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STUDY OF ANTIBIOTIC SENSITIVITY PATTERN AND EXTENDED-SPECTRUM BETA-LACTAMASES DETECTION OF ISOLATED ENTEROBACTERIACEAE

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ABSTRACT

Introduction: ESBL producers are one of the most common causes of nosocomial pathogens, which are responsible for causing variety of human infections. In the present era of antibiotic resistance, the emergence of multi-drug resistant organisms is more common. **Aims:** To observe the antibiotic sensitivity pattern of *Enterobacteriaceae* and result of Ceftazidime and ceftriaxone for ESBL detection. Provide appropriate list of sensitive antibiotics to clinician for treatment. **Materials and Methods:** Total 200 isolates of *Enterobacteriaceae* had been taken from the different types of samples. All the *Enterobacteriaceae* isolates from different samples received from hospital for gram staining, manual culture, automated bacterial culture and antibiotic susceptibility testing will be included in the study. **Results:** There were 200 different isolates of *Enterobacteriaceae*. 174(87%) ESBL producers and 26(13%) non-ESBL producers were isolated. Among the ESBL positive cases of the all samples *E.coli* (105) was the top most organism followed by *Klebsiella spp.* (26), *Citrobacter spp.* (25), *Enterobacter spp.*(25) and *proteus spp.* (5). **Conclusion:** ESBLs have evolved greatly over the last years. There is no doubt that the ESBLs will become increasingly complex and diverse in the future. This will create increasing challenges for those creating guidelines for the detection of ESBLs in the clinical microbiology laboratory. The increasing prevalence of antibiotic-resistant bacterial infections seen in clinical practice stems from antibiotic use within medicine. In medicine the major problem of the emergence of resistant bacteria is due to misuse and overuse of antibiotics.

KEYWORDS: Extended Spectrum Beta-lactamases, Antibiotic Sensitivity Testing.

INTRODUCTION

Extended spectrum β-lactamases (ESBLs) are defined as β-lactamases capable of hydrolyzing oxyiminocephalosporins and are inhibited by β-lactamase inhibitors. [1] Extended-spectrum b-lactamase (ESBL)–producing organisms were first isolated in Germany in1983.[2] And outbreaks of infection due to these organisms soon occurred in several European centres. [3,4] These organisms elaborate beta-lactamases, which can hydrolyze the amide bond in the beta-lactam ring of antibiotics. Later on, extended-spectrum beta-lactamase (ESBL)-producing organisms have been isolated around the world.[5,6,7]

ESBLs are known to hydrolyze all penicillins, early cephalosporins, oxyimino-cephalosporins and monobactams, but they lack hydrolytic activity on cephamycins and carbapenems. ESBLs are inhibited by beta-lactamase inhibitors such as clavulanic acid, tazobactam and sulbactam.[8] ESBLs are enzymes that confer resistance to aztreonam, cefotaxime, ceftazidime, and related oxyimino-b-lactams as well as to older penicillin and cephalosporin.[9] This study was aimed to the Antibiotic Sensitivity Pattern and Extended-Spectrum Beta-Lactamases Detection in Isolated species of Enterobacteriaceae family.

MATERIAL AND METHODS

The study was done in Microbiology Lab of TMU Hospital from January-2018 To October-2018. All samples (urine, pus, blood, body fluids, throat swabs) will be cultured and incubated at 32^0 C for 18-24 hours.Isolation and identification of isolates were done by Gram staining, cultural characteristics and biochemical properties, as per the Manual of Clinical Microbiology. Only the isolates which were

Enterobacteriaceae (total 200) were included in the study. Antibiotic susceptibility testing of these isolates were performed by disk diffusion method on Mueller-hinton agar as per CLSI guidelines. All isolates resistant to ceftazidime and ceftriaxone were confirmed phenotypically for ESBL production by using combined disk synergy test. Phenotypic confirmation of the presence of ESBL in Enterobacteriaceae isolates were performed using combined disk method as per CLSI guidelines.Ceftazidime and Ceftazidime-clavulanic acid disk were used for the detection of ESBL production.A difference of ≥ 5 mm between the diameters of zone of inhibition ceftazidime and ceftazidime-clavulanic acid disk were regarded as confirmatory for ESBL production.

RESULTS

Out of 200 different isolates of *Enterobacteriaceae* 174(87%) were ESBL producers and 26(13%) non-ESBL producers were isolated.

Table. 1: Gender wise distribution of ESBL & non-ESBL producers.

S. No.	Gender	ESBL n=174 (87%)	NON-ESBL n=26 (13%)	Total
1	Male	87 (50%)	7 (26.9%)	94 (47%)
2	Female	87 (50%)	19 (73.07%)	106 (53%)
	Total	174	26	200

Table. 2: Number of organisms isolated in ESBL & Non-ESBL producers.

S. No.	Organisms isolated	Total	ESBL n=174	Non-ESBL n=26
1	*E.coli*	120	105	15
2	*Klebsiella spp.*	30	26	4
3	*Proteus spp.*	7	5	2
4	*Citrobacter spp.*	28	25	3
5	*Enterobacter spp.*	15	13	2

The gender wise distribution of ESBL & non-ESBL producers were shown in table 1. The most common organism isolated among *Enterobacteriaceae* were *E. coli (*60.34*%)* followed by *Klebsiella (*14.94*%) & Citrobacter (*14.36*%)* as shown in table 2. Maximum ESBL production was seen in *E. coli* (60.34%) followed by *Klebsiella* (14.94%) & *Citrobacter* (14.36%).

DISCUSSION

ESBL producing bacteria has been increasingly reported from different geographical regions. Various mechanisms such as enzymatic inactivation of antibiotics, altered target sites, decreased poring permeability and active efflux pumps are known to produce drug resistance. One such mechanism is the production of extended-spectrum beta-lactamase (ESBL) enzymes by these bacteria**.** **[10]** Extended spectrum β-lactamases (ESBLs) arise by mutations in genes for common plasmid-mediated b-lactamases that alter the configuration of the enzyme near its active site to increase the affinity and hydrolytic ability of the b-lactamase for oxyimino compounds while simultaneously weakening the overall enzyme efficiency. Some ESBLs confer high-level resistance to all oxyimino-b-lactams. [11,12,13]

Our study, we isolated 174 (87%) ESBL producers and 26 (13%) were non-ESBL producers is finding were quite different from several studies worldwide reflecting the variation in general trend in prevalence of ESBL producing bacteria.

A study reported by Nibedita das et al. from North India on ESBL production in uropathogens showed 26.6% ESBL producers in.[14] A study by Vinod Kumar et al. from Gulbarga reported 16.8% of the ESBL producers.[15]

On the basis of gender wise distribution, a study from khan et al. 2017 there were 69% ESBL producers were found in females whereas 41% ESBL producers were found in males. However in our present study, 87(50%) ESBL producers were found in males and 87(50%) were found in females, which showed that the ESBL producers Gram-negative rods were same in both males and females. In India prevalence and incidence of ESBL from different studies has been in the range of 25% to 84%. In our study this has been 87% which was in accordance with the other studies. ESBL is a MDR organism, therefore AST of such isolates become important and our study shows that the prevalence rate of ESBL was 87% in indoor and outdoor patients, therefore screening of every ESBL isolates by ceftazidime and ceftazidime/clavulanic acid disc diffusion test is necessary for the early detection and treatment of ESBL strains in clinical samples.

In this study, the ESBL producers among the gram-negative rods were 87%, in which *E. coli* were 60.34%, *Klebsiella spp.* were 14.94%, *Citrobacter spp.* were 14.36%, *Enterobacter spp.* were 7.47% and Proteus spp. were 2.87%. In our study the *E. coli* is the most ESBL producer because *E. coli* is the most commonly found organism and it is frequently found in the environment or in the hospital environment.

In our present study we had seen a lot of resistance to the inhibitors, the resistance mostly seen to ceftazidime/clavulanic acid, sulbactum and carbapenams.

So for the better treatment we recommended Polymixin-B, Colistin, Ceftazidime/clavulanic acid, doripenum, Gentamicin and Amikacin.

CONCLUSION

ESBL producers are one of the most common causes of nosocomial pathogens, which are responsible for causing variety of human infections. In the present era of antibiotic resistance, the emergence of multi-drug resistant organisms is more common.

This will create increasing challenges for those creating guidelines for the detection of ESBLs in the clinical microbiology laboratory. Alteration of antibiotic susceptibility breakpoints may become necessary but need to be carefully considered in combination with pharmacokinetic, pharmacodynamic and clinical data.
The increasing prevalence of antibiotic-resistant bacterial infections seen in clinical practice stems from antibiotic use within medicine. The major problem of the emergence of resistant bacteria is due to the misuse and overuse of antibiotics.

In some countries, antibiotics are sold over the counter without a prescription, which also leads to the creation of resistant strains.So, we need a proper antibiotic policy according to the status of resistance/sensitivity patterns of bacteria in every Tertiary Care Hospitals.

REFERENCES

1. Bush K, Jacoby GA, Medeiros AA. A functional classification scheme for β- lactamases and its correlation with molecular structure. Antimicrob Agents Chemother, 1995; 39: 1211-33.
2. Knothe H, Shah P, Kremery V, Antal M, Mitsuhashi S. Transferable resistance to cefotaxime, cefoxitin, cefamandole and cefuroxime in clinical isolates of Klebsiella species and Serratia marcescens. Infection, 1983; 11: 315–7.
3. Sirot D, Sirot J, Labia R, et al. Transferable resistance to third-generation cephalosporins in clinical isolates of Klebsiella species :identification of CTX-1, a novel b-lactamase. J Antimicrob Chemother, 1987; 20: 323–34.
4. Brun-Buisson C, Legrand P, Phillippon A, Montravers F, Ansquer M, Duval J. Transferable enzymatic resistance to third-generation cephalosporinsduring nosocomialoutbreakofmultiresistantKlebsiella species. Lancet, 2009; 2: 302–6.
5. Knothe H, Shah P, Kremery V, et al Transferable resistance to cefotaxime, cefoxitin, cefamandole and cefuroxime in clinical isolates of Klebsiella species and Serratia marcescens. Infection, 1999; 11: 315–317.
6. Brun-Buisson C, Legrand P, Phillippon A, et al Transferable enzymatic resistance to third-generation cephalosporins during nosocomial outbreak of multiresistant Klebsiella soecies. Lancet, 1987; 2: 302–306.
7. Rahal JJ, Urban C, Horn D, Freeman K, et al Class restriction of cephalosporin use to control total cephalosporin resistance in nosocomial Klebsiella. JAMA, 1998; 280: 1233–1237.
8. Giske CG, Sundsfjord AS, Kahlmeter G, Woodford N, Nordmann P, Paterson DL, et al. Redefining extended-spectrum beta-lactamases: Balancing science and clinical need. J Antimicrob Chemother, 2009; 63: 1–4.
9. Jacoby, G. A.1994.Thegeneticsofextended-spectrumbeta-lactamases.Eur. J. Clin. Microbiol. Infect. Dis., 1994; 13(Suppl. 1): 2–11.
10. Presented in part: 36th annual meeting of the Infectious Diseases Society of America, Denver, 12–15 November 1998, Clinical Infectious Diseases, 2001; 32: 1162–71.
11. Katsanis, G. P., J. Spargo, M. J. Ferraro, L. Sutton, and G. A. Jacoby. 1994. Detection of Klebsiella species and Escherichia coli strains producing extended-spectrum b-lactamases. J. Clin. Microbiol, 1994; 32: 691–696.
12. Meyer, K. S., C. Urban, J. A. Eagan, B. J. Berger, and J. J. Rahal. 1993. Nosocomial outbreak of Klebsiella infection resistant to late-generation cephalosporins. Ann. Intern. Med., 1993; 119: 353–358.
13. Philippon, A., G. Fournier, G. Paul, G. Vedel, and P. N´evot. D´etection et distribution des b´eta-lactamases `a spectre ´elargi chez les ent´erobact´eries. M´ed. Mal. Infect, 1988; 12: 869–876.
14. Nibedita Das et al., AKB or Thakur. Antibiotic co-resistance among Extended-spectrum β-lactamase-producing urinary isolates in a tertiary medical center: A prospective study of. All India Institute of Hygiene and Public Health, Kolkata, West Bengal, India Department of Microbiology, Assam Medical College and Hospital, Dibrugarh, Assam, India, 2012; 25: 966-8.
15. Vinodkumar CS, Neelagund YF. Extended-spectrum β-lactamase mediated resistance to third generation cephalosporins among *Klebsiella pneumoniae* in neonatal septicaemia. J Inidian Paediatr; 2004; 10: 97-9.