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PREVALENCE AND DRUG RESISTANCE OF UROPATHOGENIC *ESCHERICHIA COLI* AMONG PATIENTS FROM A TERTIARY CARE HOSPITAL

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ABSTRACT

Urinary tract infection is one of the most common infectious diseases diagnosed that accounts for a large proportion of antimicrobial drug consumption. Antimicrobial resistance among bacterial strains is an emerging problem. The present study was designed to determine the prevalence of uropathogenic Escherichia coli and their antimicrobial susceptibilty pattern for the duration of two years. A total of 200 Escherichia coli isolates were recovered from urine samples of patients with clinically suspected UTIs of all age groups and identified. Antibiotic susceptibility testing of the isolates was performed as per CLSI guideline. The incidence of UTI was more in the age group of 21-30 years whereas the incidence was slightly more in females than males. The maximum sensitivity to UPEC isolates were shown by nitrofurantoin. The prevalence of pathogens and their susceptibility to antibiotics must be considered in the choice of treatment for UTI and periodically review and formulation of antibiotic policy are needed for control of acquisition of drug resistance.

KEYWORDS: Urinary tract infection, Prevalence, Antibiotic resistance, Escherichia coli, UPEC.

INTRODUCTION

Urinary tract infection (UTI) is one of the most common infectious diseases diagnosed that accounts for a large proportion of antimicrobial drug consumption which is diagnosed in outpatient as well as hospitalized patients.[1] Worldwide, about 150 million people are diagnosed with UTI each year, costing the global economy in excess of 6 billion US dollars.[2] *Escherichia coli* remains the predominant uropathogen (70-90%) in cases of acute community acquired uncomplicated infections in anatomically normal, unobstructed urinary tracts and is also responsible for 85% of asymptomatic bacteriuria and for more than 60% of recurrent cystitis.[3]

Antimicrobial resistance among bacterial strains is an emerging problem, worldwide. UTIs are one of the most common bacterial infections in humans both in the community and the hospital settings. *E. coli* is the pre-dominant pathogen commonly isolated in urine. These uropathogen has also developed resistance to commonly prescribed antimicrobial agents. This severely limits the treatment options of an effective therapy.[4] Primarily, these uropathogen exerts their antimicrobial resistance against β-lactams by producing extended spectrum β-lactamases (ESBLs) enzymes that confers bacterial resistance to all β-lactams except carbapenems, cephamycins and clavulanic acid.[5] The present study was designed to determine the prevalence of UPEC and their antimicrobial sensitivity pattern. So, we can provide appropriate data to help direct improved empirical therapy.

MATERIAL AND METHODS

This prospective study was carried out in the Department of Microbiology of the institute for the duration of two years. A total of 200 *E. coli* isolates were recovered from urine samples of patients with clinically suspected UTIs of all age groups belonging to the departments of urology, nephrology, medicine, pediatrics and etc. Urine samples were inoculated on blood and Mac Conkey agar by standard loop method and a colony count of $>10^5$ CFU/ml was taken to be significant bacteriuria. All isolates were identified as *E. coli* by standard biochemical tests.[6] Antibiotic susceptibility testing of the isolates was performed by Kirby-Bauer disc diffusion method on Mueller Hinton Agar as per CLSI guidelines.[7] Antibiotic discs used were amikacin (30 µg), ampicillin (10µg), cefoperazone + sulbactam (150/60 µg), cefotaxime (30 µg), ciprofloxacin (5µg), co-trimoxazole (25µg), gentamycin (10 µg), imipenem (10µg), nitrofurantoin (50 µg), norfloxacin (10 µg), piperacillin + tazobactam (100/10 µg). Quality control is performed by standard strains i.e. *Escherichia coli* ATCC 25922.

RESULT

A total of 200 *E. coli* were isolated from the urine samples of patients with clinically suspected UTI. The

incidence of UTI was more in the age group of 21-30 years (33%) followed by 31-40 years (32.5%), 41-40 years (15.5%), 11-20 years (11%), 1-10 years (6.5%) and >50 years (1.5%) respectively. The incidence of UTI was slightly more in females (51%) than males (49%). The age group of 31-40 years was showing highest incidence of UTI in males whereas the age group of 21-30 years was exhibiting highest incidence in females. The maximum sensitivity to UPEC isolates were shown by nitrofurantoin 173 (86.5%), followed by imipenem 161 (80.5%) ticarcillin 151 (75.5%), levofloxacin 145 (72.5%), meropenem 140 (70%), amikacin 138 (69%), cefoperazone 129 (64.5%), gentamicin 127 (63.3%), piperacillin + tazobactum 111 (55.5%), cefpodoxime 84 (42%), doxycycline 73 (36.5%), norfloxacin 62 (31%), cotrimoxazole 60 (30%), cefixime 35 (17.5%), ceftazidime 34 (17%) and ceftriaxone 33 (16.5%) respectively. Thus maximum sensitivity is shown by nitrofurantoin and maximum resistance by ceftriaxone.

Table 1: Antibiotic Susceptibility Patterns of Uropathogenic *Escherichia coli.*

Antibiotics	Sensitive (Percentage)	Resistant (Percentage)
Nitrofurantoin	173 (86.5%)	27 (13.5%)
Norfloxacin	62 (31%)	138 (69%)
Amikacin	138 (69%)	62 (31%)
Levofloxacin	145 (72.5%)	55 (27.5%)
Imipenem	161 (80.5%)	39 (19.5%)
Piperacillin/tazobactum	111 (55.5%)	89 (44.5%)
Gentamicin	127 (63.5%)	73 (36.5%)
Cefixime	35 (17.5%)	165 (82.5%)
Co-trimoxazole	60 (30%)	140 (70%)
Ceftazidime	34 (17%)	166 (83%)
Ceftriaxone	33 (16.5%)	167 (83.5%)
Meropenem	140 (70%)	60 (30%)
Cefoperazone	129 (64.5%)	71 (35.5%)
Ticarcillin	151 (75.5%)	49 (28.5%)
Doxycycline	73 (36.5%)	127 (63.5%)
Cefpodoxime	84 (42%)	116 (58%)

DISCUSSION

UPEC are the most important group of microorganisms responsible for UTI. Based on the aged between 21-30 years was maximum and least was over the 50 years of age group (1.5%). The incidence was similar as the study conducted by Polse *et al* in Iraq.[8] They also isolated UPEC mostly from people aged 11-44 years. This result was also comparable to a study conducted by Kiffer *et al* as they found higher percentage of *E. coli* isolates in people of age group of 13–60 years and lower percentage in people younger than 13 years or older than 60 years.[9]

Based on what was observed from the results obtained, female have higher percentage rate of UTI than males. This difference could be attributed to several factors such as the anatomical differences between the male and female urethra, improper cleaning of the perineum, the use of napkins, sanitary towels, and tampons together with pregnancy and intercourse.[10] In addition, the urine of females was found to have a more suitable pH and osmolarity for the growth of *E. coli* and other enteric pathogens.[11] Antimicrobial resistance in UPEC is of major concern worldwide due to its increasing resistance to several commonly prescribed antibiotics.[12] In our study, antibiotic sensitivity pattern of UPEC showed maximum sensitivity to nitrofurantoin 86.5%, followed by imipenem 80.5%, ticarcillin 75.5%, levofloxacin 72.5%, meropenem 70%, amikacin 69%, cefoperazone 64.5% and gentamycin 63.3% repectively whereas maximum resistance was seen towards ceftriaxone 83.5%, ceftazidime 83%, cefixime 82.5%, cotrimoxazole 70% followed by norfloxacin 69%. Similarly in the study by Sharma *et al* majority of *E. coli* showed susceptibility towards nitrofurantoin 94.5% followed by ciprofloxacin and ofloxacin with the susceptibility of 50.5% for each drug respetively. Cephalexin (7.3%) was found least effective drug followed by ampicillin (18.3%). Norfloxacin, nalidixic acid and co-trimoxazole were found effective only for less than half of the isolates of *E. Coli*.[13]

In the study done by Saikia *et al* in Assam antibiotic sensitivity pattern of UPEC showed maximum resistance to ampicillin (79.05%) followed by nalidixic acid (77.15%), ciprofloxacin (73.81%) and co-trimoxazole (63.81%) respectively. The high prevalence of resistance to these antibiotics is a matter of concern since all these antibiotics are commonly used for treatment of UTI. Least resistance was seen with nitrofurantion (14.29%), followed by gentamicin (21.91%).

CONCLUSION

The incidence and causative UPEC are comparable with reports from elsewhere. Females were more susceptible to UTI than males. The age group of 21–30 years was with higher percentage of *E. coli*. The prevalence of pathogens and their susceptibility to antibiotics must be considered in the choice of treatment for UTI.

Additionally, periodically review and formulation of antibiotic policy are needed for control of acquisition of drug resistance.

REFERENCE

1. Ranjan KP, Ranjan N. Complicated urinary tract infection caused by extended spectrum β-lactamase producing *Escherichia coli*. Urol Ann, 2014; 6: 112-3.
2. Neto J A D, Martins A C P, Silva L D M, Tiraboschi R B, Domingos L A, Suaid H J, Tucci S and Cologna A J. 2003, Prevalence and bacterial susceptibility of hospital acquired urinary tract infection. *Acta Cirurgica Brasileira*, 18(5): 23-5.
3. Foxman B. 2003. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. Dis Mon., 49(2): 53-70.
4. Chander and Shrestha. Prevalence of extended spectrum beta lactamase producing *Escherichia coli* and *Klebsiella pneumoniae* urinary isolates in a tertiary care hospital in Kathmandu, Nepal. BMC Research Notes, 2013; 6: 487.
5. Coque TM, Baquero F, Canton R. Increasing prevalence of ESBL producing enterobacteriaceae in Europe. Eurosurveillance, 2008; 13(47): 1–11.
6. Collee JG, Marr W. Specimen collection, culture containers and media. In: Collee JG, Fraser JG, Marr W. AG, Marimion BP, Simmons A, editors. Mackie and McCartney Practical Medical Microbiology: 14th ed. New York: Churchill Livingstone, 1996; 95-111.
7. Clinical and Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing. 26th ed. CLSI Supplement M100S. Wayne, PA: Clinical and Laboratory Standards Institute, 2016.
8. Polse RF, Yousif SY, Assafi MS. Prevalence and antimicrobial susceptibility patterns of uropathogenic *E coli* among people in Zakho, Iraq. Int J Med Sci., 2016; 4: 1219-23.
9. Kiffer CR Mendes C, Oplustil CP, Sampaio JL. Antibiotic resistance and trend of urinary pathogens in general outpatients from a major urban city. Int Braz J Urol, 2007; 33(1): 42-8.
10. Kukanur S, Meundi M, Bajaj A, Kotigadde S. Co-relation between virulence factors and antibiotic resistance of *E coli*, with special reference to uropathogenic *E. coli*. Journal of Medical and Dental Sciences, 2015; 14(3): 15-21.
11. Prast MD, Issazadeh K, Cholgh MRK. Isolation, identification and serotyping uropathogenic *Escherichia coli* siderophore manufacturer of hospital patients and health care centers in Bandare Anzali. The Caspian Sea Journal, 2016; 10(1): 51-5.
12. Moyo SJ, Aboud S, Kasubi M, Lyamuya EF, Maselle SY. Antimicribial resistance among producers and non- producers of extended spectrum beta-lactamases in urinary isolates at a tertiary hospital in urinary isolates at a tertiary hospital in Tanzania. BMC Res Notes, 2010; 3: 348.
13. Sharma AR, Bhatta DR, Shreshtha J and Banjara MR. Antimicrobial susceptibility pattern of *Escherichia coli* isolated from urinary tract infected patients attending Bir Hospital. Nepal. Journal of Science and Technology, 2013; 14(1): 177-4.