



Detection of ESBL Producers in Gram Negative Clinical Isolates

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Abstract

ESBL is a matter of great concern in hospitalized patients and a global challenge. The high incidence of beta-lactamase production due to multiple mechanism in clinical isolates is alarming and screening of ESBL strains is done in routine by their antibiotic susceptibility-testing which is to be done prior to the institution of therapy.

Keywords: *Extended spectrum beta lactamases (ESBL), Antibiotic susceptibility-testing, Ceftazidime-clavulanic acid, Piperacillin-tazobactam, Escherichia coli, Klebsiella species.*

Introduction

The number of extended - spectrum beta-lactamase positive patients are increased from hospital to community. Extended-spectrum beta-lactamase producing organisms are responsible for variety of infections² which result in treatment failure with extended-spectrum beta-lactam antibiotics. As it is difficult to detect these strains by genotypic methods in routine. So some easy, rapid and reproducible methods should be employed in the routine laboratories to detect extended-spectrum beta-lactamase strains.

Materials and Methods

2246 different biological samples were collected from patients attending SVS MBNR over a period of one year and were inoculated and incubated

overnight. The different organisms were identified and antibiotic susceptibility testing was done on Mueller Hinton agar by using Kirby-Bauer disc diffusion method according to NCCLS guidelines. The Enterobacteriaceae strains which were resistant to both cefotaxime and ceftazidime, if their zone of inhibition is less than 23 mm for cefotaxime and less than 18mm for ceftazidime which were further confirmed by phenotypic confirmatory tests.

- Double disc diffusion method
- Modified disc synergy test
- NCCLS confirmatory test

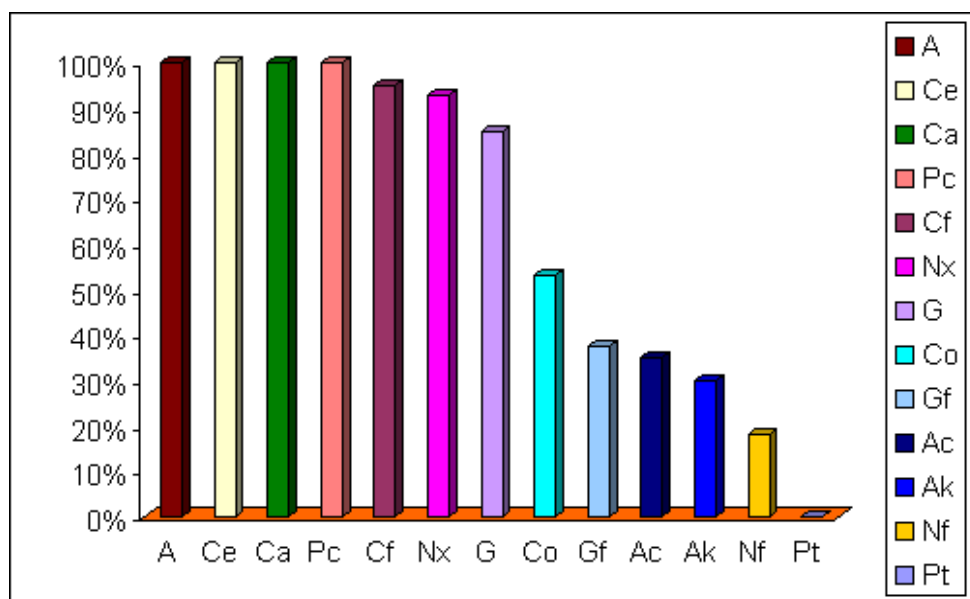
Results

In the present study, it was observed that 20.8% strains of *Escherichia coli* and 21.4% strains of

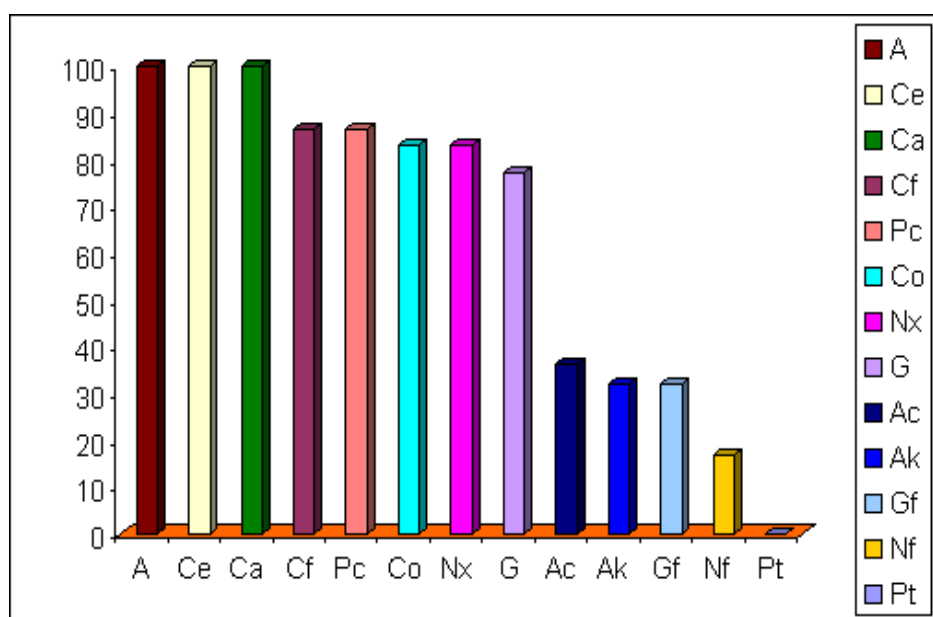
Klebsiella were confirmed to be extended spectrum beta lactamases and percentage of ESBL producers was found to be 20.9% that correlates with other studies which showed 19.8%, 20% and 22% ESBL producers^{3,2,6}. These ESBL producing isolates showed resistance to all beta lactams but when Ceftazidime and Ceftazidime-clavulanic

acid combination discs were placed 15mm apart from centre to centre, synergistic effect was observed due to resistance of the isolates to beta lactam antibiotics alone and in combination with beta lactam inhibitors like Clavulanic acid. This finding of present study correlates with the previous studies^{1,5,6,8}.

Antibiotic resistance pattern in ESBL producing Escherichia coli.



Antibiotic Resistance Pattern In ESBL Producing Klebsiella Spp.





Double disc diffusion method – inhibition zone around cephalosporin disc is extended towards co-amoxiclav disc.



Disc potentiation test showing zone of inhibition around combination disc is 5mm larger than that of cephalosporin disc.

Discussions

It was observed that percentage of extended spectrum beta lactamase producing strains among *Klebsiella* species is more than that of *Escherichia coli*⁵. These strains were seen more commonly in hospitalized patients as compared to out patients and were found to be more resistant to

3rd generation cephalosporins and these strains were also found to be multidrug resistant^{1,4,5,6,7}. High degree of co-resistance Gentamicin, Ciprofloxacin, Co-trimoxazole was seen in these ESBL positive isolates which is in par with the earlier study⁴.

Conclusion

Hence it was concluded that patients infected with these strains could not be treated with beta lactam antibiotics. So Amikacin, Nitrofurantoin and Amoxicillin-clavulanic acid were found to be alternatives for treating such patients at low cost. These strains also showed good response with third generation cephalosporins and clavulanic acid combination and also to Piperacillin-tazobactam combination but these combinations could not be substituted as prophylactic treatment. Hence spread of infection can be reduced by implementation of standard control measures and restrictive use of third generation cephalosporins.

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