RESEARCH ARTICLE

STUDY OF PATHOGENS CAUSING BLOODSTREAM INFECTIONS WITH THEIR ANTIBIOGRAM IN A TERTIARY CARE HOSPITAL.

Dr. Tharangini Karicheti¹, Dr. P. Ratna Kumari² and Dr. R.Lakshmi Kumari³.

1. 3rd-Year Postgraduate, Siddhartha Medical College, Vijayawada.
2. Professor, Department of Microbiology, Siddhartha Medical College, Vijayawada.
3. Professor and HOD, Department of Microbiology, Siddhartha Medical College, Vijayawada.

Manuscript Info

Abstract

Introduction: Bloodstream infection is the most common health care associated infection and a significant cause of mortality and morbidity. Early and appropriate antibiotic therapy is crucial in the treatment of BSI. In the current era of improper use of antibiotics, there is a rise of antimicrobial resistance in bloodstream infections. Policies should be devised to control this by the proper and effective use of antibiotics.

Aim and Objectives: To study the etiological microbial agents of bloodstream infections and their susceptibility pattern in a tertiary care centre over a period of one year.

Materials and Methods: 467 blood culture samples received from different departments of GGH, Vijayawada, A.P, from October 2016 to September 2017, were processed as per standard microbiological procedures. Antimicrobial susceptibility testing was done as per CLSI guidelines.

Results: Out of 467 blood culture samples, 104(22.2%) were culture positive, 363 were culture negative. Among culture positives, 43(41.3%) were Staphylococcus aureus, 17(16.67%) were Klebsiella species, 4 Escherichia coli. On repeated subcultures 35(34.3%) Coagulase negative Staphylococcus, 3(2.9%) Pseudomonas species were isolated. Gram-positive isolates were mostly sensitive to Vancomycin, Amoxycillin plus Sulbactam and resistant to ampicillin and cefotaxime. Gram negative isolates were mainly sensitive to Piperacillin Tazobactam, Imipenem and resistant to Levofloxacin, Cefotaxime.

Conclusion: The present study shows that Staphylococcus aureus and Klebsiella species are the most common causative agents and most effective antibiotics are vancomycin and Piperacillin tazobactam, Imipenem, respectively.

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Introduction:

Blood is a connective tissue which is essential for proper functioning and survival of human life, and it is sterile fluid unless proved otherwise. Bloodstream infections contribute to significant mortality such as shock, disseminated intravascular coagulation, multiple organ failure and even death. Bloodstream infection may be transient bacteremia which is an indication of real systemic infection or contamination from skin. Bloodstream infection is the most
common health care associated infection and a significant cause of mortality and morbidity around the globe. Blood culture is the standard test for the detection of the causative bacteria and antibiotic sensitivity providing essential information for the evaluation of a variety of diseases like endocarditis, pneumonia, pyrexia of unknown origin and helpful particularly in patients with suspected sepsis allowing for successful recovery of bacteria in 99% patients with bacteremia. Early and appropriate antibiotic therapy is crucial in the treatment of bloodstream infections. In the current era of improper use of antibiotics there is a rise of antimicrobial resistance in bloodstream infections, and hence policies should be devised to control this by proper and effective use of antibiotics.

Methods:-
A total of 467 blood culture samples were received from different departments of Government General Hospital, Vijayawada, Andhra Pradesh, from October 2016 to September 2017.

Blood culture: Venous blood 5ml from adults and 2ml from children was obtained aseptically and inoculated into brain heart infusion broth. In suspected cases of enteric fever, bile broth was used and incubated at 37°C for 24 hours. Blind subculture was done on to fresh 5% sheep blood agar and Mac Conkey’s agar. A negative result was followed up by examining the broth daily and doing a final subculture at the end of 7th day or at the appearance of turbidity, gas production or the presence of microcolonies over the clot whichever was earlier. Where ever necessary second blood culture was taken. In Subacute bacterial endocarditis, 3 consecutive blood samples were taken. Organisms were identified by cultural characters, morphology and standard biochemical tests. Antibiotic susceptibility testing was performed by the by Kirby-Bauer disc diffusion methods, and results were interpreted as per Clinical and Laboratory Standards Institute (CLSI) guidelines.

Results:-
Of the 467 blood culture samples, 104 (22.26%) were culture positive, and 363 (78%) were culture negative. Among culture isolates 43(41.3%) were Staphylococcus aureus, 17(16.3%) were Klebsiella species, and 4(3.92%) were Escherichia coli.

35(33.7%) cultures of Coagulase negative Staphylococcus, 3(2.9%) Pseudomonas strains were isolated and confirmed by repeat cultures. Gram-positive isolates were mostly sensitive to linezolid(95%), vancomycin(90%), ciprofloxacin(80%), ceftazidime(75%), and resistant to penicillin, doxycycline, Amoxycillin and Erythromycin. Gram negative isolates were mostly sensitive to imipenem(99.2%), cefoperazone & sulbactam (88%), amikacin(82.8%), Piperacillin & Tazobactam(78%) gentamycin(78%), cefixime(76%) and resistant to Ceftriaxone, Levofloxacin and Ceftazidime.

Discussion:-
Bloodstream infection is a serious medical problem, and sometimes it may be life-threatening; therefore timely detection, identification, and antimicrobial susceptibility testing of blood-borne pathogens are one of the essential functions of the diagnostic microbiology laboratory.

In the present study blood culture positivity was seen in 22 % of cases which corresponds to Arora et al. (20.2%) and V.N. Venkatesh et al. (25.89%). Studies by Mehdinijab et al. (5.6%), Amit Banik et al. (14.24%), Karunakaran et al. (16.5%), and Shilpi Gupta et al. (16.5%) reported lower culture positivity rates, whereas Nikita et al. (31.2%) and Vijay Prakash Singh et al. (30.83 %) reported higher culture positivity rates. Among the culture positive specimens Majority of the organisms are gram positive (78 %), Gram negatives contributed to 25% of culture positive organisms. It is in line with Nikita et al. (63%) and Amit Banik et al. (60.3%) which reported predominant gram positive organisms whereas Vijay Prakash Singh et al. (70.27%) and Shilpi Gupta et al. (58.34 %) reported predominant gram negative organisms in their studies. In the gram positive spectrum Staphylococcus aureus is most commonly isolated (41.3%) followed by CONS (33.7%). The findings of the present study are in line with the study by Amit Banik et al. and Arora et al. which also reported Staphylococcus aureus as the most common organism, Followed by CONS whereas Karunakaran et al. reported the majority of Gram positive organisms as CONS (33%) followed by Staph (10.4 %). A study by V.N. Venkatesh et al. reported Staph. aureus(17.33%) and CONS(17.33%).In the gram negative spectrum Klebsiella is the predominant organism (16.3%) followed by E. Coli (5.8%) and Pseudomonas( 2.9 %). It is in line with Mehdinijab et al. study which reported Klebsilla as predominant gram negative organism whereas studies by Vijay Prakash Singh and Shilpi Gupta reported E. Coli as predominant gram negative organism in their studies. In the present study gram, positive organisms are majorly sensitive to
linezolid and resistant to Penicillin. This corresponds to the studies by Mehdinijab et al., Vijay Prakash Singh et al. and Nikitha et al. In the present study gram negative organisms are sensitive to imipenem, while resistant to ceftriaxone. Various researchers studied different antibiotics in studies by V.N. Venkatesh et al., Nikita et al., and Vijay Prakash Singh Gram negative bacteria are sensitive to Colistin and resistant to ampicillin.

**Conclusion:**
The present study indicates Staphylococcus aureus and Klebsiella species are the most common causative agents of bloodstream infections. The effective antibiotics are linezolid and vancomycin for Staphylococcus aureus and Imipenem, cefoperazone & sulbactam for Klebsiella species. The prevalence of multi drug resistant organisms among etiologic agents of bacterial sepsis is on the rise. There is a need for monitoring pathogen trends and microbial susceptibility patterns. This study emphasised the need for the development of antibiotic policies which can prevent the circulation of multi drug resistant bacteria in the hospitals as well as in the community.

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**Fig 1:** Percentage of Culture Positives

**Fig 2:** Organisms isolated in blood culture
Fig 3: Antibiotic sensitivity pattern of Gram positive isolates

Fig 4: Antibiotic sensitivity pattern of Gram Negative isolates

References:
1. Arora, U & Devi, P. (2007). Bacterial profile of blood stream infections and antibiotic resistance pattern of isolates. JK Science. 9. 186-190
2. 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;10:332-7.
3. CLSI. Principles and Procedures for Blood Cultures; approved Guideline. CLSI Document M47-A. Wayne, PA: Clinical and Laboratory Standards Institute; 2017

4. Clinical and Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing: Twenty- Fourth Informational Supplement. CLSI Document M100-S27. Wayne, PA: Clinical and Laboratory Standards Institute; 2017

5. Chhina D, Gupta V. Bacteriological profile and antimicrobial susceptibility pattern of Blood isolates from a tertiary care hospital in North India. IJPRBS 2013;2:24-35.

6. Devi V, Sahoo B, Damrolien S, Praveen S, Lungran P, Devi M.A study on the bacterial profile of bloodstream infections in Rims Hospital. J Dent Med Sci 2015;14:18 - 23.

7. 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

8. Gohel K, Jojera A, Soni S, Gang S, Sabnis R, Desai M. Bacteriological profile and drug resistance patterns of blood culture isolates in a tertiary care nephrourology teaching institute. Biomed Res Int 2014;2014:153747.

9. 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.

10. Iregbu KC, Elegba OY, Babaniyi IB. Bacteriological profile of neonatal septicaemia in a tertiary hospital in Nigeria. Afr Health Sci 2006;6:151 - 4.

11. Jadhav S, Gandham N, Paul R, Misra RN, Ujagare MT, Angadi K.et al. Bacteriological profile of septicaemia and antimicrobial susceptibility of isolates from tertiary care hospital in India. Res J Pharm Biom Sci 2012;3:1100-8.

12. Jain S, Kumar A, Kashyap B, Kaur IR. Clinico-epidemiological profile and high-level aminoglycoside resistance in enterococcal septicemia from a tertiary care hospital in east Delhi. Int J Appl Basic Med Res 2011;1:80 - 3.

13. Karunakaran R, Raja NS, Ng KP, Navaratnam P. Etiology of blood culture isolates among patients in a multidisciplinary teaching hospital in Kuala Lumpur. JOURNAL OF MICROBIOLOGY IMMUNOLOGY AND INFECTION. 2007 Oct;40(5):432

14. Kohli-Kochhar R, Omuse G, Revathi G. A ten-year review of neonatal bloodstream infections in a tertiary private hospital in Kenya. J Infect Dev Ctries 2011;5:799 - 803.

15. 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

16. M. Mehdinejad, A.D. Khosravi and A. Morvari, 2009. Study of Prevalence and Antimicrobial Susceptibility Pattern of Bacteria Isolated from Blood Cultures.Journal of Biological Sciences, 9: 249-253.

17. 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

18. Seifert H, Wisplinghoff H. Bloodstream infection and endocarditis. In: Borriello SP, Murray PR, Funke G, editors. Topley and Wilson’s Microbiology and Microbial Infections, Bacteriology. 10th ed., Vol. 1. Ch. 4.1. London: Hodder Arnold ASM Press; 2005. p. 1181 - 235

19. Sharma M, Goel N, Chaudhary U, Aggarwal R, Arora DR. Bacteraemia in children. Indian J Pediatr 2002;69:1029-32.

20. Sharma R, Sharma R, Gupta S. Bacteriological analysis of blood culture isolates with their antibiogram from a tertiary care hospital. Int J Pharm Sci Res 2015;6:4847-51.

21. Singha VP, Mehtab A. Bacteriological profile of blood stream infections at a Rural tertiary care teaching hospital of Western Uttar Pradesh. Indian Journal of Basic and Applied Medical Research. 2017 Jun;6(3):393-401.

22. Vanitha RN, Kannan G, Venkata NM, Vishwakant D, Nagesh VR, Yogitha M, et al. A retrospective study on blood stream infections and antibiotic susceptibility patterns in a tertiary care teaching hospital. Int J Pharm Pharm Sci 2012;4:543-8.

23. Vasudeva N, Nirwan PS, Shrivastava P. Bloodstream infections and antimicrobial sensitivity patterns in a tertiary care hospital of India. Therapeutic advances in infectious disease. 2016 Oct;3(5):119-27.

24. Venkatesh, V.N. & Kotian, Swapna. (2017). Isolates and their Antibiogram from Blood Stream Infection in a Tertiary Care Hospital, Uttarakannada, India. International Journal of Current Microbiology and Applied Sciences. 6.16581668.20546/jicmas.2017.606.194

25. Wattal C, Raveendran R, Goel N, Oberoi JK, Rao BK. Ecology of blood stream infection and antibiotic resistance in intensive care unit at a tertiary care hospital in North India. The Brazilian Journal of Infectious Diseases 2014;18(3):245-51.