Original Article

Choice of Antibiotics in Community Acquired UTI due to *Escherichia Coli* in Adult Age group

Microbiology Section

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ABSTRACT

Background: Urinary tract infections (UTI), being the most common infections diagnosed in community and hospital, are to be treated scrupulously considering the type of infecting organism and its antibiotic resistance pattern. The study of changing antibiotic resistance pattern is pertinent for appropriate treatment.

Aim: The aim of this study was to find out the drug options for treatment of community acquired urinary tract infection (UTI) due to *Escherichia coli* in adult age group in our geographical area in the current scenario of increasing antimicrobial resistance.

Setting and Design: A total of 208 Escherichia coli isolates from urine of adult patients presenting in various out patient department of Government Medical College & Hospital, Chandigarh were studied between January 2009 to June 2009. Antimicrobial susceptibility of various drugs was carried out by disc diffusion method following CLSI guidelines.

Results: Amongst the orally administered drugs ampicillin, amoxycillin/clavulanic acid, norfloxacin, ciprofloxacin, tetracycline and co-trimoxazole showed 100%, 83.6%, 78.1%, 72.5%, 69.1% and 69% resistance respectively. Amongst parenterally administered antibiotics, the antimicrobial resistance for cefotaxime, ceftazidime, gentamicin, netilmicin and amikacin was found to be 58.8%, 67.2%, 18.7%, 4.8% and 4.6% respectively. Nitrofurantoin showed only 3.8% resistance. No drug resistance was seen with imipenem.

Conclusion: Amongst oral drugs, nitrofurantoin was shown to be suitable for the treatment of UTI due to *Escherichia coli*. Ampicillin, amoxycillin/clavulanic acid, norfloxacin, ciprofloxacin, tetracycline, co-trimoxazole should no longer be considered first line drugs for empirical treatment of clinically evident UTI because of very high resistance rates. Aminoglycosides though parentral drugs can be the alternative choice for community acquired UTI.

Key Words: UTI, Escherichia Coli, Outpatient, Antibiotic

KEY MESSAGE

- Continuous surveillance of antibiotic resistance pattern is important in the scenario of increasing antibiotic resistance even in community.
- Nitrofurantoin is suitable as an oral drug for the treatment of community acquired UTI due to Escherichia coli in our geographical region.
- Quinolones (Norfloxacin and Ciprofloxacin), commonly prescribed by the physicians in our region can no longer be used empirically i.e. before the availability of urine culture and sensitivity report.
- Aminoglycosides can be instituted as a parenteral drug in community.
- For institution of appropriate therapy urine culture and sensitivity is the gold standard test.

INTRODUCTION

Urinary tract infections (UTI) are one of the most common infections diagnosed in outpatients as well as in hospital. The choice of antibiotic for treatment depends upon the type of infecting organism and its antibiotic resistance pattern. The most common organism responsible for both community acquired and hospital acquired UTI is *Escherichia coli* and these days we have seen the upsurge of highly drug resistant strains even in the community. Antibiotic resistance has become one of the world's most pressing public health problems. With the increase in over-the counter availability of drugs in developing countries like India, antibiotic resistance is on the rise. Antibiotic resistance varies according to the geographical and regional locations. The knowledge about the antibiotic resistance pattern is important not only for appropriate therapy but also for the prevention of resistance amongst microbes as the treatment given without considering the prevalent microbe and its antibiotic resistance pattern results in the selection of more resistant strain [1]. We have conducted this study to know the antimicrobial resistance pattern of *Escherichia coli* isolates from urine samples of adult patients (defined as patients >18 years of age) attending outpatient clinics and to find out the drug options for the empiric treatment of community acquired UTI in our geographical region.

METHODS

This study was conducted on 208 *Escherichia coli* isolates from urine of adult patients attending various outpatient clinics at Government Medical College Hospital, Chandigarh over a time period of six months (1st January 2009-30th June 2009). These isolates were obtained as pure growth of ≥105 colony forming unit (CFU)/ml from patients with symptoms of UTI but without history of hospitalization and catheterization. The samples were inoculated on CLED (Cysteine Lactose Electrolyte Deficient) agar by standard loop method using 0.001ml loop and incubated at 37°C overnight. Identification of the organisms was done by standard biochemical methods and antimicrobial susceptibility was done by disc diffusion method using Kirby-Bauer method following CLSI guidelines [2],[3]. The drugs along with their content which were tested include ampicillin (10µg), amoxycillin/clavulanic acid (20/10µg), cefotaxime (30 µg), ceftazidime (30µg), cefoperazone+sulbactam (75/10 µg), pipeacillin+tazobactam (100/10 µg), cefepime+tazobactam (30/10 µg), imipenem (10 µg), norfloxacin (10 µg), ciprofloxacin (5 µg), gentamicin (10 µg), netilmicin (30 µg), amikacin (30 µg), tobramycin (10 µg), tetracycline (30 µg), nitrofurantoin (300 µg), trimethoprim/sulfamethoxazole (1.25/23.75 µg) (HiMedia, Mumbai, India). *Escherichia coli* ATCC 25922 strain was used as a quality control strain for antimicrobial susceptibility testing.

RESULTS

Out of 208 isolates, 127 were obtained from females and 81 were obtained from males. The number of these isolates amongst male and female patients in different age groups is given in [Table/Fig-1]. We found that maximum isolates in males were obtained from patients of >60 years of age while in females the maximum isolates were from patients in between 18-25 years of age. The overall resistance to various antibiotics in male and female patients is given in [Table/Fig-2].

Age group (years)	Female	Male
18–25	47	13
26–30	22	02
31–35	05	02
36–40	12	09
41–45	05	05
46–50	06	05
51–55	10	07
56–60	15	13
>60	05	25

[Table/Fig-1]: Age and gender wise distribution of E.coli isolates from community

Antibiotic	Total Resistance (%)	Resistance (%) Male	Resistance (%) Female
Ampicillin	100	100	100
Amoxycillin+ clavulanic acid	83.6	94.4	76.6
Cefotaxime	58.8	82.7	46.4
Ceftazidime	67.2	84.4	55.9
Cefoperazone + sulbactam	14.4	41	1.3
Piperacillin + Tazobactam	1.9	5.1	0
Cefepime + Tazobactam	0	0	0
Imipenem	0	0	0
Norfloxacin	78.1	87.5	71.6
Ciprofloxacin	72.5	85.7	63.3
Gentamicin	18.7	25.9	15.6
Netilmicin	4.8	7.1	2.9
Amikacin	4.6	12.5	0
Tobramycin	71.4	75	66.7
Tetracycline	69.1	84.4	55.6
Nitrofurantoin	3.8	8	1.2
Co-trimoxazole	69	78.6	62.8

[Table/Fig-2]: Percentage distribution of antimicrobial resistance of E.coli in community acquired UTI

DISCUSSION

IDSA (Infectious disease Society of America) recommends the use of a 3 day course of co-trimoxazole as a first line treatment except in communities with high rate of resistance (>10-20%) to co-trimoxazole among uropathogens [4]. In our study, we have found a very high i.e. 69% resistance to co-trimoxazole. Therefore, in our geographical area, we do not have any option of using this drug empirically even though it is an oral drug, cost effective and safe. In a previous study between 1997-1999 from our institute, we found similar resistance for co-trimoxazole [5]. Norfloxacin, being an oral drug with easy dosage schedule, is commonly prescribed by the clinicians for the treatment of UTI in outpatients not only in India but in other countries also [6]. This may be the reason of increasing quinolones resistance in our area and is also revealed by other studies [7],[8]. Amongst other oral antibiotics, nitrofurantoin was found to be the most effective in both males and females. This finding has been corroborated by other studies also [1],[9],[10]. However, in a study conducted by Akram M *et al* in Aligarh on community acquired UTI, the resistance to nitrofurantoin was found to be very high (80%) [8]. This reflects the importance of generation of data from respective geographical region for preparing antibiotic guidelines.

A high resistance was seen for beta lactam antibiotics. A very high resistance was seen not only for ampicillin (aminopenicillin) but also for amoxycillin+clavulanic acid which is the combination of aminopenicillin with beta lactamase inhibitor and also a costlier drug. Resistance rate for third generation cephalosporins was significantly high which is indicative of production of extended spectrum beta lactamase (ESBLs) enzyme by the isolates from community. A study conducted in our institute by Gupta *et al* between January and October 2004 also revealed the infiltration of ESBLs in community isolates. They found 23.91% of *Escherichia coli* isolated from various clinical samples to be ESBLs positive [11].

Amongst β-lactam+ β-lactamase inhibitor combinations, cefepime+ tazobactam showed good susceptibility in-vitro. We found that resistance to imipenem has not entered in our community till now. In addition to this, aminoglycosides were found to be the preferred alternative drugs in case of resistance towards oral drugs. Amongst them, netilmicin and amikacin were found to be the most effective. In the last [10] years, the resistance rates of gentamicin and amikacin have shown a downward trend in our area (26% to 18.68% for gentamicin and 6% to 4.6% for amikacin) [4]. Based on current antibiotic resistance pattern amikacin can be used. Seeing the see-saw pattern of antibiotic resistance over the years, we emphasize on the generation of own data for empirical treatment. This fact is also corroborated by Dyer IE *et al* who in their study between 1991-1997 found that in the first 3 years the resistance to ampicillin, carbenicillin, tetracycline and co-trimoxazole was

increased but in the next three years it showed the downward trend and almost returned to 1991 levels [12].

In females, UTI was maximally seen in 18-25 yrs age group while the males of >61 years were most commonly affected amongst all age groups. A higher level of resistance was seen in elderly males as compared to females which can be due to prostatic enlargement predisposing to recurrent UTI and chronic use of antibiotics.

In the last, we may say that, amongst oral drugs nitrofurantoin is suitable for the treatment of community acquired *Escherichia coli* UTI in our geographical region. Ampicillin, amoxycillin/clavulanic acid, norfloxacin, ciprofloxacin, tetracycline, co-trimoxazole should no longer be considered first line drugs for empirical treatment of clinically evident UTI. In cases of resistance to oral drugs or where combination treatment is desirable, parentrally administered aminoglycosides could be a good choice for community acquired UTI. Continuous analysis of antibiotic resistance patterns act as a guide to initiate the empirical treatment but for institution of appropriate therapy urine culture and sensitivity is the gold standard even in community.

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