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Bacteriological Profile & Antibiogram of Blood Cultures from a Teritiary Care Hospital – Hyderabad

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Abstract **Original Research Article**

Blood stream infections range from self-limiting infection to life threatening sepsis and require rapid, aggressive and appropriate antimicrobial treatment. Blood culture is a key investigation for diagnosis of blood stream infections. The main purpose of blood culture is to identify the etiological agent , confirm infectious etiology, guide in the antimicrobial therapy. With the increase in antibiotic resistance amongst the organisms which is of worldwide concern it has become more important to know the microbial profile and its susceptibility pattern for treatment and specific therapy. This study shows the most common organisms isolated from blood cultures and their susceptibility pattern. Blood samples received for diagnostic microbiology were processed and identification done by standard protocol. Antibiotic susceptibility test was done using Kirby Bauer disk diffusion method It is a prospective study for 1 year from 2018 to 2019. Out of the total 1050 blood cultures received 501 (47.7%) showed growth. Gram Positive Cocci: 336 (67%), MRSA: 46(13.6%), Gram Negative Bacilli: 161 (32%), ESBL: 36(22%) Candida 04 (1%). Most common Gram Positive organism: Staphylococcus aureus, Gram Negative organism: Klebsiella species. This antibiogram of isolate will improve the therapeutic outcome and prevent antibiotic resistance.

Keywords: Blood stream infections, Antibiogram, Bacteriological profile, Anti-microbial susceptibility.

INTRODUCTION

Bloodstream infection (BSI) remains one of the most important causes of morbidity and mortality globally [1]. They range from self-limiting infection to life threatening sepsis and require rapid, aggressive and appropriate antimicrobial treatment [2]. The mortality rate ranges from 20% to 50% in cases of bacteremia [3]. In recent years, there has been an increase in the incidence of bacteremia caused by the members of Enterobacteriaceae and other Gram‑negative bacilli. Sensitive bacterial strains are now being replaced by multi‑drug resistant (MDR) strains of Klebsiella, Pseudomonas, Acinetobacter, and Citrobacter species [4]. This increasing antimicrobial resistance is a worldwide concern and is subjected to regional variation [5] It has become more important to know the microbial profile and its susceptibility pattern for emperical and specific therapy as awareness of the baseline microbial resistance specific to a hospital prevents irrational use of antibiotics in that hospital, thus helps progress a step forward in the prevention of spread of antibiotic resistance. Blood culture is a key investigation for confirming infectious aetiology and to guide the antimicrobial therapy [6].

AIM

To isolate the pathogens from blood cultures and to give antibiotic susceptibility pattern for the most common isolates.

MATERIALS AND METHODS

A total of 1050 blood samples were received in the microbiology laboratory of a tertiary care teaching hospital of South India over duration of 1 year. Samples received were from the inpatient population of the hospital. Blood samples were collected from the patients before the administration of any antibiotic. Relevant details of the patients were recorded in a predesigned proforma. Blood culture bottles inoculated with the sample was incubated at 37°C aerobically, and periodic subcultures were done on blood agar and MacConkey's agar on day 2 and day 4 and day6, respectively.

Fig-1: Blood culture bottles containing BHI broth
A) Uninoculated
B) Inoculated

The growth obtained was identified by colony morphology, Gram-stain of the isolated colonies, and conventional biochemical identification tests as per the standard protocol followed in the laboratory. The antibiotic susceptibility pattern of the isolated organisms was performed by Kirby–Bauer disc diffusion method on Mueller–Hinton agar plates, and the results were recorded as per the Clinical and Laboratory Standards Institute 2015 guidelines. The routine antimicrobial susceptibility testing was put up with following antibiotics:

For Gram Positive Cocci: Linezolid, Ofloxacin, Amikacin, Cefoxitin, Cefeperazone, Cefeperazone and Sulbactam, Azithromycin.

For Gram Negative Bacilli

A) For Enterobacteriaceae: Ceftazidime, Ceftazidime plus Clavulanic acid, Imipenem, Cefuroxime, Ofloxocin, Ceftriaxone, Amikacin, Cefipime.

B) For Non Fermenters: Imipenem,Amikacin ,Ofloxacin, Piperacillin and Tazobactam ,Ceftazidime , Cefaperazone, Ceftazidime plus Clavulanic Acid.

Cefoxitin disc diffusion method was used to identify MRSA among Staphylococcus and Ceftazidime, Ceftazidime plus Clavulanic acid was used for ESBL detection. An increase of 5 mm in the zone of inhibition in a disk containing clavulanate compared to the drug alone was considered as positive for ESBL producers.

Quality control

Reference strains E. coli (ATCC 25922) and S. aureus (ATCC 25923) were used as a control reference strains for identification and drug susceptibility testing. Negative control was done by randomly taking the prepared culture media and incubating over night to observe for any growth.

STUDY PERIOD

It is a prospective study of 1 Year from 2018 – 2019 conducted at Osmania General Hospital, Hyderabad.

RESULTS

Out of total 1050 samples collected during study 501 showed positive cultures. The rate of bacterial isolation in blood culture in this study was 47.7%. The common isolates in present study amongst GPC were Staphylococcus aureus (74.2%) followed by CONS (23.2%) & Streptococcus (2%) & amongst GNB were Enterobacteriaceae (77.2%) followed by Pseudomonas (18%) and PROTEUS (4%) (Chart 1).

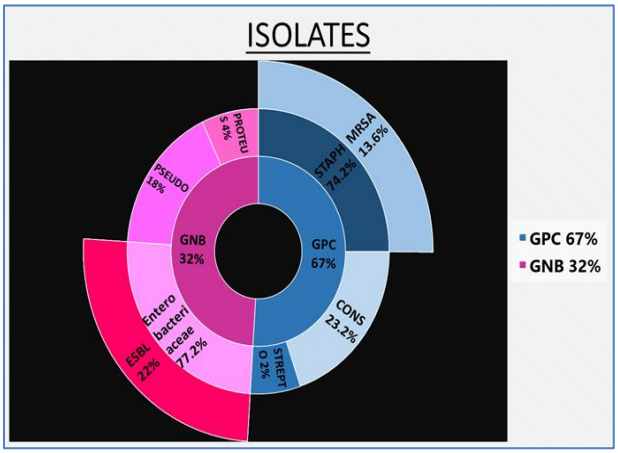

Chart-2: Staphylococcus aureus is highly sensitive to Linezolid (97%) & Ofloxocin (79%) & highly resistant to Azithromycin

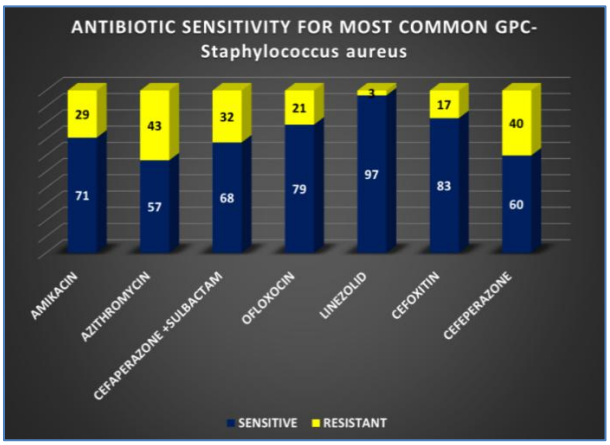

Chart-3: Klebsiella is highly sensitive to Imipenem (80%) Amikacin (75%) & highly resistant to most of Cephalosporins

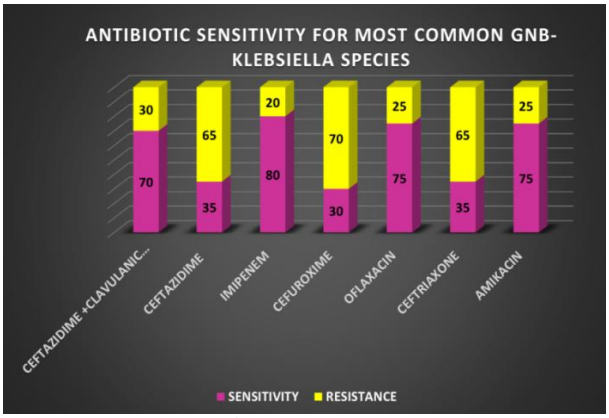

Fig-2: The occurrence of MRSA (13.6%) & ESBL (22%) is seen

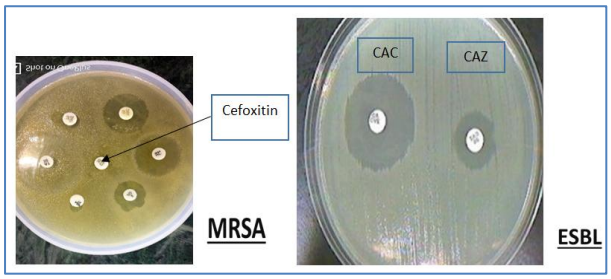

Fig-3

DISCUSSION

There is a substantial burden of sepsis worldwide on health care. The gold standard of diagnosis is blood culture to isolate the etiologic agents for sepsis. BSIs have been a challenge for the clinicians due to changing bacterial resistance profile [7]. The present study provides information on the distribution of bacterial isolates causing bloodstream infections along with their antibiotic susceptibility pattern that plays a crucial role in effective management of septicemic cases. The blood positivity rate found in our study was 47.7%, which was comparable to rates reported by various other Indian studies [8-12]. In contrast, low culture positivity ranging from 5.6% to 8.9% whereas were reported by various other authors. Such variation in blood culture positivity can be explained by various factors such as volume or the number of blood culture samples taken for study [13]. Of these, gram positive bacteria (67%) were found to be more common than gram negative bacteria (32%) which was comparable to Kumar p Arun *et al.* [14] gram positive bacteria (59.01%) were found to be more common than gram negative bacteria (40.99%). A nationwide surveillance study conducted in 49 hospitals in USA showed a large prevalence of Gram-positive bacteria causing BSI's compared with Gram-negative organisms [15].

Majority of all bloodstream infections were caused by Staphylococcus Spp. S. aureus was the predominant pathogen (250/501) recovered. Pre-eminence of S. aureus as a blood stream pathogen has been documented by numerous similar studies [16, 17]. Among these isolates, majority were methicillin-sensitive S. aureus (MSSA) and only 13.6% were methicillin-resistant S. aureus (MRSA). These organisms are notorious since they do not respond to the broad class of beta-lactam antibiotics and acquire resistance to newer antibiotics quite rapidly. This effectively complicates the management of such BSIs [18]. CoNS, the usual skin commensals are increasingly being considered bloodstream pathogens in selected settings. Improper methods of blood collection and the presence of long-standing intravascular catheters are recognized as possible modes of spread of BSI by CoNS.

Among Gram-negative pathogens, Enterobacteriaceae as a group accounted for maximum sepsis cases (125/161) with a predominance of Klebsiella species followed by E. coli. Among Nonfermenting bacilli Pseudomonas spp. (n = 29) was more predominant followed by Proteus species (n=7). This is of significant concern as in the hospital settings, these isolates are associated with a high degree of antimicrobial resistance. Fungemia has been documented in 4 (1%) cases. All of them were due to Candida spp.

Within Staphylococcus spp., MRSA were most responsive (100%) to the action of Linezolid. MSSA isolates were highly responsive (>70%) to Linezolid, Ofloxacin, Amikacin. Streptococcus spp. were uniformly sensitive to penicillin and other beta-lactam antibiotics. Most of Staphylococcus species showed resistance to Azithromycin followed by Cefeperazone.

GNB'S reveal higher susceptibility for aminoglycosides and carbapenems overall. For treating BSIs caused by Enterobacteriaceae isolates, imipenem, amikacin, had ~ 75%–80% sensitivity. Ofloxacin and cephalosporins such as cefepime and ceftriaxone were also very good alternatives to treat such cases except those perpetuated by E. coli strains. Treatment of sepsis caused by nonfermenting GNB was more successful when attempted with carbapenems, aminoglycosides, ofloxacin, and piperacillin-tazobactam. Pseudomonas spp. isolates were highly responsive toward ceftazidime and cefoperazone.

Effective treatment of BSI depends on early diagnosis and appropriate targeted antimicrobial therapy. The choice of antibiotics is based on local knowledge of bacteriological profile and antimicrobial sensitivity patterns. Beta-lactam drugs are rapidly becoming ineffective for treating BSIs due to indiscriminate and nonjudicious usage. The fact that cephalosporins are one of the most commonly used antibiotics for inpatients as well as for outpatients could be the reason for such high degree of resistance. Hence, rationalization of treatment strategies is very much warranted considering the local trends of BSIs. Poor infection control practices and inappropriate use of antibiotics are main driving forces for the spread of

resistant organisms. With the shortage of newer drugs' availability and increasing resistance, use of limited option drugs such as colistin by clinicians could soon lead to the condition of so-called pan-drug-resistance.

CONCLUSION

In the present study, both Gram-negative and Gram-positive bacteria were responsible for blood stream infections. Staphylococcus aureus and Klebsiella sps were among the most common Gram-positive and Gram negative organisms identified causing adult sepsis, respectively. Prevalence of BSI in this current study was high. This study added to the knowledge of the epidemiology of the isolates with high rates of resistance to most used antibiotics. Therefore, timely investigation of bacterial flora of the bloodstream infections and monitoring of their antibiotic susceptibility pattern is important to reduce the incidence of bloodstream infections and multi drug resistant strains. The selection of antimicrobials should be based on the local rates of susceptibility and the site of infection. The increase in the prevalence of MDR bacteria emphasize the urgent need for rational use of antibiotics, formulation of antibiotic policy, and implementation of infection control practices for the effective management and prevention of drug resistance. This antibiogram of isolate will improve the therapeutic outcome and prevent antibiotic resistance

REFERENCES

1. Zenebe T, Kannan S, Yilma D, Beyene G. Invasive bacterial pathogens and their antibiotic susceptibility patterns in Jimma University Specialized Hospital, Jimma, and Southwest Ethiopia. *Ethiop J Health Sci*.2011; 21:1.
2. Gupta S, Kashyap B. Bacteriological profile and antibiogram of blood culture isolates from a tertiary care hospital of North India. Trop J Med Res. 2016; 19:94-9.
3. Diekema DJ, Beekmann SE, Chapin KC, Morel KA, Munson E, Doern GV. Epidemiology and outcome of nosocomial and community‐onset bloodstream infection. J Clin Microbiol. 2003; 41:3655‐60.
4. Vanitha RN, Kannan G, Venkata NM, Vishwakanth D, Nagesh VR, Yogitha M. A retrospective study on blood stream infections and antibiotic susceptibility patterns in a tertiary care teaching hospital. *Int J Pharm Sci*. 2012; 4:543‐8.
5. Jadhav S, Gandham N, Paul R, Misra RN, Ujagare MT, Angadi K. Bacteriological profile of septicaemia and antimicrobial susceptibility of isolates from tertiary care hospital in India. *Res J Pharm Biol Chem Sci*. 2012; 3:1100‐8.
6. Debananda Sahoo, Lalatendu Mohanty, S S Panda, S N Mishra. Bacteriological analysis of blood culture isolates in patients with sepsis in a tertiary care hospital of eastern India. International Journal of Contemporary Medical Research. 2016;3(12):3448-3450.
7. Singh AK. Bacterial and antimicrobial resistance profile of bloodstream infections: A hospital‐based study. *Chrismed Journal of Health and Research*. 2014; 1:140-144.
8. Mehdinejad M, Khosravi AD, Morvaridi A. Study of prevalence and antimicrobial susceptibility pattern of bacteria isolated from blood cultures. *J Biologic Sci*. 2009; 9:249‐53.
9. Ndugulile F, Jureen R, Harthug S, Urassa W, Langeland N. Extended spectrum β‐lactamases among gram‐negative bacteria of nosocomial origin from an intensive care unit of a tertiary health facility in Tanzania. *BMC Infect Dis.* 2005; 5:86.
10. Anbumani N, Kalyani J, Mallika M. Original research distribution and antimicrobial susceptibility of bacteria isolated from blood cultures of hospitalized patients in a tertiary care hospital. *Indian J Pract Dr*. 2008; 5:1‐7.
11. Khanal B, Harish BN, Sethuraman KR, Srinivasan S. Infective endocarditis: Report of a prospective study in an Indian hospital. *Trop Doct*. 2002; 32:83‐5.
12. Sharma M, Goel N, Chaudhary U, Aggarwal R, Arora DR. Bacteremia in children. *Indian J Pediatr*. 2002; 69:1029‐32.
13. Lee A, Mirrett S, Reller LB, Weinstein MP. Detection of bloodstream infections in adults: How many blood cultures are needed? *J Clin Microbiol*. 2007;45:3546‐8.
14. Kumar P, Arun and Chougale R. Bacteriological profile of Blood Stream Infection in Tertiary Care Hospital, Kolhapur. *IOSR Journal of Dental and Medical Sciences*. 2018; 17. 54-58.
15. Orsini J, Mainardi C, Muzylo E, Karki N, Cohen N, Sakoulas G. Microbiological profile of organisms causing bloodstream infection in critically ill patients. *J Clin Med Res*. 2012;4(6):371–377.
16. Rajeevan S, Ahmed SM, Jasmin PT. Study of prevalence and antimicrobial susceptibility pattern in blood isolates from a tertiary care hospital in North Kerala, India. *Int J Curr Microbiol Appl Sci*. 2014;3:655–62.
17. Prabhu K, Bhat S, Rao S. Bacteriologic profile and antibiogram of blood culture isolates in a pediatric care unit. *J Lab Physicians*. 2010;2:85–8.
18. Banik A, Bhat SH, Kumar A, Palit A, Snehaa K. Bloodstream infections and trends of antimicrobial sensitivity patterns at Port Blair. *J Lab Physicians.* 2018;10(3):332–337.