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Original Article

ANTIBIOTIC SUSCEPTIBILITY PATTERN AND ESBL PREVALENCE IN ESCHERICHIA COLI ISOLATES FROM PUS SAMPLES IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: *Escherichia coli* is one of the most common etiological agent isolated from various infections. ESBL (Extended spectrum beta lactamase) producing strains of *Escherichia coli* have become a great therapeutic challenge to the clinicians in managing such infections. The aim and objective of the present study is to find out the antibiotic susceptibility pattern and to assess the prevalence of ESBL producers among the *Escherichia coli* isolates.

Methods: 100 isolates of *Escherichia coli* from pus samples identified by standard conventional methods were included in the study. Antibiotic sensitivity testing was carried out using the Kirby Bauer's disc diffusion method. Isolates showing resistance to third generation cephalosporins were subjected to phenotypic confirmatory test to confirm ESBL production.

Results: The antibiogram revealed higher susceptibility percentage to Amikacin, Gentamicin and Levofloxacin. Higher resistance rate was noted for Amoxyclav, Ciprofloxacin, Cefotaxime, Ceftazidime and Ertapenem. All the isolates were found to be susceptible to Imipenem and Tigecycline. 36% of the *Escherichia coli* isolate were detected to be ESBL producers.

Conclusion: ESBL producing strains of *Escherichia coli* will cause therapeutic failure and also contribute to multidrug resistance. Hence routine surveillance for ESBL production and infection control methods should be made mandatory.

Keywords: ESBL (Extended spectrum beta lactamase), *Escherichia coli*, Ceftazidime and Ceftaclav (Ceftazidime clavulanic acid).

INTRODUCTION

Escherichia coli, a member of the Enterobacteriaceae family is one of the most common pathogens isolated from a wide variety of clinical samples in the bacteriology laboratory. Infections due to extended spectrum beta lactamase [ESBL] producing *Escherichia coli* range from uncomplicated UTI to life threatening septicaemia [1].

Beta lactam antibiotics [Penicillins and Cephalosporins] remained the main stay of therapy against microorganisms for more than 2 decades until resistance mechanism due to production of beta lactamase by Gram negative bacilli became a serious issue [2]. ESBLs are a group of enzymes which can cause hydrolysis of many types of beta lactam ring including Cephalosporins [eg. Ceftazidime, Cefotaxime and Ceftriaxone] and Monobactams [Aztreonam] in addition to Penicillins [3]. They have been found in various members Enterobacteriaceae family. The irrational prescription and extensive use of an expanded spectrum Cephalosporins has led to the emergence of resistant organisms which were previously susceptible to these agents and this resistance has spread to *Escherichia coli* in addition to other Gram negative rods [4].

Recent studies have demonstrated that 9-50% of clinical isolates of members of Entero bacteriaceae produce ESBL [5-7]. *Escherichia coli* and Klebsiella pneumoniae often carry genes for TEM-1, TEM-2 and SHV-1 beta lactamases. These types of ESBLs were generally detected in *Escherichia coli* during 1980s and 1990s [8]. Later a newer group of ESBLs termed as CTX-M was considered to emerge in *Escherichia coli*. This enzyme preferentially hydrolyzed Cefotaxime rather than Ceftazidime [9].

Initially ESBL producing strains of *Escherichia coli* were reported mainly from nosocomial infections. But nowadays, they are isolated commonly even from community acquired infections. Hence knowledge about the ESBL producing *Escherichia coli* is necessary for successful management of both hospital acquired and community acquired infections. Moreover local antibiotic susceptibility pattern is a very useful guide for clinicians in selecting the right antibiotic for empirical therapy. Hence we conducted this study to throw light on the antibiotic susceptibility pattern and ESBL prevalence among *Escherichia coli* isolates in a tertiary care hospital, Chennai.

MATERIALS AND METHODS

The present study was carried out in a tertiary care centre from April, 2014 to September, 2014. One hundred isolates of *Escherichia coli* from pus samples [obtained after getting informed consent] identified by conventional techniques were incorporated into the study. Kirby Bauer's Disc Diffusion method was used to find out the antibiotic susceptibility pattern. Antibiotics used were Ceftazidime [30 mcg], Ceftazidimeclavulanic acid [30/10mcg], Amoxyclav [20/10 mcg], Amikacin [30 mcg], Gentamicin [10 mcg], Cefotaxime [30 mcg], Ciprofloxacin [5 mcg], Levofloxacin [5 mcg], Tigecycline [15 mcg], Imipenem[10 mcg] and Ertapenem [10 mcg]. Interpretation of the diameter of the zone of inhibition was done as per CLSI guidelines.

The isolates of Escherichia coli which showed resistance to third generation Cephalosporins [Ceftazidime, Cefotaxime] were considered as potential ESBL producers and were further tested for confirmation of ESBL production by Phenotypic Confirmatory Test [PCT] using Ceftazidime [30mcg] and Ceftazidime--Clavulanic acid [30/10mcg][10].

The isolates were inoculated into peptone water and incubated at 37 degree C for 3 to 5 hours. The turbidity was adjusted to 0.5 Mac Farland's standard. With this suspension, lawn culture was made onto MHA [Mueller Hinton Agar]. Plain Ceftazidime and Ceftazidime--Clavulanic acid combination discs were kept at a distance of 25 mm on MHA plate and incubated at 37 degree C for overnight period. An increase in diameter of the zone of inhibition of >= 5 mm between Ceftazidime disc and Ceftazidimeclavulanic acid disc confirmed the production of ESBL [11].

RESULTS

Among the 100 isolates of *Escherichia coli* higher percentage of susceptibility was noted for Amikacin[92%], Gentamicin [76%] and Levofloxacin [72%]. The antibiogram also revealed that the isolates

showed lower susceptibility percentage to Amoxyclav[26%], Ciprofloxacin [27%], Ertapenem [47%], Cefotaxime [24%] and Ceftazidime [30%]. 100% sensitivity was noted for Imipenem and Tigecycline. By Phenotypic Confirmatory Test the prevalence of ESBL among *Escherichia coli* isolates was found to be 36%.

Table 1: percentage of susceptibility of *Escherichia coli* isolates to various antibiotics

Antibiotics	Sensitivity percentage
Ceftazidime	30
Cefotaxime	24
Amikacin	92
Gentamicin	76
Amoxyclav	26
Ciprofloxacin	27
Levofloxacin	72
Ertapenem	47
Imipenem	100
Tigecycline	100

DISCUSSION

ESBL producing bacterial strains have emerged as a potential threat to the treating clinicians. The prevalence of ESBLs among *Escherichia coli* isolates is now alarmingly high and also continues to increase rapidly.

By screening 100 Escherichia coli isolates we found that 92% of them were susceptible to Amikacin and 72% were susceptible to Levofloxacin. All the isolates were susceptible to Imipenem [3]. 100% sensitivities were also observed for Tigecycline. 76% of the isolates showed resistance to Cefotaximeand 70% showed resistance to Ceftazidime. By doing the Phenotypic Confirmatory Test 36% were detected to be ESBL producing strains of Escherichia coli. Previous studies have indicated that the rate of ESBL production in Escherichia coli ranges from 21 to 34% [6, 12-14]. Our study reports 36% of Escherichia coli to be ESBL producers which nearly correlate with a study conducted by Sameenaetal [3].

The high prevalence rate of ESBLs necessitates the need for continuous monitoring measures and highly effective infection containment practices. The production of beta lactamases may be chromosomally mediated or may be of plasmid origin. Plasmid mediated resistance is transferrable from one microorganism to another by way of gene transfer mechanisms. This kind of transferrable plasmid [extra chromosomal DNA] may also encode for resistant determinants to other antibiotics. Therefore ESBL producing strains are found to be multidrug resistant. In our study, also most of the ESBL producing strains were multidrug resistant.

CONCLUSION

In the present study, we observed an alarming prevalence of ESBL producing *Escherichia coli* isolates. ESBL production will result in clinical failure with antibiotics like Penicillin, Aztreonam and Cephalosporins inspite of being susceptible *in vitro*. Therefore Phenotypic Confirmatory Test should be carried out as a mandatory procedure to confirm ESBL production for all the isolates. Judicious prescription of antibiotics for empiric therapy based on local susceptibility pattern will definitely reduce the emergence and spread of ESBL producing organisms.

CONFLICT OF INTERESTS

Declared None

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