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Bacteriological Profile of Blood Stream Infections Along with their Antibiogram at Government Cancer Hospital, Aurangabad

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A B S T R A C T

Bacterial bloodstream infections are important causes of morbidity and mortality globally. The aim of present study was to determine the bacterial profile of bloodstream infections and their antibiotic susceptibility pattern among the clinically diagnosed cases of sepsis in cancer patients. In the present study, etiological and antimicrobial susceptibility profile of blood cultures over a period of 1 year at a tertiary cancer care hospital was done. Blood culture positive isolates were identified using standard microbiological methods and by Manual method. The antibiotic susceptibility pattern of the organisms was performed by Kirby-Bauer disc diffusion method. There were 242 blood culture samples, of which 97 (40%) were identified to be culture positive. Out of 97 positive cultures, Gram positive were 60 (62%) and Gram negative were 37 (38%). The most common Gram-positive isolate was MRSA (38%) and Gram-negative isolate was *Escherichia coli* (35%). *Escherichia coli* showed highest sensitivity to colistin (100%) and sensitivity to meropenem and Polymyxin B was 92% each. High degree of resistance was found to cephalosporins and piperacillin + tazobactam. The results indicate high level of antimicrobial resistance among Gram negative bacilli in septicemic patients. The results warrant continuous monitoring of antimicrobial pattern so as to build geographical epidemiological data.

Introduction

Blood stream infections are an important cause of mortality and morbidity and are amongst the most common health care associated infections (1).

Infectious complications consequent to the immunosuppressive therapy has become a major cause of morbidity and mortality in cancer patients (2).

Blood stream infections increase the length of hospital stay, cause significant morbidity and mortality and increase the cost of stay. Situation further deteriorates with increasing rate of multidrug resistance. The crude mortality rate due to BSIs in cancer patients ranges from 18% to 42% (3-6).

The organisms and their antibiotic susceptibility pattern vary among different healthcare facilities and geographical areas. Blood culture is the single most reliable procedure for bacterial isolation and detection. The aim of the present study was to determine the bacterial profile of bloodstream infections and to assess the antibiotic susceptibility pattern of the major pathogens among the clinically diagnosed cases of sepsis in cancer patients.

Materials and Methods

This was a retrospective study conducted at a tertiary care hospital for cancer patients. We analyzed all blood samples sent for bacterial culture during the year 2018

A total of 242blood samples from clinically suspected cases of sepsis, received in the microbiology laboratory of 100-bedded cancer hospital over duration of one year, were included in the study. Blood samples were collected before the administration of antibiotics. Relevant details of the patients were recorded. Blood was taken in BHI Broth 1:5 ratio with all aseptic precaution. The blood culture bottles were kept in incubator for 12-18 hrs then sub cultures were done on blood agar, MacConkey agar. The growth obtained was identified by colony morphology, Gram stain of the isolated colonies, standard microbiological, and biochemical test.

The antibiotic susceptibility pattern of the isolated organisms was performed by Kirby-Bauer disc diffusion method on Mueller-Hinton agar plates and results were interpreted as per the Clinical and Laboratory Standards Institute (CLSI) 2016 guidelines. Cefoxitin disc diffusion method was used to identify MRSA (Methicillin resistant *Staphylococcus aureus*) as per CLSI guidelines. MDR (Multi drug resistant) was defined as non-susceptibility to at least one agent in three or more antimicrobial categories

The antibiotic discs that were used to identify the susceptibility pattern of the gram-negative pathogens and their concentrations include amikacin (30 mcg), amoxicillin+clavulanic acid (20/10 mcg), ceftazidime (30 mcg), ceftriaxone (30 mcg), cefepime (30 mcg), cefoperazone + sulbactam (75/30 mcg), meropenem (10 mcg), piperacillin + tazobactum (100/10 mcg), levofloxacin (5 mcg), cotrimoxazole (1.25/23.75).

Results and Discussion

This study was carried out from January 2018 –December 2018 with 242 blood samples received from patients suspected of having blood stream infections attending and admitted in Government cancer Hospital Aurangabad, Maharashtra. Relevant details viz. medical registration number, laboratory number, age and sex of the patients were recorded. Culture positivity was seen in 97 (40.08%) samples and 145 (59.92%) samples were sterile.

Out of 97(40.08%) positive cultures, 60(61.86%) showed gram positive and 30(38.14%) were gram negative

Total number of samples- 242

Total Number of Isolates- 97 /242 (40.08%)

Sterile Samples – 145/242 (59.92%)

Gram Positive-60/97 (61.86%)

MRSA - 23/60 (38.33%)
MSSA - 19/60 (31.67%)
CONS - 16/60 (26.67%)
ENTEROCOCCUS - 2/60(3.33%)

Gram Negative – 37/97 (38.14%)

E.coli – 13/37 (35.14%)
Pseudomonas - 7/37 (18.92%)

NON-FERMENTERS – 7/37 (18.92%)
Acinetobacter – 6/37 (16.21%)
Kleibsiella – 4/37 (10.81%)

This study gives information on the distribution of bacterial isolates causing blood stream infections with their antibiotic susceptibility pattern which plays an important role in effective management of patients in septicemia. Our study has shown blood culture positivity rate to be 40.01% which was approximately similar to Nikita Vasudeva *et al.,* (7) which showed 31.2%, Wasihun *et al.,* (8) showed 28%, Radha Rani, *et al.,* (9) showed 27.16%. This is in contrast to other studies which have shown positive rates ranging between 9.94% - 11.2%. (10-14). Such differences in positivity rates may be due to the difference in methodology used for blood culture system, the study design, geographical differences, nature of patient population, epidemiological difference of etiological agents and differences in the policies for infection control (15-17).

In our study Gram positive and Gram negative bacteria constituted 61.86% and 38.14% respectively. This finding was in contrast with other studies (12, 18-23) where Gram negative organisms have taken over Gram positive organisms.

In the present study, the predominant Gram-negative isolates were *Escherichia coli* (35.14%) followed by *Pseudomonas* species (18.92%) which was in concordance with other studies (24-28). In contrast to this finding, a study from Mumbai revealed that, *Pseudomonas* species was the most common cause (30.37%) and *Escherichia coli* amounted upto 16.06% (22).

In a study from Pakistan to evaluate drug resistance amongst bacterial isolates *Escherichia coli* was found to be the predominant organism among Enterobacteriaceae and *P. aeruginosa* and *Acinetobacter* among non-Enterobacteriaceae group. (25) In a recent study from Lebanon *Escherichia coli* represented 39.5% which was very similar to the findings of our study. (24)

In our study predominant Gram positive isolate was Methicillin Resistant *Staphylococcus aureus* (38.33%) followed by methicillin sensitive *Staphylococcus aureus* (31.67%), coagulase negative Staphylococci (26.67%). This finding is similar to other studies where *Staphylococcus aureus* was the most common isolate (22, 31, 32). This is in contrast with other studies where coagulase negative Staphylococci has contributed to the blood stream infections in cancer patients. (27, 29, 30)

Among *Klebsiella* and *Escherichia coli* meropenem sensitivity was seen in 100% and 92% respectively and colistin sensitivity was 75% and 100% respectively. Sensitivity to piperacillin + tazobactam was 50% and 15% respectively. The susceptibility pattern of *Klebsiella* was similar to a study from Mumbai where susceptibility to beta-lactam/beta lactam inhibitors was 56.5 % whereas that of *Escherichia coli* was in contrast to the same. (33)

A high degree of resistance to cephalosporins among Enterobacteriaceae in our study might be because of the fact that cephalosporins are one of the most commonly used antibiotics for inpatients and for outpatients in developing countries and also because of high incidence self medications as these are available at the counter.(34).

Among non-fermenters, *Pseudomonas* showed highest sensitivity to polymyxin b and colistin. *Acinetobacter* species showed highest sensitivity to polymyxin b and colistin. Sensitivity to meropenem was 100%

in *Pseudomonas* species and 83% in *Acinetobacter* species. All our isolates were sensitive to colistin. This was similar to a study from Mumbai where imipenem sensitivity was 91.82%. Colistin showed 94.55% sensitivity (22) (Fig. 1–9).

Fig.1 Sensitivity pattern of *Acinetobacter*

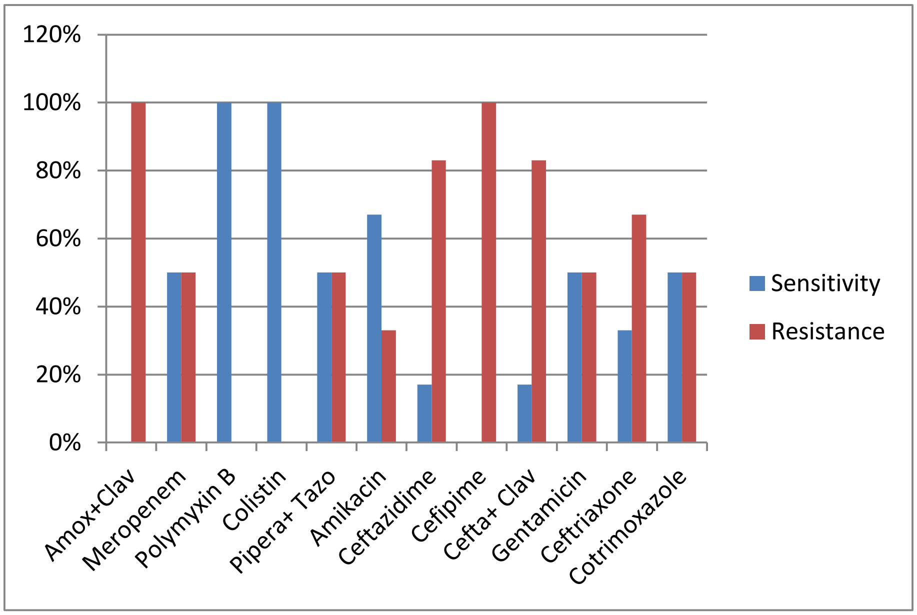


Fig.2 Sensitivity pattern of MRSA

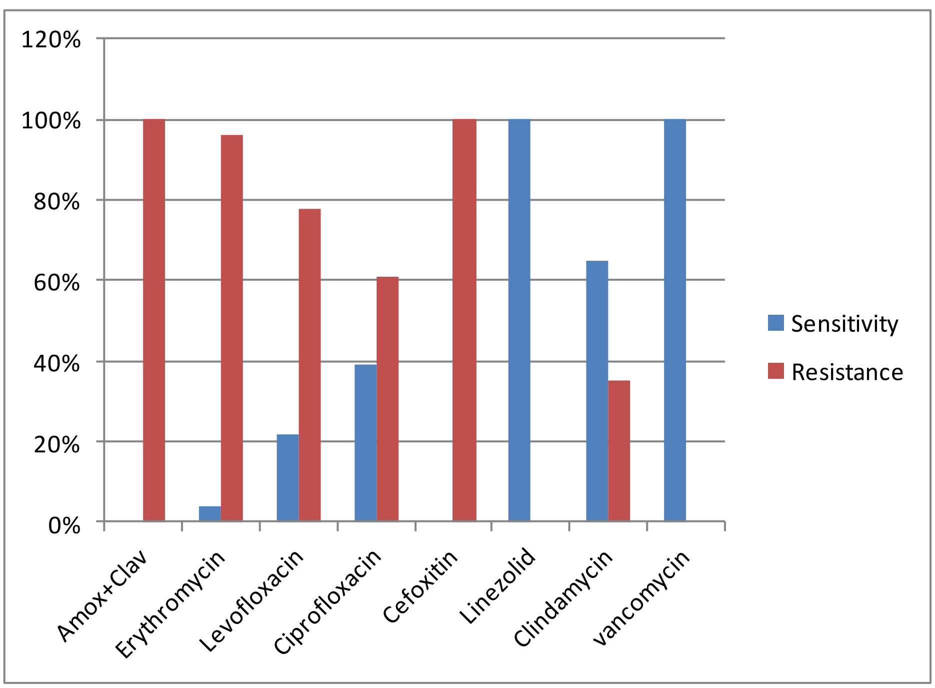


Fig.3 Sensitivity pattern of MSSA

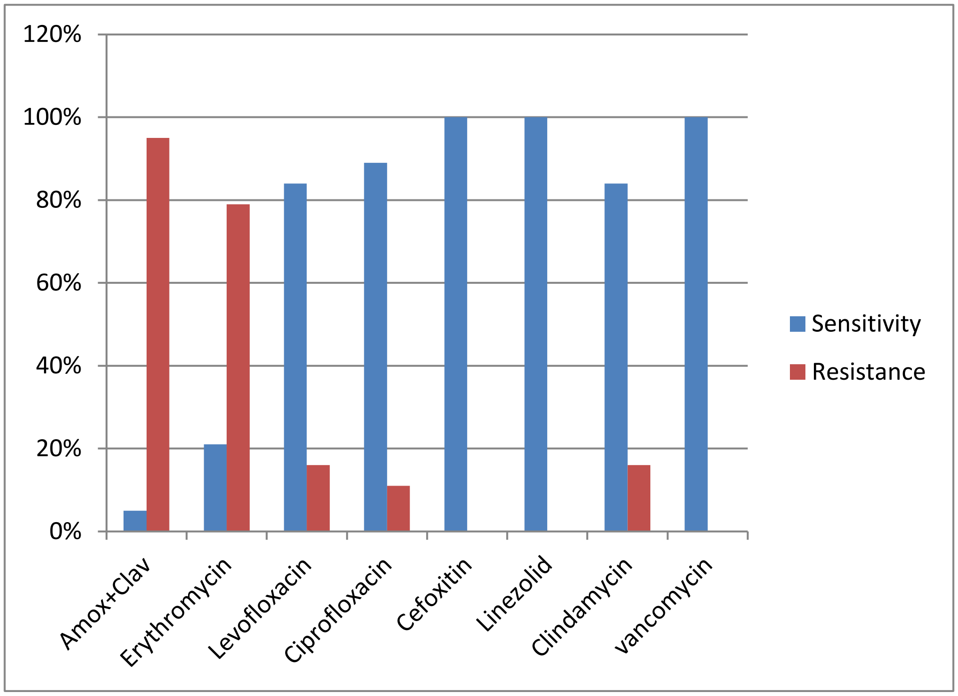


Fig.4 Sensitivity pattern of CONS

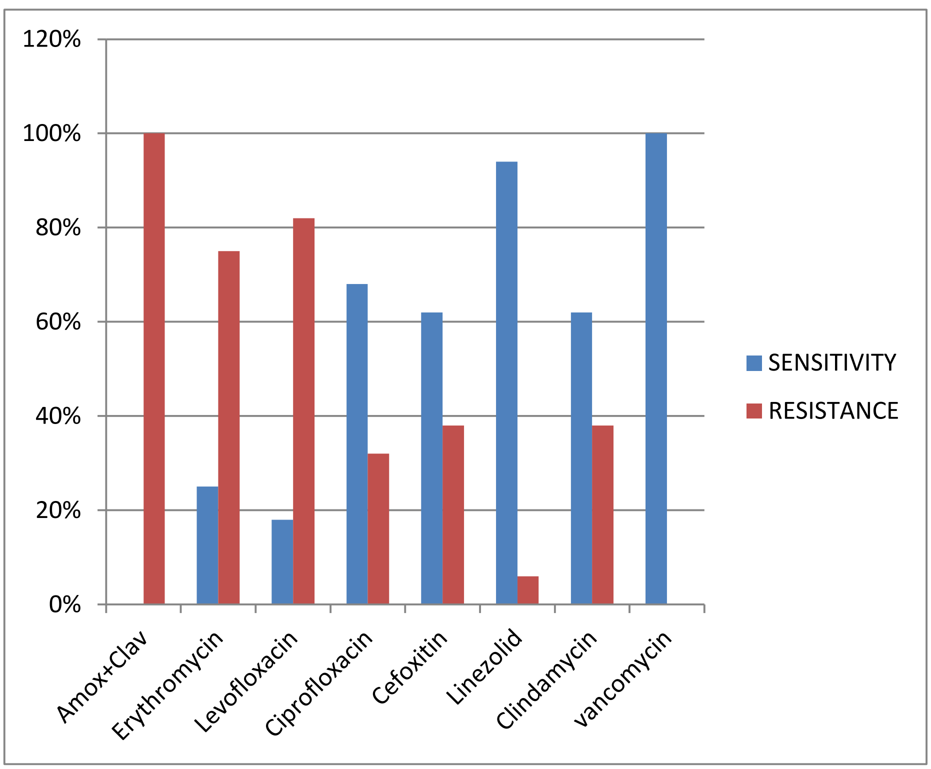


Fig.5 Sensitivity pattern of *Escherichia coli*

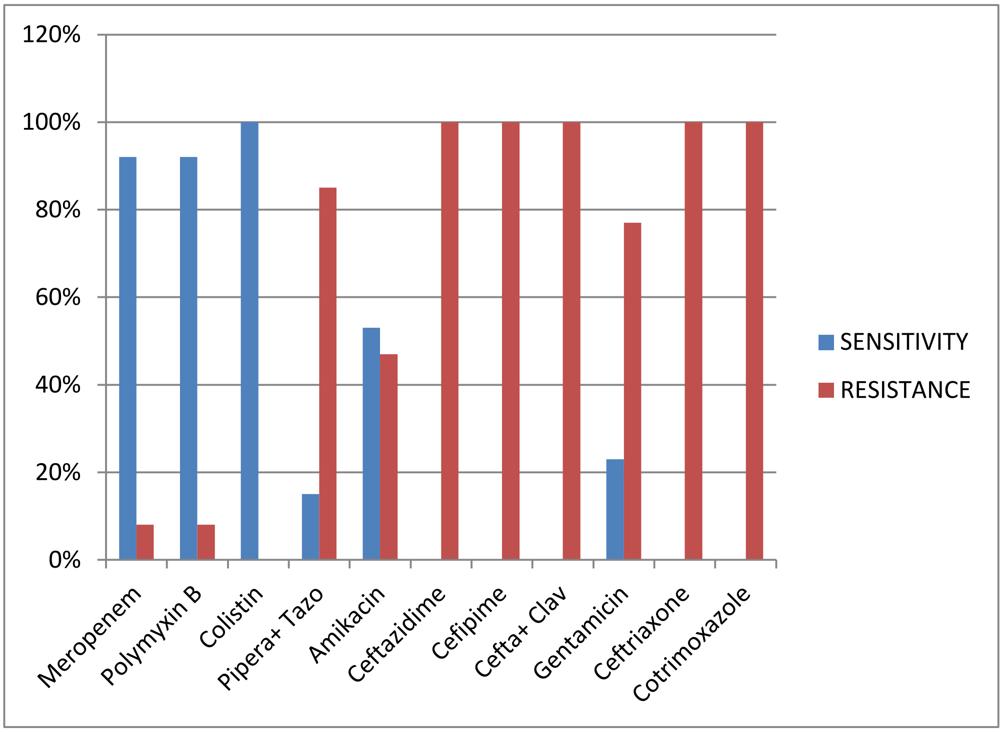


Fig.6 Sensitivity pattern of *Pseudomonas*

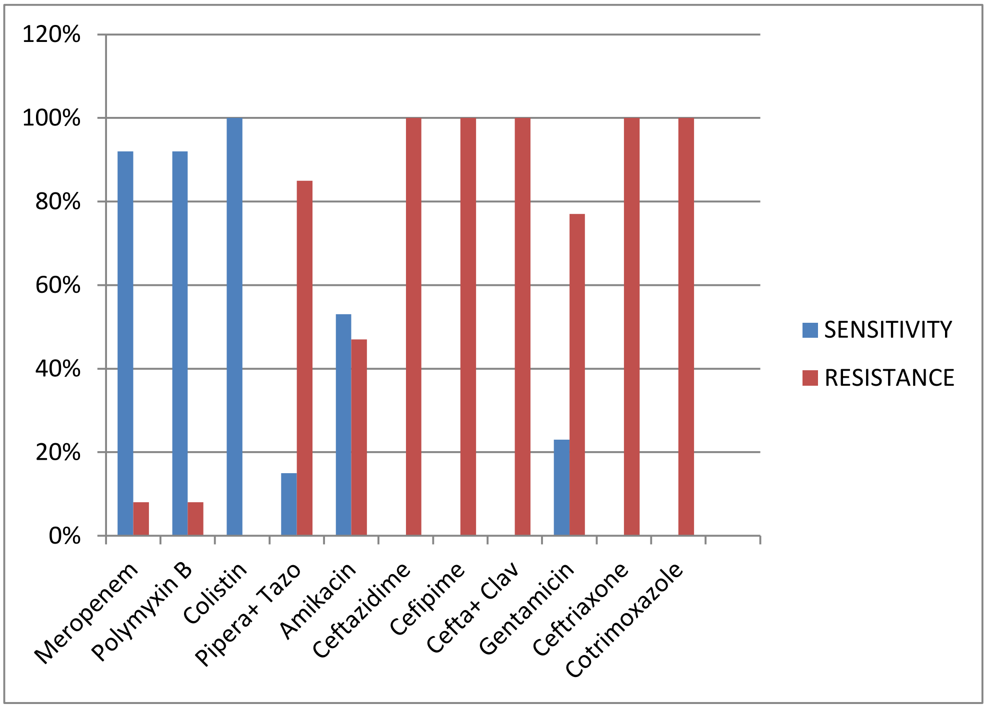


Fig.7. Sensitivity pattern of non-fermenters (other than *Pseudomonas*)

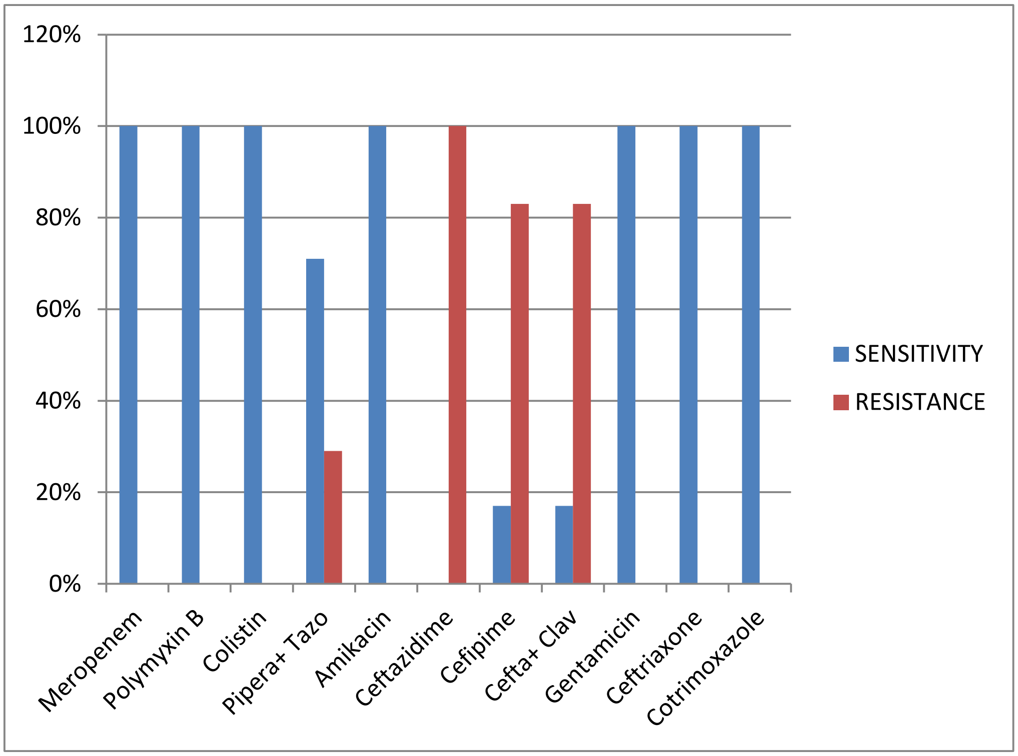


Fig.8 Sensitivity pattern of *Klebsiella*

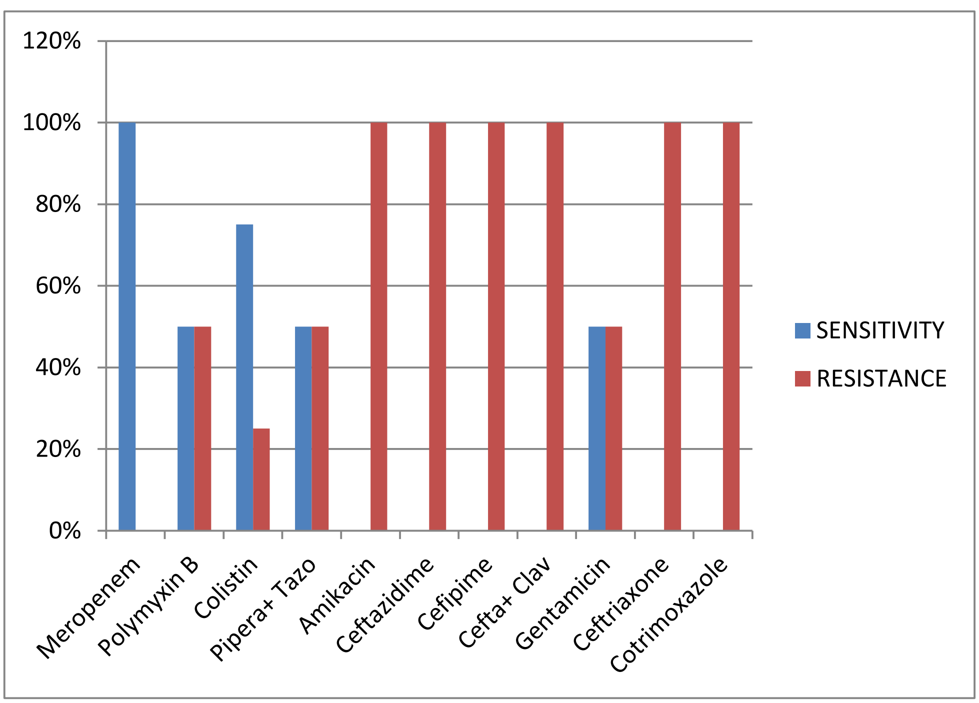
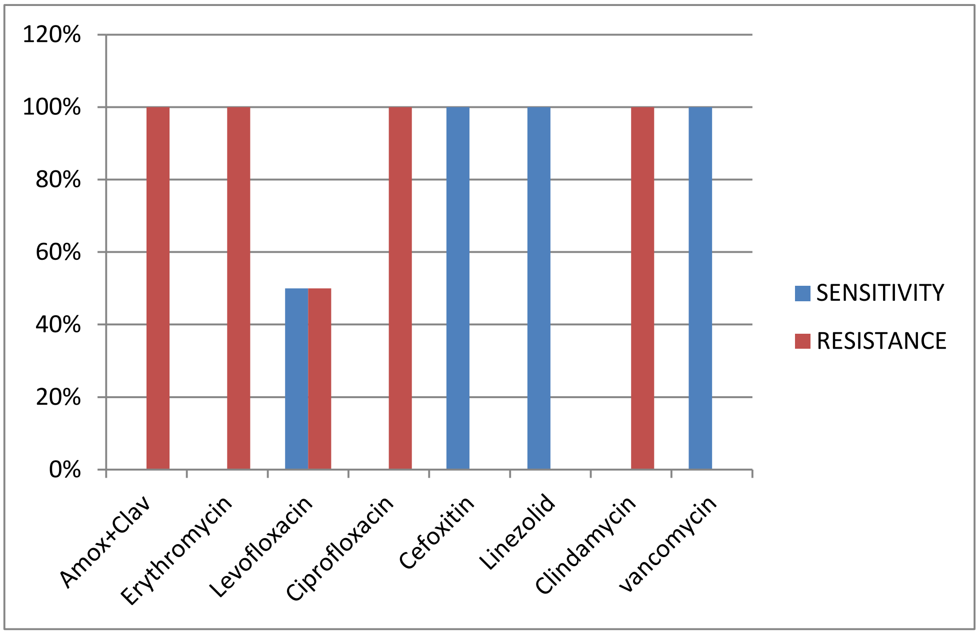


Fig.9 Sensitivity pattern of *Enterococcus*



In conclusion, the timely detection of Blood stream infection followed by expeditious identification of pathogen and determination of susceptibility to antimicrobial agents can have great diagnostic and prognostic importance in order to decrease related mortality and morbidity. This will reduce complication and shorten hospital stay and will result in major financial saving for the Institution as well as improving patient care.

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