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Original Research Article

Spectrum of Bloodstream Infection in a Tertiary Care Hospital of Tripura

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Abstract:

Introduction: Blood stream infections (BSI) are characterized by presence of viable microorganisms in the bloodstream that elicit inflammatory response and often accompanied by alteration of clinical, laboratory, and haemodynamic parameters. It remains one of the important causes of morbidity and mortality.[1] Globally, BSI affects about 30 million people leading to 6 million deaths with 3 million newborn and 1.2 million children annually. Management of BSI has become a challenge with the emergence of antimicrobial resistance (AMR).[2] Empirical antibiotic therapy is initiated in almost all cases before the blood culture reports are available. Choice of right empirical therapy is important. An early blood culture report helps in selection of appropriate antibiotics.

Materials and Methods: A hospital based cross-sectional study was undertaken at AGMC & GBPH for a period of one year. A total of 668 patients were included in the study. Blood cultures were processed through automated BacT/Alert 3D.

Results: Out of 668 samples, 59 (8.83%) samples yielded pathogenic organisms on culture. Gram negative bacilli were predominant (51.6%) followed by gram positive cocci (39.43%) & yeast (8.87%). Among the BSI identified, HAIs predominated (60%) and all the cases were Primary BSI. All the cases were non CLABSI.

Conclusion: Acinetobacter spp, Klebsiella pneumoniae and Staphylococcus aureus were the predominant isolates of the study. Resistance against ceftriaxone and colistin were high and Amikacin resistance was lower among the isolates. Non albicans candida was common than Candida albicans with resistance to multiple antifungals widely used. Good antimicrobial stewardship policy and strict hospital infection control measures are required to prevent the emergence of multidrug resistant organisms. Continuous update of antimicrobial pattern is essential for epidemiological purpose & rational use of antibiotics. Early diagnosis & continuously monitoring trends in the microbiology of BSI pathogens is important which can help in diagnostic approaches, treatment strategies, and prevention programs.

Keywords: BSI, AMR, HAI.

Introduction

Blood stream infections (BSI) are characterized by presence of viable microorganisms in the bloodstream that elicit inflammatory response and often accompanied by alteration of clinical, laboratory, and haemodynamic parameters. It remains one of the important causes of morbidity and mortality worldwide. [1]

Globally, BSI affects about 30 million people leading to 6 million deaths with 3 million newborn and 1.2 million children annually [2]. Management of BSI has become a challenge with the emergence of antimicrobial resistance (AMR). [2] BSI with resistant microorganisms are associated with increased risk of mortality and infections with resistant gram negative bacilli are considered as a severe threat to patients' health worldwide. [3] The resistance of Enterobacteriaceae to 3rd-generation cephalosporins and carbapenems makes these organisms a critical priority requiring urgent attention. Misuse and irrational use of antimicrobials have contributed to the emergence of MDR microorganisms. [4,5]

Choice of right empirical therapy is hence important. Empirical antibiotic therapy is initiated in almost all cases before the blood culture reports are available. An early blood culture report thus will help in selection of appropriate antibiotics. Also information regarding spectrum of microorganisms and their resistance pattern will guide physicians, hospital infection control committee (HICC), and

policy makers in making evidence based decisions to overcome antimicrobial resistance. [6]

Aim and Objectives:

1. To isolate and identify the organisms causing blood stream infection.
2. To perform antimicrobial sensitivity test.
3. To estimate the proportions of various types of BSI.

Materials and Methods:

A hospital based cross-sectional study was undertaken at AGMC & GBPH in the Department of Microbiology in collaboration with Department of Medicine for a period of one year. A total of 668 patients were included in the study.

Blood was collected after proper disinfection and then inoculated in blood culture bottles and then incubated at 37ºC. Blood cultures were processed through automated BacT/Alert 3D. Susceptibility testing was done with the Kirby-Bauer disc diffusion method using Mueller-Hinton agar and VITEK 2 antimicrobial susceptibility testing (AST) cards. The results were interpreted as per CLSI (Clinical and Laboratory Standards Institute) guidelines.

Data were entered in Microsoft Excel worksheet and susceptibility percentages were calculated.

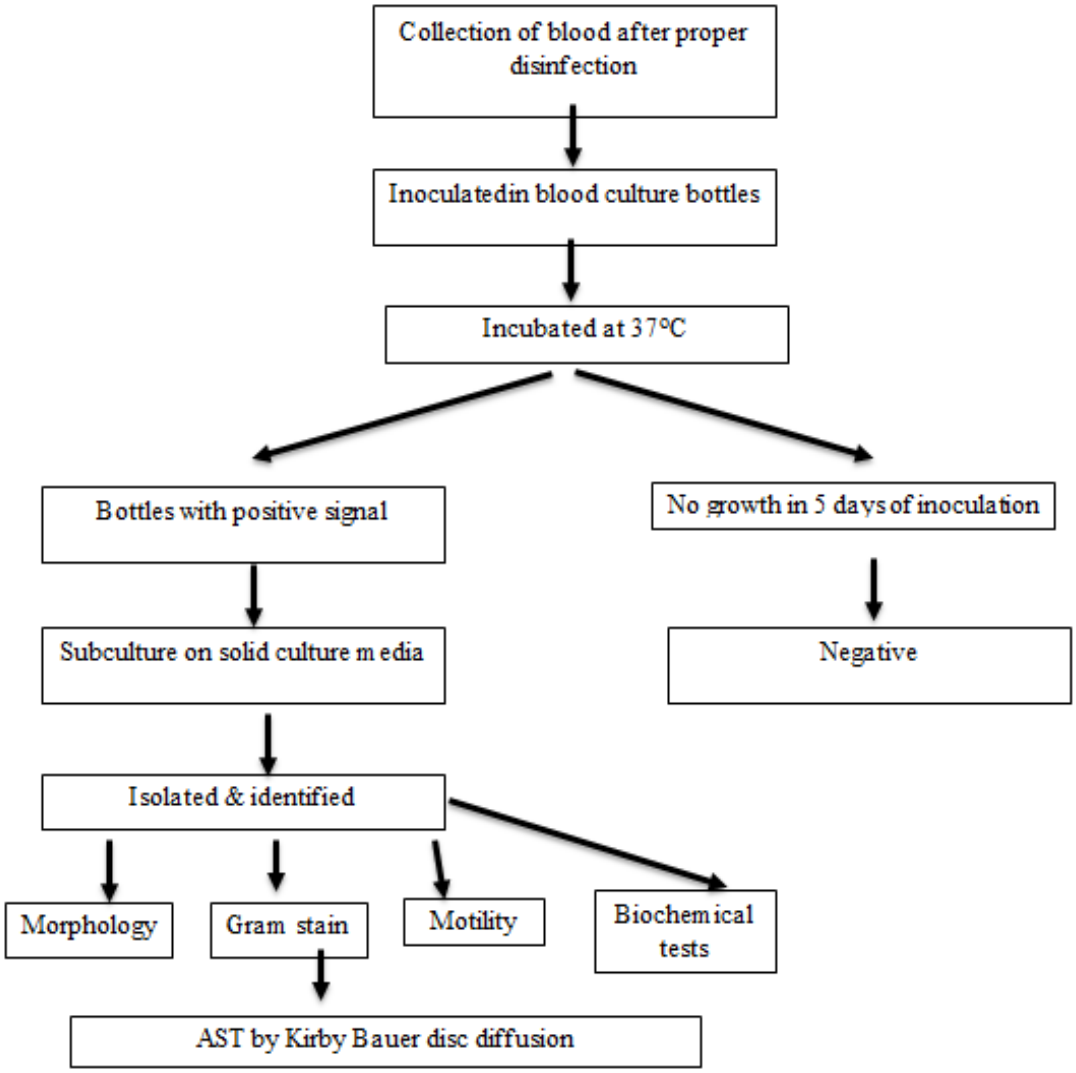

Chart 1:

Results

668 patients were included in the study out of which 314 were males and 354 were females. Out of 668 samples, 59 (8.83%) samples yielded pathogenic organisms on culture. Among them, 26 were males and 33 females. Figure number 1 depicted below shows the percentage of pathogenic organisms and skin commensals identified in the samples.

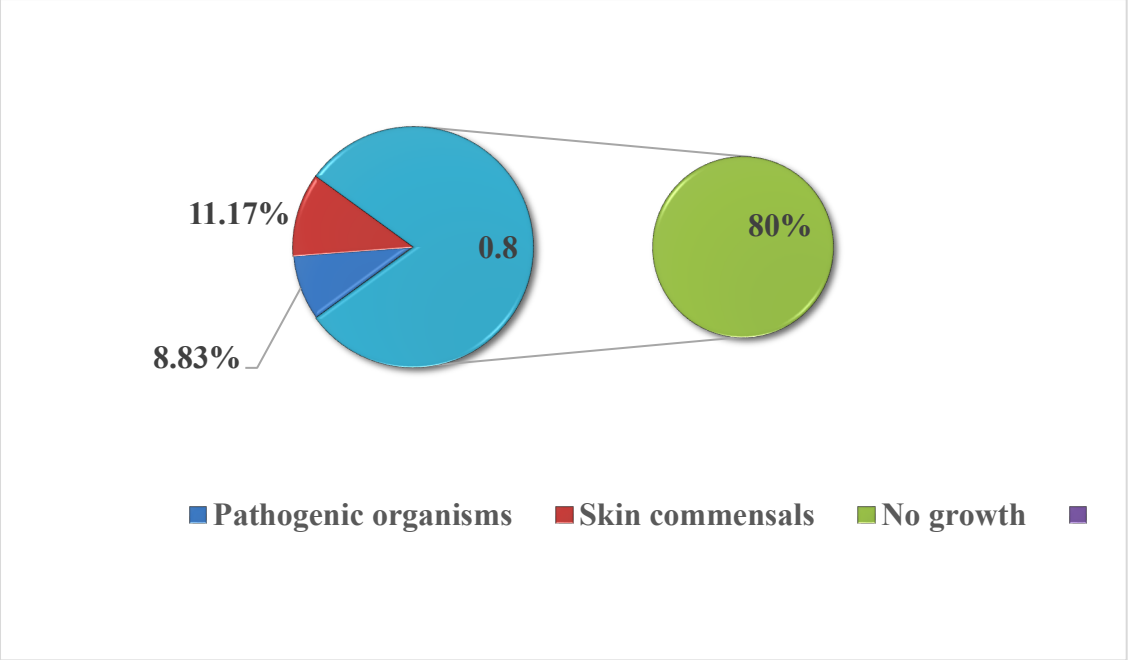

Figure 1: Percentage of pathogenic organisms identified

Among the pathogenic organisms identified, Gram negative bacilli were the most predominant to cause BSI (51.6%) followed by Gram positive cocci (39.43%) & Yeast (8.87%).

Acinetobacter spp was the most predominant gram negative bacilli (14.14.%) followed by Klebsiella pneumoniae (12.02%) and Enterobacter cloacae (10.12%).

Among the gram positive cocci, Staphylococcus aureus was the most predominant microorganism (36.43%) followed by Enterococcus spp (3%) contributing to BSI.

Among the Yeast isolated from BSI, Candida albicans and Candida tropicalis contributed equally (3.20%) followed by Candida parapsilosis (2.47%).

Figure number 2 depicted below shows the spectrum of various microorganisms, Figure number 3 and 4 shows proportion of gram negative bacilli and gram positive cocci respectively and Figure number 5 depicts contribution of yeast to BSI.

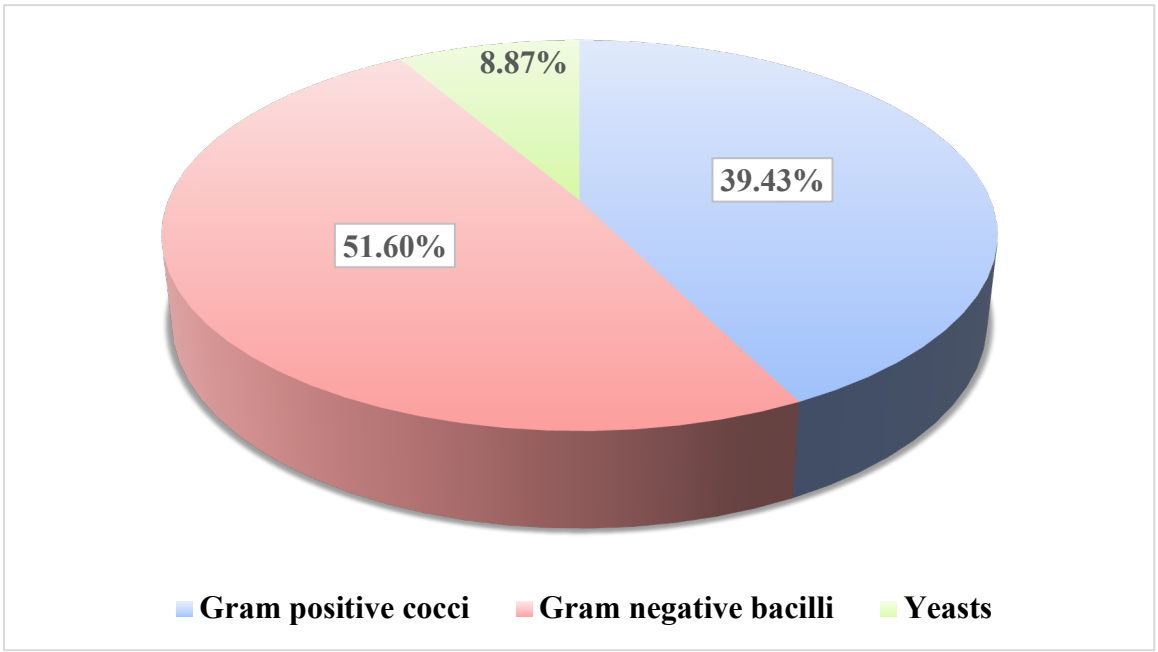

Figure 2: Spectrum of various microorganisms contributing to BSI

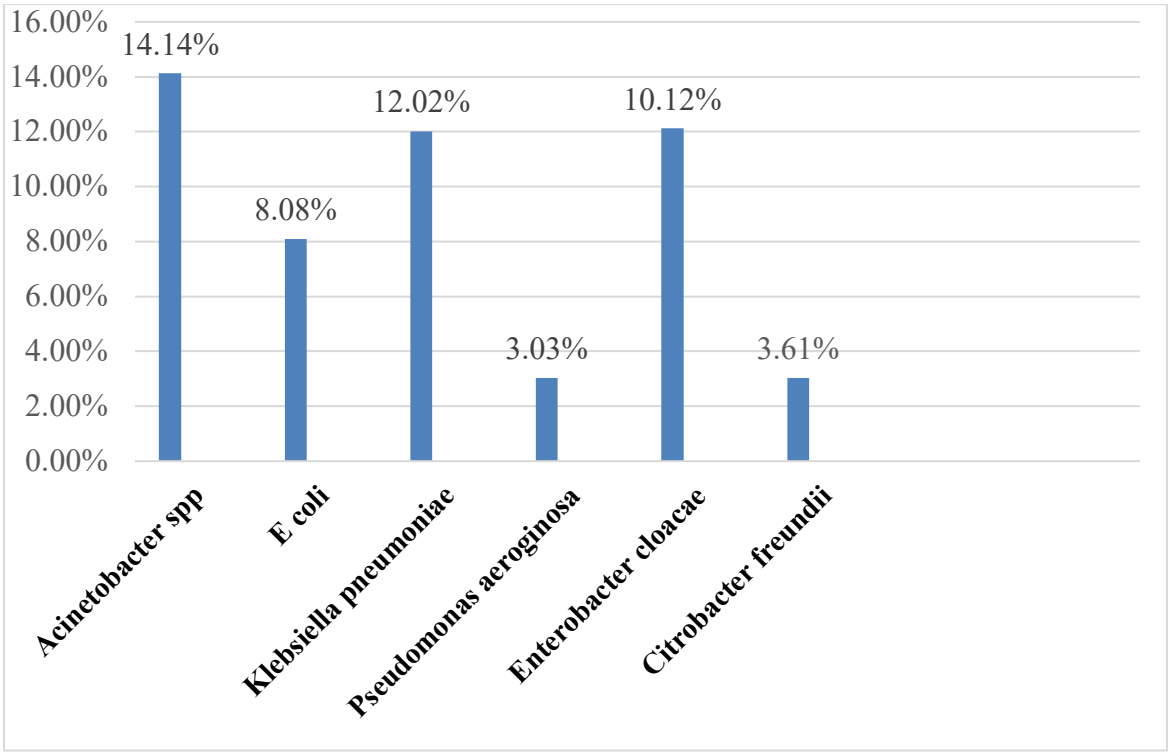

Figure 3: Proportion of gram negative bacilli

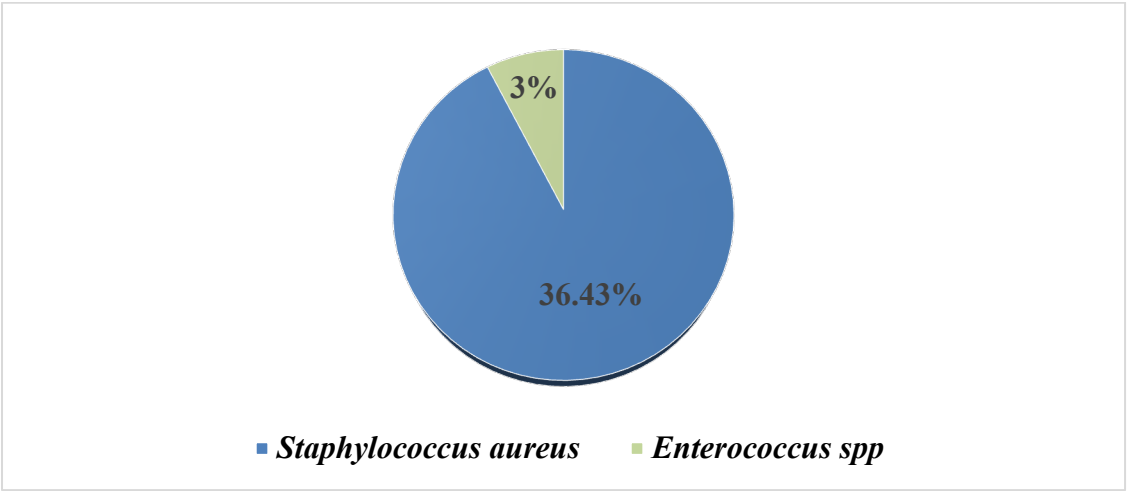

Figure 4: Proportion of gram positive cocci

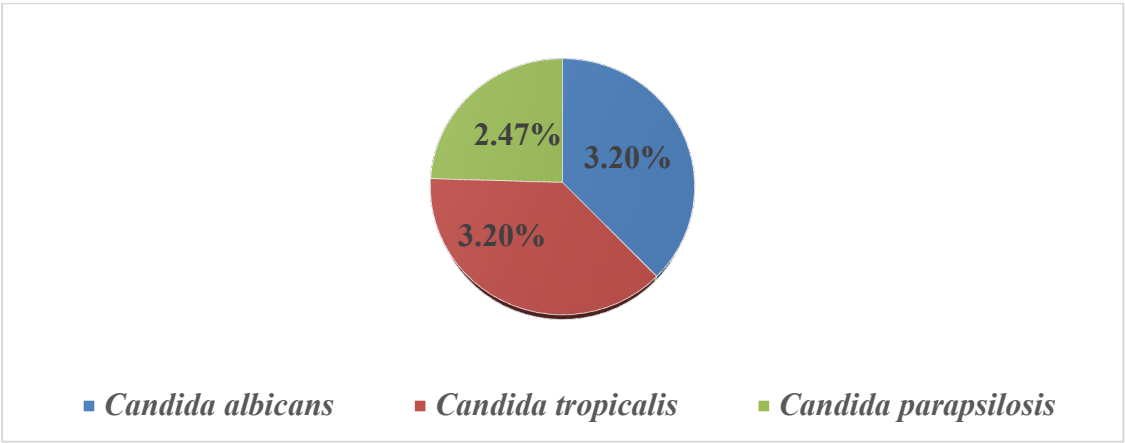

Figure 5: Proportion of yeast contributing to BSI

- Among the BSI identified, HAIs predominated (60%) and all the cases were Primary BSI.
- All the cases were non CLABSI.

Figure number 6 shows the proportion of BSI.

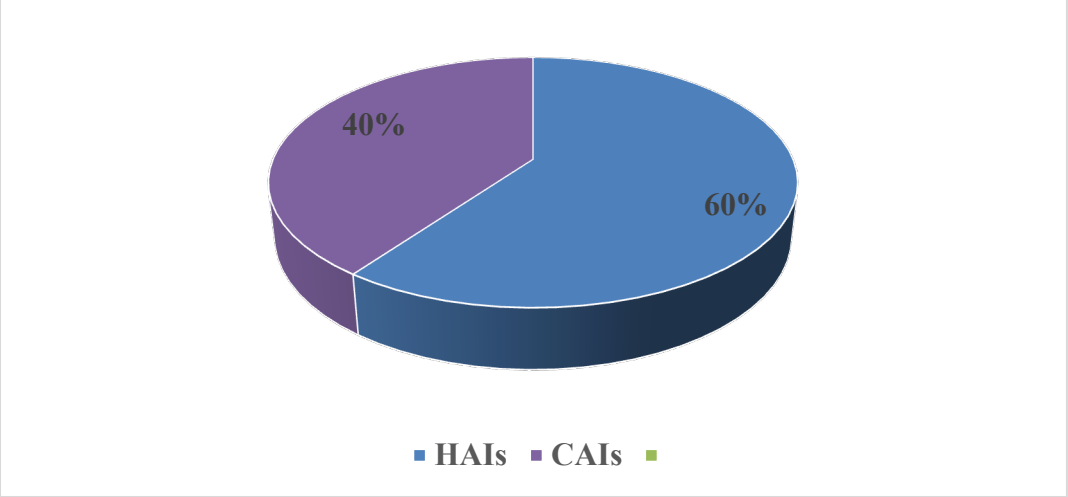

Figure no 6: Proportion of BSI

Sensitivity pattern of Gram Negative Bacilli: Most of the Gram negative isolates were found to be resistant to drugs like third generation cephalosporins, quinolones, carbapenem and colistin. They were, however, found to be susceptible to amikacin. Figure number 7 depicted below shows Sensitivity pattern of Gram negative Bacilli.

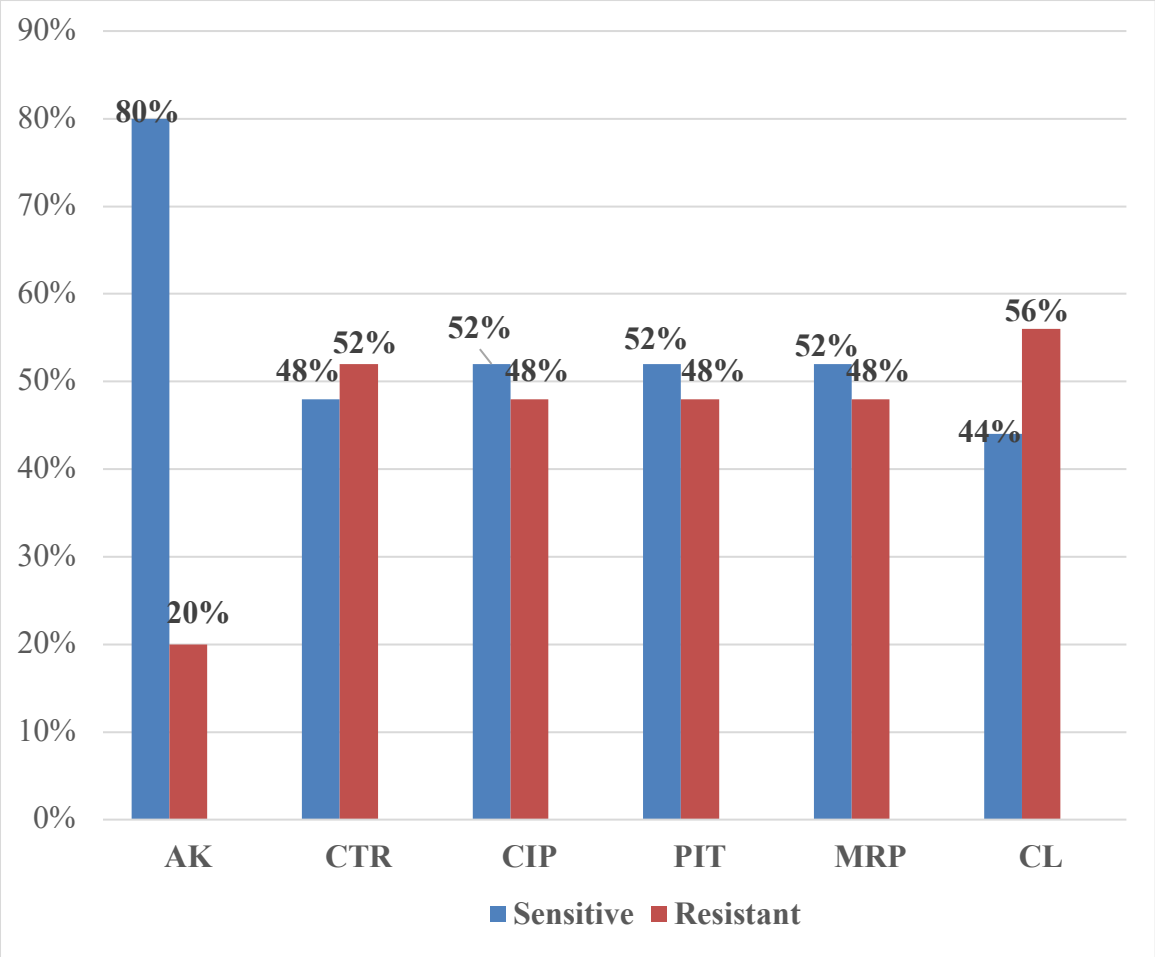

Figure 7: Sensitivity pattern of Gram Negative Bacilli

Sensitivity pattern of Gram Positive Cocci: Majority of the gram-positive isolates were found to be susceptible to Vancomycin (100%) and Fluoroquinolones (91.3%.) They were found to be resistant to Gentamycin (47.83%), and third generation cephalosprins (39.13%). Figure number 8 depicted below shows Sensitivity pattern of Gram Positive Cocci.

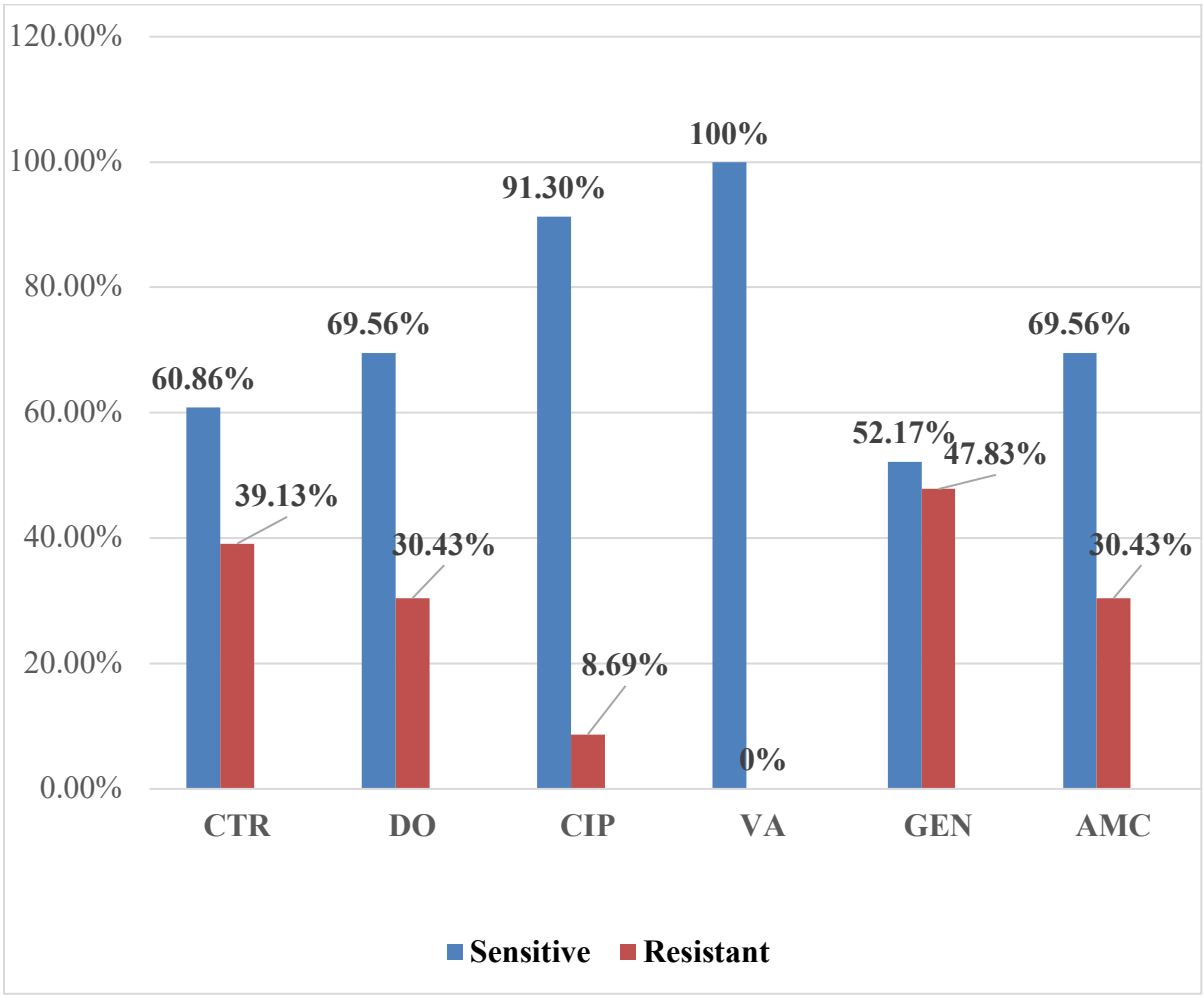

Figure no 8: Sensitivity pattern of Gram Positive Cocci

Among the fungus isolated from BSI, Candida albicans was found to be sensitive to voriconazole, caspofungin, flucytosine, and amphotericin B but resistant to fluconazole whereas Non albicans candida were found to be resistant to fluconozole, itraconazole, voriconazole, caspofungin & sensitive to amphotericin B.

Discussion

BSI is the most devastating but preventable infection in hospital settings especially in the intensive care units [7].

Early detection and treatment of BSI is very important from patient point of view. Isolation of the etiological agent is the gold standard method of diagnosis [7].

Isolation rates of etiological agents of BSI performed by various other studies conducted in other parts of India showed a wide variation like Meenakshi Kante et al, 2014 reported 17% rate [8], Pragnya Paramita Jena et al, 2015 reported a rate of 22.5% [9] and Vijay Prakash et al, 2017 showed 30.83% [10]. In India, isolation rate of BSI pathogens differs due to the inappropriate administration of broad-spectrum antibiotics to patients before coming to tertiary care hospitals. [7]

The overall positivity of blood culture isolates in this study was 8.83% which was similar to a study done in south India (8.39%) [2] and Jaipur (9.4%) [11] whereas studies conducted in Mangalore, Delhi showed markedly higher rates (more than 20%). [7]

- Incidence of GNB & GPC in this study was 51.6% and 44.9% respectively which was similar to a study conducted by Swamy MA et al [1].
- Among the yeast isolated, C albicans & C tropicalis were isolated from two samples and C parapsilosis from one sample.
- C tropicalis were resistant to fluconozole, itraconazole, voriconazole, caspofungin & sensitive to amphotericin B which was similar to

studies from different parts of India where emergence of nonalbicans Candida with resistance to widely used antifungal agents [1,11]

Gram negative and Gram positive organism showed high resistance to most of the antibiotics tested which suggest that the drug resistance is significant and poses a threat to mankind.

Conclusion

Acinetobacter spp, Klebsiella pneumoniae and Staphylococcus aureus were the predominant isolates of the study. Resistance against ceftriaxone and colistin were high and Amikacin resistance was lower among the isolates. Non albicans candida was common than Candida albicans with resistance to multiple antifungals widely used. Good antimicrobial stewardship policy and strict hospital infection control measures are required to prevent the emergence of multidrug resistant organisms.

Continuous update of antimicrobial pattern is essential for epidemiological purpose & rational use of antibiotics. Early diagnosis & continuously monitoring trends in the microbiology of BSI pathogens is important which can help in diagnostic approaches, treatment strategies, and prevention programs.

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