Original Research Paper

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ANTIBIOTIC RESISTANCE ASSOCIATION OF ESCHERICHIA COLI IN URINARY TRACT INFECTION OF THE PATIENTS OF JANAKPURDHAM.

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ABSTRACT **Introduction:** Urinary tract infection is the most frequently occurring infection in both community as well as in hospital environments. The aim of this study is to determine the association of E.coli in urinary tract infection along with their antibiotic resistance pattern. **Material & Methods:** A prospective study was conducted in the Department of Pathology and Microbiology of Janakpur Hospital. Total 100 positive samples of E.coli culture were taken Over a period of 10 months and the antibiotic pattern were studied. Antibiotic sensitivity was performed using AST N 280 Vitek card for Gram negative bacilli. Results were compared with the MICs for standard ATCC strain (ATCC E.coli 25922). **Results:** A total of 100 urinary isolates of E.coli were included in the study in which 67% were Female and 33% were Male, which clearly depicted that females were more commonly affected in our study except in the age group of 71-80 years where males were more affected. High level of resistance was seen to amoxicillin, ampicillin, ampi-sulbactam, cotrimoxazole, cefotaxime, ceftriaxone, cefepime & ciprofloxacin ranging from 70-95% whereas imipenem, amikacin, nitrofurantoin, tigecycline & piperacillin, showed low level of resistance. Although fluoroquinolones are among the most effective drugs in treating UTI. Our study shows imipenem and amikacin to be highly sensitive to all urinary isolates of E. coli including multidrug resistant strains. The consistent and high level susceptibility of E. coli to nitrofurantoin may be influenced by their narrow spectrum of activity. In our study, we encountered five different enzyme resistance mechanisms possessed by the isolates, responsible for showing resistance to different classes of drugs. These were extended spectrum β lactamase group of enzymes, amino acyl carboxylase enzymes, inhibitor resistant penicillinase, high level cephalosporinase followed by carbapenemase group of enzymes in descending order of their occurrence. Out of these mechanisms production of extended spectrum β lactamases was the chief mechanism responsible for resistance to different classes of drugs followed by amino acyl carboxylase production. **Conclusion:** The emergence of ESBL producing organisms among both the hospital and community isolates has forced the clinical microbiology laboratories to check for their presence compulsorily. Apart from this, treating the infections which are caused by these multi-drug resistant isolates by administering carbapenems, is not feasible for the common man in a developing country like ours.

KEYWORDS : Antibiotic resistance, β-lactamase, E.coli, enzymes, urinary tract infection

INTRODUCTION

Urinary tract infection (UTI) is one of the most common infections encountered and treated worldwide. The spectrum of etiologic agents causing urinary tract infections and their antimicrobial resistance pattern have been continuously changing over the years, both in community and in hospitals. [25]

Paul Ehrlich described the concept of antimicrobial agents as "magic bullets" for killing microbes. This impression of antimicrobial agents as magic bullets was thoroughly reinforced when penicillin and other antibiotics came into clinical use in the 1940s. However, shortly after the introduction of these magic bullets in clinical practice, it was discovered that the bacteria were capable of developing resistance to the antimicrobials.

The full magnitude of the resistance problem was not appreciated during the first decades of chemotherapy.[5] However, bacteria became more resistant, new types of bacteria developed resistance, resistance genes spread among different bacteria, and resistant organisms spread to new geographical areas. [6] Inappropriate use of antibiotics, use of broad-spectrum antibiotics, insufficient hygiene, immunosuppression and prolonged hospitalization may promote antimicrobial resistance. Use of antimicrobials of poor quality may contribute to emerging resistance and is a huge problem in countries with poor regulatory capacities.[9]

Many antibiotics like amoxicillin, amoxicillin/clavulanic acid, cephalexin, cotrimoxazole and ciprofloxacin are often used in the empirical therapy for community associated UTI.[26] However, as with many community acquired infections, antimicrobial resistance among the uropathogens that cause community associated UTI is increasing.[18] For rational empirical therapy of community associated UTI, it is necessary to consider the spectrum of uropathogens and their antimicrobial susceptibility pattern time to time, as it may vary institutionally, temporally and geographically.[1,15,16,19] There are many unresolved questions regarding antimicrobial resistance in general, including regarding its impact on patient outcome.

MATERIALS AND METHODS

Study Group: Study was conducted on all patients who came to the laboratory for urine culture and sensitivity and 100 *E.coli* isolates were included in the study.

Type of Study: Prospective study

Methods: Culture was done by Conventional method on CLED Agar and antibiotic sensitivity was performed using AST N 280 Vitek card for Gram negative bacilli.

Inclusion Criteria: All patients coming to the laboratory with chief complaints of dysuria, frequency, flank pain, fever and other co morbid conditions were included in the study.

Exclusion Criteria: Patients already on antibiotic treatment were excluded from the study.

- Informed consent from all the patients was obtained, before collection of clinical samples.

RESULTS

A total of 100 urinary isolates of *Escherichia coli* were included in the study, done over a period of 10 months. These isolates were distributed among different age groups with predilection primarily for females except in older age group wherein males were more affected [Table 1].

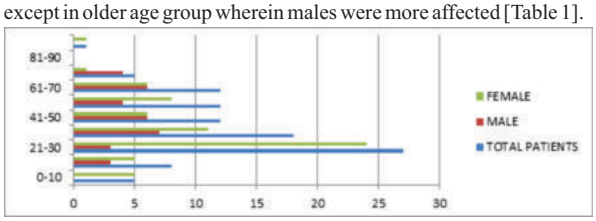

Table 1: Distribution of Escherichia coli in Males & Females

Increase in frequency and dysuria were found to be the chief symptoms associated with almost every age group while hypertension and DM

were chiefly present after the middle age. Nephropathy led to the chronicity of symptoms at a later age [Table 2].

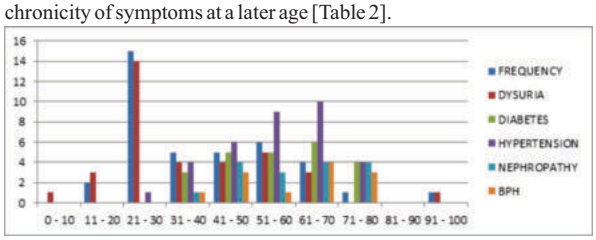

Table 2: Prevalence of symptoms in different age groups

This table depicts that most of the urinary isolates were resistant to commonly prescribed drugs for treatment . Only drugs found to be effective were Imipenem, Tigecycline, Amikacin and Nitrofurantoin in decreasing order of preference.

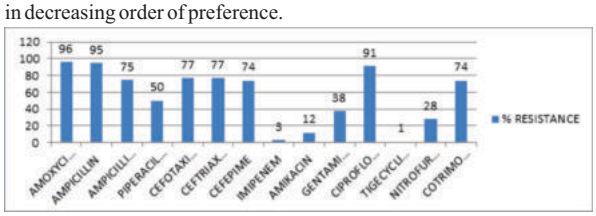

Fig 1: % Resistance of isolates to different drugs

Table 3: Enzyme induced Resistance (%)

ENZYME RESISTANCE MECHANISM	% OF TOTAL ISOLATES SHOWING RESISTANCE
ESBL	56.1
Carbapenemase	2.3
AAC	33
High level Cephalosporinase	3.07
Inhibitor resistance penicillinase	5.3

Most of the urinary isolates of *Escherichia coli* showed resistance to commonly used antibiotics due to the production of Extended spectrum β lactamase group of enzymes followed by amino acyl carboxylase enzymes [Table 3]

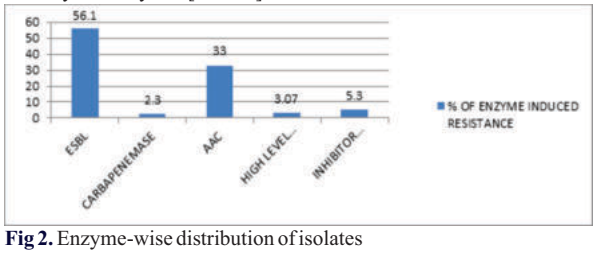

Fig 2. Enzyme-wise distribution of isolates

DISCUSSION

A total of 100 *Escherichia coli* isolates were cultured from urine samples over a period of 10 months of these 67 % were females and 33 % were males which clearly depicted that females were more commonly affected in our study except in the age group of 71-80 years where males were more affected. Infection in this group usually occurs in the setting of underlying anatomical or functional abnormalities or following instrumentation of the urinary tract and the use of prophylactic antimicrobials.

High level of resistance was seen to amoxicillin, ampicillin, ampi-sulbactam, cotrimoxazole, cefotaxime, ceftriaxone, cefepime & ciprofloxacin ranging from 70-95% whereas imipenem, amikacin, nitrofurantoin, tigecycline & piperacillin, showed low level of resistance. Although fluoroquinolones are among the most effective drugs in treating UTI.[2] Diverse studies have revealed increasing resistance to fluoroquinolones.[3] Our study also shows a high level of resistance to ciprofloxacin.

Our study depicted that most of the 73% of the isolates were resistant to cephalosporin group of drugs owing to the production of extended spectrum β lactamases and association between ESBL production and drugs ceftriaxone and cefepime was found to be highly significant. Although all other drugs belonging to cephalosporin group had a strong positive correlation with these group of enzymes. Rest of the isolates were either sensitive to these drugs or having a different enzyme resistance mechanism. [11,12]

CONCLUSION:

The emergence of ESBL producing organisms among both the hospital and community isolates has forced the clinical microbiology laboratories to check for their presence compulsorily. Apart from this, treating the infections which are caused by these multi-drug resistant isolates by administering carbapenems, is not feasible for the common man in a developing country like ours.

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