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A STUDY ON EXTENDED SPECTRUM BETA LACTAMASE PRODUCING GRAM NEGATIVE BACILLI AMONG BLOOD CULTURE ISOLATES AND THEIR ANTIBIOTIC SUSCEPTIBILITY PATTERN FROM INTENSIVE CARE UNITS IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Infection rates in ICU have been found to be high among hospital acquired infections. Blood stream infections lead to higher mortality and morbidity. This study was done to determine the prevalence of Extended spectrum beta lactamase producing gram negative bacilli among blood culture isolates from ICU and their trends of antibiotic susceptibility patterns which is prevalent among these isolates in our Institute from ICU patients. The study was conducted in the Department of Microbiology at Sree Balaji Medical College and Hospital from December 2017 to December 2018.Total number of blood samples received were 1440 in our microbiology laboratory from ICU. Isolates were identified by colony morphology, gram stain and standard biochemical reactions. Antibiogram was determined by Clinical and Laboratory Standards Institute (CLSI) guidelines. Total positive culture present in the study 156(10.8%). Among these culture positive isolates 106 were gram positive (67.95%) isolates and 50 were gram negative (32.05%). The most common isolate was CONS followed by E.Coli, Klebsiella pneumoniae, Klebsiella oxytoca, Proteus vulgaris, Pseudomonas aeruginosa, Acinetobacter baumanni species. Most of the gram positive isolates were susceptible to Linezolid, vancomycin and clindamycin. All the extended spectrum beta lactamase producing

gram negative isolates showed 100% susceptibility to Carbapenems, Colistin and Polymyxin-B.

KEYWORDS: Blood stream infections, Intensive care unit, Antimicrobial resistance, Coagulase negative Staphylococcus, E.Coli.

INTRODUCTION

Blood stream infections are a potentially distressing, preventable infectious complication which is encountered in ICU. These succumb patients to stay in the ICU of hospital for longer duration, with increased mortality and also burdening patients with lots of financial constraints.[1] Surveys from India suggest mortality rate is on the higher side ranging from 35.2% to 44.9% which is usually high when compared to other countries like united states.[2] It is also shocking that 30% of poor outcome of patients is due to inappropriate empirical therapy with antibiotics.[3][4] These blood stream infections are due to either gram positive or gram negative organisms. With the emergence of antimicrobial drug resistance in ICUs, it is very challenging for physicians to treat such patients and has become a threat to public health.[5][6][7] Diagnosis of blood stream infections are usually made with blood cultures which yields a higher positive predictive value. Early diagnosis and appropriate treatment with antibiotics can decrease the burden of blood stream infections in critical care units. Hence this study was done to know the prevalence of Extended spectrum beta lactamase producing gram negative bacilli among blood culture isolates from ICU and their trends of antibiotic susceptibility patterns which is prevalent among these isolates in our institute.

MATERIALS AND METHODS

The study was conducted in the Department of Microbiology at Sree Balaji Medical College and hospital from December 2017 to December 2018.Total number of blood samples received were 1440 in our microbiology laboratory from ICU. All these blood samples were collected from each patient under strict aseptic precautions. About 5 to 10 ml of blood was collected among adults and then inoculated into the 50 ml brain heart infusion broth. Blood culture bottles were incubated at 37 deg C aerobically for 24 hrs. Followed by subcultures onto nutrient agar, blood agar and Mac-conkey agar. Blood culture bottles that did not show any signs of growth (hemolysis, turbidity) were sub cultured again, on 2nd, 3rd, and 7th day and were reported negative on 7th day after final subculture. Isolates were identified by Colony morphology, Gram stain and standard biochemical reactions.[8] The antibiotic

sensitivity test was done by Kirby-Bauer disc diffusion method on Muller Hinton Agar with commercially available himedia discs ampicillin(10mcg), cefazolin(30mcg), cefuroxime(30mcg), ceftriaxone(30mcg), amoxicillin-clavulanate(20/10mcg), gentamicin(10mcg), amikacin(30mcg), ciprofloxacin(5mcg), cotrimoxazole(1.25/23.75mcg), ceftazidime(30mcg), ceftriaxone(30mcg), cefotaxime(30mcg), tobramycin(10mcg), piperacillintazobactam(100/10mcg), meropenem(10mcg), imipenem(10mcg), ciprofloxacin(5mcg), cotrimoxazole(1.25/23.75mcg), amikacin(30mcg), aztreonam(30mcg), ceftazidime(30mcg), cefepime(30mcg), chloramphenicol(30mcg), tetracycline(30mcg), penicillin(10units), cefoxitin(30mcg), erythromycin(15mcg), linezolid(30mcg), tetracycline(30mcg), ciprofloxacin(5mcg), clindamycin(2mcg), trimethoprim/sulphamthoxazole(1.25/3.75mcg),chloramphenicol(30mcg),linezolid(30mcg),vancomycin(30mcg),highlevelgentamycin(120mcg),aztreonam(30mcg),. Results were interpreted according to CLSI guidelines.[9][CLSI] These were also confirmed by automated identification and antimicrobial susceptibility system.i.e. By Vitek-2 compact machine.Isolates with decreased susceptibility to cefotaxime and ceftazidime were tested for presence of Extended spectrum beta lactamases by double disc synergy test and confirmation was done by phenotypic confirmatory test by cephalosporin clavulanate combination disc test and E-Test.

RESULTS

A total of 1440 blood samples from patient suspected of bacteremia, admitted in intensive care unit of our hospital were routinely processed for blood culture in the Department of Microbiology from December 2017 to December 2018.Out of these samples males were 742(51.5%), females were 698(48.5%).

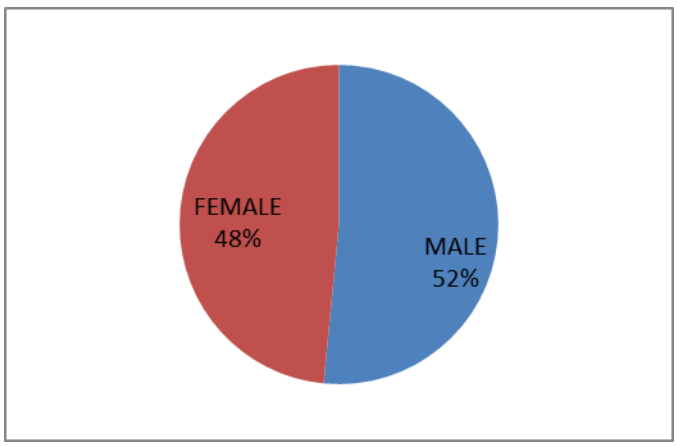

FIG: 1.

Total positive culture present in the study 156(10.8%).Among these culture positive isolates 106 were gram positive(67.95%) isolates with higher preponderance[10] and 50 were gram negative(32.05%).

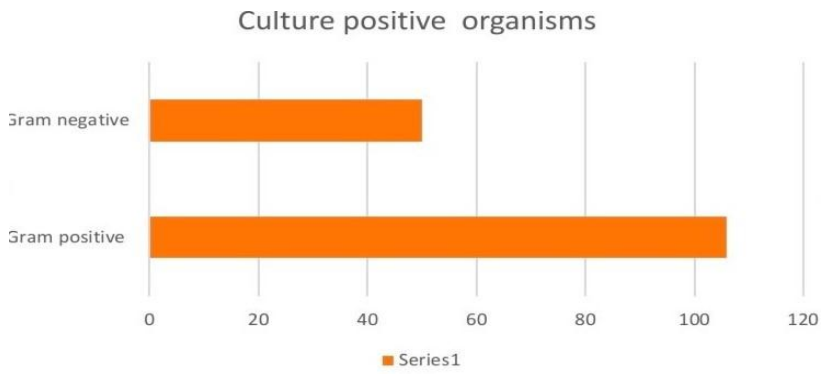

Fig. 2.

The most common isolate was CONS followed by E.Coli, Klebsiella pneumoniae, Klebsiella oxytoca, Proteus vulgaris, Pseudomonas aeruginosa, Acinetobacter baumanni species. Most of the gram positive isolates were susceptible to Linezolid, vancomycin and clindamycin. All the extended spectrum beta lactamase producing gram negative isolates showed 100% susceptibility to Carbapenems, Colistin and Polymyxin-B.

Among gram positive bacterial isolates 100% of CONS, 29% of Staphylococcus aureus, 80% of Enterococcus species were resistant to penicillin group of antibiotics. However most of the gram positive isolates were susceptible to Linezolid, Vancomycin and Clindamycin.

Among gram negative isolates, E.Coli (46.66%), Klebsiella pneumonia (9.09%) were dominant species. All these gram negative isolates showed weak activity against third generation cephalosporins but showed 100% susceptibility to Carbapenems, Colistin and Polymyxin-B.

Table 1: Antibiotic Sensitivity Pattern of Extended Spectrum Producing Beta Lactamase Producing Gram Negative Bacilli Among Blood Culture Isolates From Intensive Care Unit.

Isolates (n=50)	MRP	IMP	PIT	CIP	COT	DO	AK	AMC	GEN
E.Coli (n=15)	15 (100.00%)	15 (100.00%)	14 (93.3%)	8 (53.33%)	11 (73.3%)	5 (33.3%)	8 (53.33%)	4 (26.6%)	7 (46.6%)
Klebsiella pneumoniae (n=11)	11 (100%)	11 (100%)	4 (36.3%)	7 (63.6%)	8 (72.7%)	4 (36.36%)	6 (54.54%)	3 (27.27%)	4 (36.36%)

DISCUSSION

Patients admitted in intensive care units are likely to develop nosocomial bloodstream infections which can lead to increased morbidity and mortality. Our study provides information regarding distribution of aerobic blood culture isolates along with their antibiotic susceptibility pattern among patients admitted in intensive care units, which plays a crucial role in the management of these patients. The blood culture positivity rate in our study was 10.8%. A wide range of organisms are responsible for blood stream infections. In our study among the culture positive isolates 106 were gram positive(67.95%) 50 were gram negative(32.05%). Among the gram positive isolates, CONS was the most common followed by E.Coli, Klebsiella pneumoniae, Klebsiella oxytoca, Proteus vulgaris, Pseudomonas aeruginosa, Acinetobacter baumanni species.

The E.Coli (30%) was the most common gram negative isolate followed by Klebsiella pneumoniae species (22%), Pseudomonas aeruginosa (28%), and Acinetobacter baumanni species (16%).

The irrational use and over-the counter availability of antibiotics have led to a higher prevalence of resistance among micro-organisms and invasive diseases like sepsis. All the gram positive organisms were susceptible to Linezolid, Vancomycin and Clindamycin.

All the gram negative organisms showed poor susceptibility to beta-lactam antibiotics, because of the fact that beta-lactam antibiotics are the most commonly prescribed drugs for both inpatients and outpatients could be the reason for such high level of resistance. The members of the family enterobacteriaceae showed good susceptibility to Carbapenems, Cotrimoxazole, Ciprofloxacin similarly Non-fermenters in the study showed high susceptibility to Carbapenems, Co-trimoxazole and Doxycycline poor susceptibility to Amikacin, Amoxicillin-clavulanic acid, and Piperacillin Tazobactam.

Minimum inhibitory concentration of Ceftazidime by E-test strip method for 8 ESBL producing organisms in this study was between 16µg/ml to 32µg/ml. Minimum inhibitory concentration of Ceftazidime for 7 isolates of ESBL producing Escherichia coli was between 16µg/ml to 32µg/ml.Minimum inhibitory concentration of Ceftazidime by E-test strip method for 1 isolate of ESBL producing Klebsiella pneumoniae was between 16µg/ml to 32µg/ml.

We observed 7 (9.2%) of gram negative isolates were resistant to carbapenems, with 4(57.1%) and 3(42.8%) isolates among non-fermenters and members of enterobacteriaceae respectively. The greatest threat with infections caused by these organisms is the limited antibiotics which is available for treatment. With increasing resistance and limited options available for treatment, the clinicians are left with the so called drugs like Polymyxin-B and Colistin which could soon lead to most dreaded condition like pan drug resistance.

CONCLUSION

The present study showed prevalence of Extended spectrum beta lactamase producing gram negative baciilli among blood culture isolates from intensive care units is around 16% and also it identified that both gram positive and gram negative organisms are responsible for causing blood stream infections. This implies that blood culture must always be done in suspected cases of bacteremia and septicemia, once the antibiotic susceptibility profile of organisms is known de-escalation of higher end antibiotics should be done to reduce antimicrobial pressure. However effective stringent hospital infection control policy and good antibiotic policy with routine surveillance for baseline resistance will go a long way in combatting drug resistance.

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