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Etiology and Susceptibility of Blood Stream Infections in a Referral Hospital in North Delhi: A One Year Study.

Shalini Duggal[1]*, Sharon Rainy Rongpharpi[1], Renu Gur[1], Ritu Nayar[2], and Vivek Mohan Arora[3].

[1]Department of Microbiology, Dr Baba Saheb Ambedkar Hospital, Rohini, Delhi-110085, India.
[2]Department of Microbiology, Dr Lal Path Labs, Rohini, Delhi - 110085, India.
[3]Department of Microbiology Maharishi Valmiki Hospital, Delhi, India.

ABSTRACT

Bacteremia can endanger the life of an individual if left untreated or if there is delay in initiation of appropriate therapy. Microbiologists owe the responsibility to adopt rapid blood culture techniques and communicate results promptly. Blood culture is regarded as the gold standard for diagnosis of bacteremia. Culture helps to establish etiological diagnosis and susceptibility results guide therapy. Knowledge of the common etiological agents and their susceptibility patterns guide empirical therapy in an institution. Therefore a retrospective analysis of blood culture records was done in our hospital over a period of one year.

Keywords: bacteremia, infection, antibiotic susceptibility, resistance

Corresponding author

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INTRODUCTION

Bacteria can enter bloodstream as complications of infection, surgery, through catheters/ foreign bodies entering arteries or veins. Blood Stream Infections (BSI) may either be primary where infectious agent enters the blood directly or secondary to septic focus is elsewhere in body. Presence of bacteria in blood stream initiates an immune response which can lead to sepsis and septic shock resulting in high morbidity and mortality rates. It is therefore important to know the most common etiological agent for septicemia in a hospital and the local antibiogram. A retrospective study was done to study etiology and antimicrobial susceptibility pattern of micro-organisms isolated from blood stream over a one year period.

MATERIAL AND METHODS

Retrospective analysis of isolates from Bactec (BD) positive blood cultures was done from July'2011 to June'2012. These were processed according to standard microbiological procedures. [1] All non- duplicate isolates were noted and divided into Gram positive and Gram negative organisms and susceptibility profile was recorded. Kirby Bauer disc diffusion method was used for sensitivity testing according to the CLSI guidelines [2]. For the purpose of analysis, five most common organisms showing susceptibility to five different antibiotics were analysed. For *S. aureus*, vancomycin (30 µg), clindamycin (2 µg), ofloxacin (5 µg), cotrimoxazole (25 µg) and chloramphenicol (30 µg) discs were used. For *Enterococcus* spp., vancomycin (30 µg), ampicillin (10 µg), ciprofloxacin (5 µg), cotrimoxazole (25 µg) and erythromycin (15 µg) discs were used. For *Acinetobacter* and *Klebsiella* spp., amikacin (30 µg), cefepime (30 µg), ciprofloxacin (5 µg), ceftriaxone (30 µg) and meropenem (10 µg); and for *Salmonella* Typhi, ceftriaxone (30 µg), ampicillin (10 µg), ciprofloxacin (5 µg), cotrimoxazole (25 µg) and amoxycillin-clavulanic acid (30 µg) discs were used.

RESULTS

During this period, 2129 blood cultures were received in our laboratory, out of which 728 (34.19%) showed growth of micro-organisms. This included 422 (57.9%) gram positive bacteria, 165 (22.6%) gram negative bacteria and 36 (4.9%) yeast isolates. The Gram positive isolates were *Staphylococcus aureus* (95)*, Enterococcus* spp. (24), *Streptococcus* spp. (9). The Gram negative isolates included *Acinetobacter* spp. (50), *Salmonella* Typhi (29), *Klebsiella* spp. (21), *Enterobacter* spp. (20), *Achromobacter* spp. (10), *Escherichia coli* (8), *Pseudomonas spp.* (6), *Salmonella* Paratyphi A, *Citrobacter* and *Providencia* spp. (2 each), *Stenotrophomonas maltophilia* and *Burkholderia cepacia* (one each). Twelve gram negative oxidase negative non-fermenters could not be identified. Antifungal susceptibility testing of *Candida* isolates was not done. There were 295 coagulase negative staphylococci which were excluded for analysis as the clinical significance of these isolates was not clear. These were *Staphylococcus epidermidis, S. hemolyticus, S. hyicus*. The aerobic spore bearers of *Bacillus* spp. (33), Diphtheroids (45) and *Micrococcus* spp. (27) were considered as contaminants, therefore not processed further. The percentage of contaminants during study period was 4.95% of total blood cultures. The remaining 328 (45%) isolates were considered clinically significant, hence antibiotic susceptibility testing was done. Out of

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these, 61.3% were from admitted patients, 8.5% from out-patient departments and 30.2% from Intensive Care Units. The Most common gram positive and negative organisms were *Staphylococcus aureus* (95) and *Acinetobacter* spp. (50) respectively. Five most common antibiotics were considered for each isolate. Their susceptibility patterns are depicted in figures 1, 2, 3, 4, 5. *Staphylococcus aureus* and *Enterococcus* spp. showed maximum resistance to co-trimoxazole (76.7%) and erythromycin (95.2%) respectively while both showed least resistance to vancomycin (0%). Maximum resistance in *Acinetobacter* spp. and *Salmonella* Typhi was to ciprofloxacin (79.6% & 38.5%) while *Klebsiella* spp. was to ceftriaxone (71.4%). Resistance to meropenem was seen in 60% and 17.6% in *Acinetobacter* spp. and *Klebsiella* spp. respectively while 3.7% of *Salmonella* Typhi were resistant to ceftriaxone.

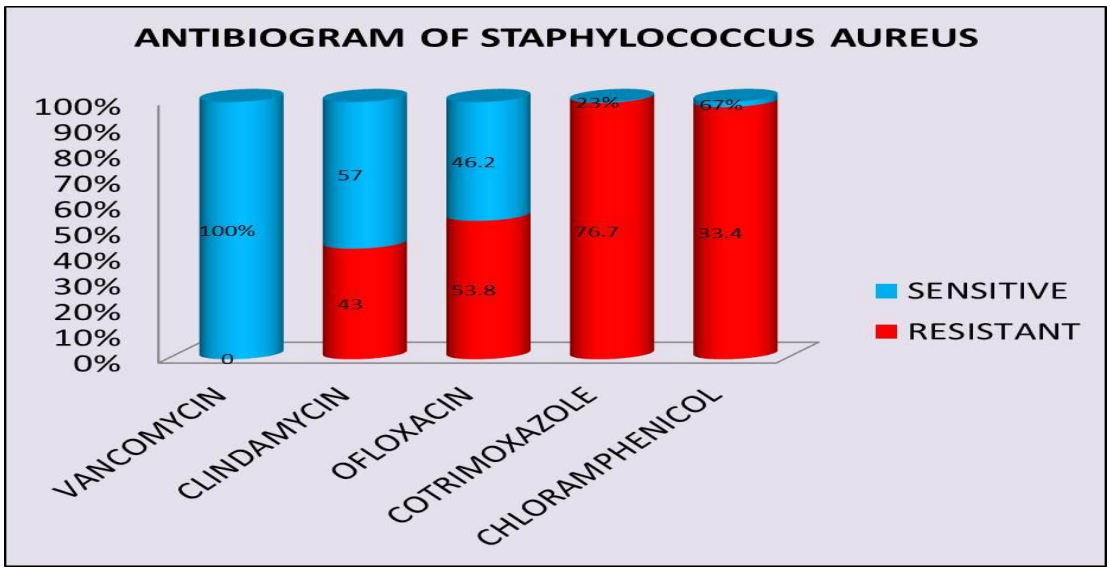

Figure 1

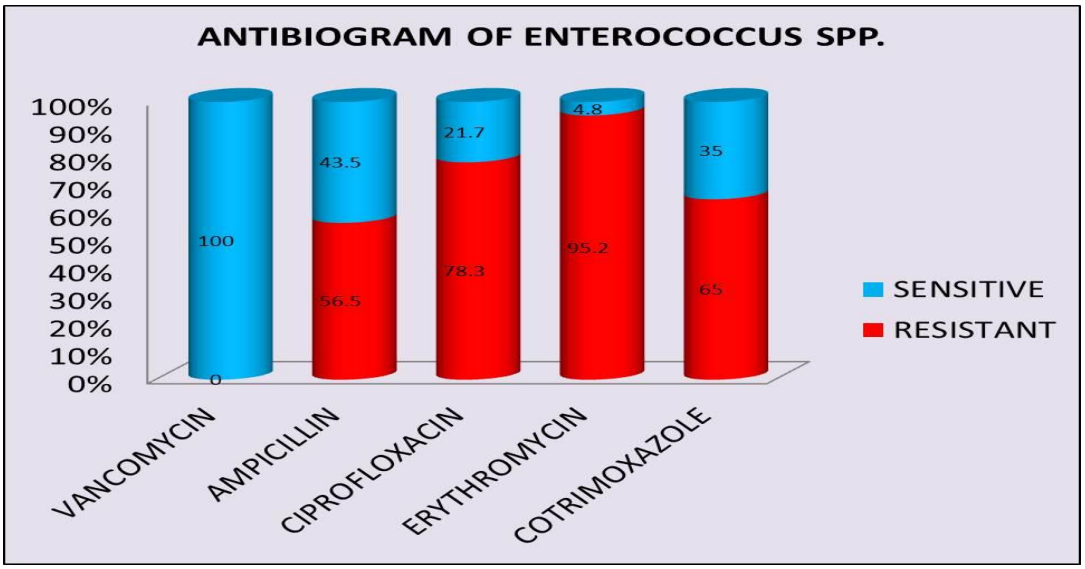

Figure 2

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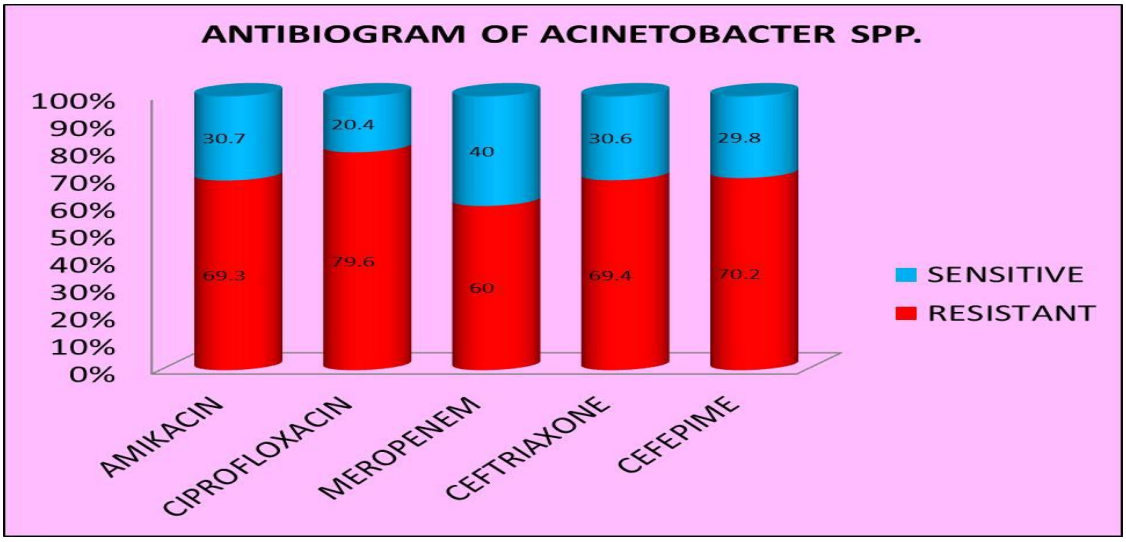

Figure 3

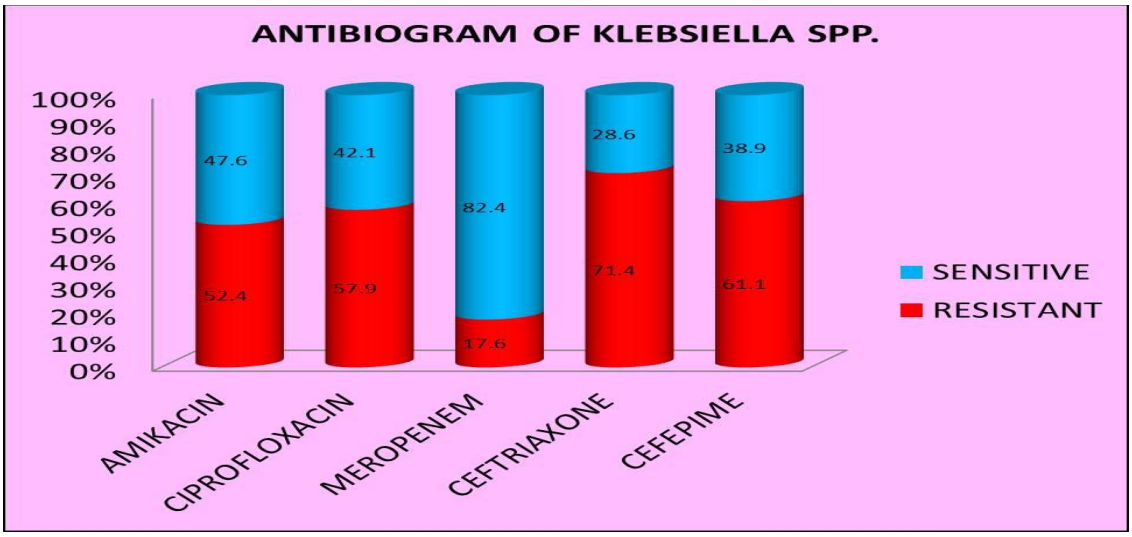

Figure 4

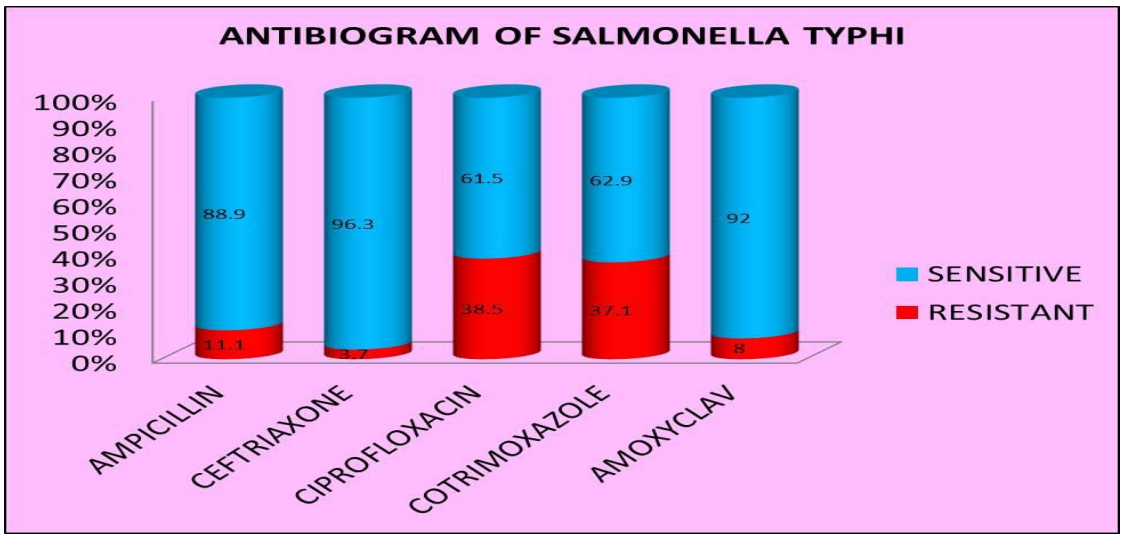

Figure 5

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DISCUSSION

Comparison of the etiological profile of our blood cultures with various studies was done. The trend of antimicrobial susceptibility pattern has been compared in table 1 [3-9]. In our study the maximum number of isolates was *Staphylococcus aureus* followed by *Acinetobacter* spp. The number of isolates of *Salmonella* Typhi in our study is less compared to studies from central Delhi hospitals [7, 8] but is comparable to a study from Rohtak [9].

Table 1: Comparison of etiological data of the present study with other studies

ORGANISMS	PRESENT STUDY	SIMILAR STUDIES	OTHER STUDIES
Staphylococcus aureus	28.96%	29.2% [6]	8.3% [3], 3.9% [4], 2.9% [5], 14.09% [7]
Enterococcus spp.	7.31%	5% [5]	3.7% [3], 0.3% [7]
Acinetobacter spp.	15.24%	14.2% [3]	8.5% [4]
Salmonella Typhi	8.84%	9.2% [9]	1.2 % [5], 44.09% [7], 77.3% [8]
Klebsiella spp	6.40%	7.3% [3], 11% [4], 5.1% [7]	16.8 % [5]

Staphylococcus aureus and *Enterococcus* spp. showed maximum resistance to co-trimoxazole and erythromycin while both showed Zero resistance to vancomycin. Among gram negative bacteria *Acinetobacter* spp. showed maximum resistance to ciprofloxacin and least resistance to meropenem. Ceftriaxone resistance was encountered most in *Klebsiella* spp. while a single isolate of *Salmonella* Typhi was resistant to it.

In our study coagulase negative Staphylococci were 40.52% of positive blood cultures but were not processed further for lack of clinical correlation. These findings are similar to those of Ghadiri et al (34.8%) [4], in some studies it was 9.1% [5]. Susceptibility test against coagulase negative staphylococci should be done for patients in critical care areas, patients with prosthetic devices, immunocompromised patients and all others in which clinical correlation can be established.

The contamination rate in our blood cultures was 4.95%. It can range from 0.6-6.0% [10]. In a study conducted by Chraita et al. [11] contamination rates was found to be 12.6% while Malik et al found a contamination rate of 18% in their study [12]. The target rates for contamination have been set to 2-3% according to CLSI guidelines. [13] Every institution should compile their microbiological and antibiotic data so that local antibiotic policies can be formulated to guide empiric therapy.

CONCLUSION

Empiric treatment guidelines for BSI in our hospital can be formulated on basis of data presented. Contamination rate of blood cultures was higher than the permitted level (≤3%), hence steps are being taken to reduce it by training and education. Need for strict aseptic precautions on the part of health care workers to be strictly implemented.

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