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RESEARCH ARTICLE

ESBL PRODUCING ENTEROBACTERIACEAE ISOLATES – PREVALANCE AND THEIR SUSCEPTIBILITY PATTERNS

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ABSTRACT

Background: Antimicrobial resistance seen among many Enterobacteriaceae isolates, especially those expressing extended spectrum beta lactamase (ESBL) enzymes are on the rise. This has limited our treatment options and made it very difficult to control these infections. **Aim:** To determine the prevalence of ESBL productions among Enterobacteriaceae isolates and also study their susceptibility patterns. **Methods:** A total of 220 clinical isolates of Enterobacteriaceae were screened for ESBL production by using five screening drugs.those resistant any one of the drugs were further tests for confirmation of ESBL production by Double disc synergy test (DDST). The ESBL producers were further studied for susceptibility patterns to other antibiotics. **Results**: Among the 220 isolates 117 (53.17%) were found to ESBL producers. These ESBL producers were most sensitive to meropenem, piperacillin/tazobactum and least sensitive to co-trimoxazole . **Conclusions:** The prevalence of multidrug resistant ESBL producers is very high and there is an urgent need to rationalize the use of antibiotics and minimize their mis-use.

Key words: Enterobacteriaceae, Extended spectrum beta lactamase, Double disc synergy test, Meropenem, Piperacillin/Tazobactum, Co-trimoxazole.

INTRODUCTION:

Members of the family Enterobacteriaceae commonly express plasmid encoded beta lactamases (e.g TEM-1, TEM-2 and SHV-1) which confer resistance to penicillins but not to extended spectrum cephalosporins. In the mid 1980's a new group of the extended spectrum beta lactamase (ESBL) enzymes were detected[1]. These being plasmid mediated, they are easily transmitted among the members of family Enterobacteriaceae, thus facilitating the dissemination of resistance not only to beta-lactams but also to other commonly used antibiotics such as quinolones and aminoglycosides. Therefore antibiotic options in the treatment of such organisms become very limited. ESBL producing organisms may appear susceptible to some extended spectrum cephalosporins in vitro. However treatments with such antibiotics are associated with high failure rates. In recent years, prevalence of ESBL producers is on the rise[2]. This study was taken up to determine the prevalence of ESBL production among Enterobacteriaceae in our set up and also study their susceptibility pattern to know the treatment options available in such cases.

MATERIAL AND METHODS:

A total of 220 clinical isolates of Enterobacteriaceae from clinical specimens collected from various in-patient and outpatient department at Basaveshwara Medical College and Hospital, Chitradurga over a period of three months were studied. Isolates were identified by colony morphology and standard biochemical reactions[3]. Antimicrobial susceptibility testing was done on Mueller Hinton agar plates with commercially available antibiotic discs by Kirby Bauer's method. Each isolate was also screened for possible ESBL production by testing with 30µg each of ceftazidime, cefotaxime, ceftriaxone and

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aztreonam and 10µg of cefpodoxime discs. The results were recorded and interpreted as per CLSI guidelines[4].

Phenotypic Confirmatory test for ESBL production:

Every isolate that showed resistance to any one of the screening drugs for ESBL production were further tested for confirmation of ESBL production by Double disc synergy test (DDST) as described by Jarlier et.al[5]. E.coli ATCC 25922 strain was used as a negative control and in house ESBL producer was used as positive control.

RESULTS:

Table 1: Clinical isolates with their source

Isolate	Urine	Sputum	Stool	Pus	Blood	Total
E.coli	84	01	00	15	04	104
K.pneumoniae	55	13	00	04	02	74
Citrobacter	10	00	00	01	00	11
Proteus	18	00	00	02	01	21
Salmonella	00	00	05	01	02	08
Shigella	00	00	02	00	00	02

A total of 220 enterobactericeae were studied of which 104 (47.2%) were E.coli followed by K.pneumoniae 74 (33.6%). Table 1 shows the various isolates and their sources.

Table 2: Comparison of ESBL producers and Non ESBL producers among the clinical isolates

Isolate	ESBL (%)	Non ESBL (%)
E.coli (104)	76 (73.07)	28 (26.93)
K.pneumoniae (74)	38 (51.35)	36 (58.65)
Citrobacter (11)	01 (9.09)	10 (90.91)
Proteus (21)	02 (9.52)	19 (90.48)
Salmonella (08)	00 (00)	08 (100)
Shigella (02)	00 (00)	02 (100)
Total (220)	117 (57.35)	103 (52.65)

Among 104 isolates of E.coli, 76 (73.07%) were ESBL producers whereas among 74 isolates of K.pneumoniae, 38 (51.35%) were ESBL producers. ESBL producers among all isolates are shown in Table – 2.

Table 3: Susceptibility pattern among ESBL producers to antibiotics other than beta lactams

	E.coli (76)	K.pneumoniae (36)	Proteus (02)	Citrobacter (01)
Meropenem	74	38	02	01
Piperacillin/Tazobactum	74	38	02	01
Amikacin	66	30	02	01
Gentamycin	60	30	02	01
Netilmicin	66	30	02	01
Ciprofloxacin	58	26	01	01
Ofloxacin	58	26	01	01
Co-trimoxazole	46	28	00	01
Chloramphenicol	52	30	00	01

Among these 76 isolates of E.coli, 74 (97.3%) strains were susceptible to meropenem and piperacillin/tazobactum and other 02 (2.7%) were resistant to even meropenem and piperacillin/tazobactum. All other ESBL producing isolates were sensitive both these drugs.

For ESBL producing E.coli isolates co-trimoxazole (60.52%) was the least sensitive drug followed by chloramphenicol (68.42%). The sensitivity of aminoglycosides and quinolones was 86.8% and 76.3% respectively.

Among these 38 K.pneumoniae isolates, all were susceptible to meropenem and piperacillin/tazobactum. The least sensitive drug were quinolones (68.42%) followed by co-trimoxazole (73.68%) and aminoglycosides (78.94%).

Table 3 shows the overall susceptibility pattern of all ESBL producing enterobacteriaceae isolates to antibiotics other than beta lactams.

DISCUSSION:

A total of 220 isolates were screened for ESBL production of which 117 (57.35%) were detected to be ESBL producers. Among these 117 ESBL producers E.coli 74 (63.2%) was the most common followed by K.pneumoniae 38 (32.42%), Proteus 02 (1.76%). Even 01 isolate of C.koseri was found to be ESBL producer. However Rao et.al[6] has found P.mirabilis to be the most common ESBL producer in their study.

ESBL production was seen in 76 out of 104 (73.07%) E.coli and 38 out of 76 (51.35%) of K.pneumoniae isolates. Also 02 out of 21 (9.52%) P.mirabilis and 01 out of 11 (9.09%) C.koseri were found to be ESBL producers. Baby Padmini et.al[7] reported 41% of the E.coli and 40% of K.pneumoniae isolates to be ESBL producers. Similarly Jain et.al[8] – E.coli 63.6%, K.pneumoniae 86.6% , Varsha Gupta et.al[9] – E.coli 63.8%, K.pneumoniae 76.2% have reported varying prevalences of ESBL producers in their studies. However Kumar et.al[10] – E.coli 19.2%, K.pneumoniae 21.2% and Lee et.al[11] E.coli 7.8% have reported low prevalence of ESBL producers in their studies. This shows that the prevalence and organisms producing ESBL's keep varying from time to time and from place to place.

The presence of multi-drug resistance was found to be higher in ESBL producing E.coli and K.pneumoniae. Carbapenems and piperacillin/tazobactum were found to be the most effective drugs. ESBL producers were least sensitive to co-trimoxazole followed by quinolones and aminoglycosides. Rudresh et.al[12] reported similar finding in their study.

CONCLUSIONS:

Our study has shown the prevalence of multi-drug resistant ESBL producers to be high. Also few ESBL producers were found to be carbapenem resistant which should serve as a wakeup call otherwise we may be left with nothing else to treat these multi-drug resistant bugs. Further and periodical studies are required to keep ourselves updated regarding the prevalence of ESBL producers and the organisms and their susceptibility patterns.

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