxins, mechanisms to avoid host defenses including oxidative stress.⁶

Quinolones resistance is frequently seen in the cultures obtained for UTI and is due to the global spread of extended-spectrum beta-lactamase (ESBL) genes associated with multidrug- resistant (MDR) phenotypes.^{7,8}

Frequency of MDR E Coli

In a study by Ali I et al conducted in Potohar region of Pakistan, UPEC isolates were resistant to co-trimoxazole in 82% followed by cephalosporins in 80%, 2nd Gen, 3rd Gen and 4th Gen cephalosporins, respectively. Overall, 59% of the isolates were resistant to at least three antibiotics including one fluoroquinolone.⁹

Similarly, in a study conducted in Mexico, Ramirez-Castillo FY et al evaluated MDR E.coli isolates in UTIs among children and found that 63% of the strains were multidrug-resistant (MDR).¹⁰ A high degree of resistance to fluoroquinolones, sulfa group and penicillin was observed.

Considering the emerging MDR UPEC in Pakistan and lack of available data on the spectrum of this resistance we planned this study to determine the occurrence of antibiotic resistance profile of UPEC isolates from patients admitted in nephrology ward of Nishtar Hospital Multan.

Methods:

The study was conducted at department of Nephrology Nishtar Hospital Multan from 5th January - 5th July 2020. All patient presenting with UTI had culture sensitivity performed by a consultant microbiologist. E.coli resistance was tested antibiotics in the following three classes: lactams, aminoglycosides, and quinolones proven on urine culture and sensitivity report using disk diffusion method [modified Kirby-Bauer method] on Mueller Hinton agar and reported as multidrug resistant (MDR) if two of the antibiotic groups was resistant.¹¹

Inclusion Criteria:

1. Age 20 – 65 years, of both gender
2. Patients with urinary tract infection, duration \leq 7 days

Exclusion Criteria

1. Hospitalized within last 4-weeks of current episode of urinary tract infection
2. Treated for UTI with antibiotics within last four weeks of current episode
3. Catheterized (Foley catheter) within last four weeks of current UTI episode

Study design: Cross sectional study with non-probability consecutive sampling

Data collection procedure

The study was conducted after permission from institutional ethical review committee. Patients with symptoms of UTI had urine culture performed and total of 146 patients with E.Coli UTI fulfilling the eligibility criteria were enrolled after informed consent was obtained. Urine culture and sensitivity was performed from the same laboratory and reported by consultant microbiologist with at least 3-year post-fellowship experience. Demographic characteristics including age (in years), gender (male/female), duration of illness (days), hypertension (Yes/No), diabetes mellitus (Yes/No), chronic kidney disease (yes/no), hemodialysis (yes/no), passage of central venous catheter (CVC) (yes/no), arterio-venous (AV) fistula (yes/no) were noted.

Urine collected through clean catch method was inoculated into the agar plates and incubated for 24 hours at 37 °C in aerobic atmosphere. Growth of a single organism with a count of \geq 10⁵ colony-forming units (CFU)/ml was considered to represent the infection and was identified using appropriate routine identification methods including colony morphology, gram-stain, and biochemical confirmatory tests. Further antimicrobial susceptibility was tested by the disk diffusion method [modified Kirby-Bauer method] on Mueller Hinton agar. Antibiotics that were tested in my study were Ampicillin, Amoxicillin clavulanate, Gentamycin, Ciprofloxacin, Levofloxacin, trimethoprim sulfamethoxazole, Cephalexin, Cefixime, Ceftriaxone, Ceftazidime, Piperacillin tazobactam, Imipenem, Meropenem, Tigecycline, and Colistin sulphate. Escherichia coli ATCC

Frequency of MDR E Coli

25922 was used as a control organism for antibiotic susceptibility testing. All the obtained information was noted on the performa specifically designed.

Data analysis

Data was analyzed using Statistical Package for Social Science (SPSS) software version 20, (IBM Corp, Chicago, USA). Quantitative data i.e. age and duration of illness (days) was described using mean and standard deviation. Qualitative data [gender, multidrug resistance of E.coli, hypertension, diabetes mellitus, chronic kidney disease, hemodialysis, CVP line, A-V fistula] was described as frequency and percentages. The data was stratified with respect to age groups, gender, duration of illness, hypertension, diabetes mellitus, chronic kidney disease, hemodialysis, CVP line and presence of A-V fistula to see the effect on MDR-E.coli. Post stratification chi-square test was applied. A p-value of ≤ 0.05 was taken as significant.

Results:

Of these 146 study cases, 65 (44.5 %) were male patients while 81 (55.5 %) were female patients. Patient characteristics are detailed in Table No. 1.

Multi - drug resistant E. coli was noted in 69 (47.3%) and it was stratified with regards to gender, age, residential status, diabetes, hypertension, obesity, disease duration and CKD, Table No 2, 3.

Table No. 1: Patient characteristics of 146 patients with E.coli UTI.

Gender	Frequency	Percentage
Male	65	44.5
Female	81	55.5
Rural	90	61.6
Urban	56	38.4
Poor	108	74.0
Middle Income	38	26.0
Diabetes		
Yes	31	21.2
No	115	78.8
Hypertension		
Yes	54	37.0
No	92	63.0
Chronic Kidney Disease		
Yes	27	18.5
No	119	81.5
Obesity		
Yes	27	18.5
No	119	81.5

Discussion:

Half of the UTI involving E.Coli bacteria were MDR in our study and this incurs a huge health care cost. In 2007, 10.5 million office visits and a third more emergency visits were due to UTI symptoms.¹² It is estimated that it mounts to approximately US\$3.5 billion per year in the United States alone. All age groups and genders are affected with UTI especially infant boys, older men and females of all ages. UTI may be complicated with pyelonephritis, CKD, and pregnant patients may develop complications such as pre-term, abortion and infant death.⁵⁻⁷

Frequency of MDR E Coli

UPEC is the most common pathogen grown in urine cultures whether it is uncomplicated or complicated UTIs.^{6,7} Repeated use of antibiotics alter the local microbiota flora resulting in development of MDR organisms and need for devising plans for rational use of antibiotics, alternative treatments and early cultures where MDR UTI is suspected.¹³

Table No. 2: Percentage of Multidrug resistant E coli UTI among 146 patients with E.coli UTI.

Multi – drug resistant E. coli	Frequency	Percentage
Yes	69	47.3
No	77	52.7
Total	146	100

Table 3: Factors associated with multidrug resistant E.coli UTI among 146 patients with E.coli UTI

	Frequency	Percentage	P value
Male	31	34	1.000
Female	38	43	
Up to 50 Years	41	62	0.006
More than 50 Years	28	15	
Rural	51	39	0.007
Urban	18	38	
DM: Yes	22	09	0.004
DM: No	47	68	
HTN: Yes	33	21	0.016
HTN: No	36	56	
Obesity: Yes	24	03	0.001
Obesity:No	45	74	
Days of UTI ≤3 days	51	39	0.006
Days of UTI >3 days	18	38	
CKD: Yes	16	11	0.202
CKD: No	53	66	

Early detection using newer techniques such as RNA sequencing to detect uropathogens in patients experiencing symptoms has led to novel avenues in managing patients with UTI.¹⁴

Our study comprised of a total of 146 patients with E.coli UTI and more than 55.5% patients were females similar to other studies.¹⁵⁻¹⁸ However, a study conducted by Baqai et al has reported 64 % male gender predominance which is quite higher than that of our study results.¹⁹

Age more than 50 years, and the presence of hypertension, obesity, rural residence was significantly associated with MDR E.coli UTI, $p < 0.05$. other factors such as diabetes mellitus, CKD and gender was not associated with the presence of E.coli UTI. These findings are similar to the findings by Balooch et.al.¹⁵

Conclusion:

We note a high frequency of MDR E. coli among patients with urinary tract infection in our study. All clinicians treating such patients with UTI should always employ culture and sensitivity test before prescribing antibiotics, owing to their high burden of resistance. Rampant use of antibiotics will increase the incidence of MDR.

Conflict of interest: None declared

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