International Journal of Advanced Science and Research
ISSN: 2455-4227
Impact Factor: RJIF 5.12
www.allsciencejournal.com
Volume 2; Issue 6; November 2017; Page No. 96-98

Bacteriological profile and antibiotic resistance pattern in blood stream infection in critical care units of a tertiary care hospital in central India

[1] Dr. Krishna Kumar Patel, [2] Dr. Sarita Patel, [3] Dr. Deepak Sinha
[1] Assistant Professor, Department of Microbiology, TCL Govt. PG College, Janjgir, Chhattisgarh, India
[2] Assistant Professor, Department of Zoology, DLS PG College Bilaspur, Chhattisgarh, India
[3] Assistant Professor, Department of Chemistry, Govt. Nagarjuna PG College of Science, Raipur, Chhattisgarh, India

Abstract
Blood stream infections (BSIs) are an important cause of morbidity and mortality worldwide. The condition can be life threatening in critically ill patients in intensive care units (ICUs) of the hospitals. The case fatality rate associated with BSIs in ICU patients is between 35% - 50%. Risk factors contributing to these infections are many but leading causes are intravascular catheters (IVCs), debilitating condition of the patients due to some underlying infection or invasive diagnostic or therapeutic procedures. Blood stream infections (BSIs) are an important cause of morbidity and mortality worldwide. The condition can be life threating in critically ill patients in intensive care unit (ICUs) of the hospital. Emergence of resistance among the bacterial pathogens causing these infections is another issue of the public health concern. This study was carried out in our to medical college in Bilaspur India, to know the spectrum of bacterial pathogens causing BSIs in the patients admitted to the critical care units also to know the trends of resistance among these agents. It was a hospital based retrospective cross-sectional study and was carried out in tertiary care hospital in Central India. The data was collected by reviewing the records of 565 patients admitted to various critical care units (ICUs) of the hospital from May 2016 to March 2017. Out of total 565 blood samples of the patients suspected of bacteremia, admitted to critical care units of the hospital 140 were culture positive. Out of these isolates 74(53%) were Gram positive bacteria (GPB) and 55(39.3%) were Gram negative bacteria (GNB) and 11(7.9%) were non-albicans Candida. The predominant bacterial isolate were Coagulase negative staphylococcus (CoNS) 49 (34.5%) followed by *Enterobacter cloacae* 22 (15.4%) and *Staphylococcus aureus* 20 (14%). The antimicrobial resistance profile of both Gram positive and Gram negative isolates showed a high prevalence of resistance among them. This study will provide the clinicians an update on high prevalence of multi-drug resistant isolates in the critical care units of the hospital.

Keywords: blood stream infections, critical care units, multi-drug resistance

1. Introduction
The condition can be life threatening in critically ill patients in intensive care units (ICUs) of the hospitals. The case fatality rate associated with BSIs in ICU patients is between 35% - 50% [1].
Blood stream infections (BSIs) are an important cause of morbidity and mortality worldwide.
Risk factors contributing to these infections are many but leading causes are intravascular catheters (IVCs), debilitating condition of the patients due to some underlying infection [2, 4].
Emergence of resistance among the bacterial pathogens causing these infections is another issue of the public health concern. Studies have shown that there is a wide range of bacteria, both Gram negative and Gram positive which are associated with this infections [5, 8]. The diagnosis of these infections can easily be made with blood culture and since blood is a sterile fluid, the positive predictive value of a blood culture is high. Early identification of the causative pathogen and start of appropriate treatment can significantly reduce the morbidity, hospital stay and mortality among patients with BSIs.
This study was carried out in Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh, India to know the spectrum of bacterial pathogens causing BSIs in the patients admitted to the critical care units and also to know the trends of resistance among these agents.

2. Materials and methods
A prospective study was conducted over a period of one year (May 2016 to March 2017) at the Clinical Microbiology Laboratory at Chhattisgarh Institute of Medical Sciences, Bilaspur, Chhattisgarh, India. The data was collected by reviewing the records of 565 patients admitted to various critical care units (ICUs) of the hospital from May 2016 to March 2017. The samples of these patients were routinely processed for blood culture in the department of Microbiology.
Data collection included age & sex of the patients, the results of the blood culture and antimicrobial sensitivity testing (AST).
Blood samples were collected from the patients taking all aseptic & antiseptic measures. For all samples was performed after disinfection of vein puncture site with 70% alcohol followed by 2% tincture iodine. Five of blood was collected

for adults and 2 ml for paediatric age group which was then inoculated in brain heart infusion (BHI) broth 50 ml and 10 ml respectively. Blood culture bottles were incubated at 37ºC aerobically for 24 hrs. followed by sub-cultures on a Blood agar plate and Mac-Conkey's agar, Blood culture broth which did not show any signs of bacterial growth (hemolysis or turbidity) were reported negative after 7 days of incubation, after doing a final subculture. Isolates were identified by Vitek 2 Compact (Bio-merieux) using gram negative, gram positive and yeast identification cards and AST cards for sensitivity. Antibiotic sensitivity results were interpreted as per CLSI guidelines.

3. Results

A total of 565 blood samples of the patients suspected of bacteremia, admitted to critical care units of the hospital were processed routinely for blood culture in the department of Microbiology from May 2016 to March 2017. Out of these patients 379 were (67%) were males. Male to female ratio was approximately 2:1. Medium age of the patients was 43 years with a range from 1 day to 85 years. In our study total no of positive blood culture was 140. Out of these isolates 74(53%) were Gram positive bacteria (GPB) (Table -1) and 55 (39.3%) were Gram negative bacteria (GNB) (Table -2) and 11 (7.9%) were non-albicans Candida (Table -3).

Table 1: Gram positive isolated (53%)

SN	Organism isolated	Number of Organism isolated	% of Organism isolated
1	Coagulase-negative *staphylococcus*	49	35%
2	*Staphylococcus aureus*	20	14.3%
3	*Enterococcus*	5	3.6%

Table 2: Gram negative isolated (39.3%)

SN	Organism isolated	Number of Organism isolated	% of Organism isolated
1	*Enterobacter cloacae*	22	15.7%
2	*Klebsiella pneumoniae*	12	8.6%
3	*Escherichia coli*	8	5.6%
4	*Acinetobacter spp.*	8	5.6%

Table 3: Candida isolated

SN	Organism isolated	Number of Organism isolated	% of Organism isolated
1	*Non albican*	11	7.9%

The predominant bacterial isolate were Coagulase negative *staphylococcus* 49 (34.5%) followed by *Enterobacter cloacae* 22 (15.4%) and *Staphylococcus aureus* 20 (14%). In addition there were 11 isolates of Candida species, all non albicans with *Candida utilis* (9) being the predominant species followed by *Candida tropicalis* (2). All blood stream infections were due to a single organism only.

Antibiotic susceptibility patterns: Antibiotic resistance patterns of the isolates recovered from blood cultures. Among Gram positive bacterial isolates, 100% isolates of CONS and *Enterococcus* and 85% isolates of *Staphylococcus aureus* were resistant to penicillin and oxacillin. However most of the GPB were sensitive to teichoplanin, daptomycin and linezolid and 100% were sensitive to vancomycin.

Among Gram negative bacterial isolates, *Enterobacter cloacae* and *Klebsiella pneumonia* were dominant species in descending order. Third generation cephalosporins showed a very weak activity against them carbapenem resistance was detected in 64% isolates of *Enterobacter cloacae* and in 92% of *Klebsiella pneumonia*. 100% stains of both species were multidrug resistant (MDR) most of their strains were sensitive to both tegicycline and colistin.

4. Discussion

Patients admitted to the critical care units of the hospitals are always at a higher risk of developing nosocomial BSIs which results in high morbidity and mortality among these patients. This study was done to know the spectrum of pathogens causing BSIs in the patients admitted to the critical care units of our hospital and also to know the trends of resistance among them.

The results of the study showed the microbial profile of the blood stream infections as well as the resistance pattern of the isolates as follows. Out of total 565 patients samples, blood 140 were culture positive; the rate of isolation was 24.8% which was comparable to other studies from India. Slight variation may be due to many factors like geographical locations, patient type, timing and number of blood cultures or difference in blood culture system[9-11].

There is a wide range of organisms which can cause BSIs and same has been studied by many researchers. In our study 53% of the infections were caused by Gram positive bacteria and 39.3% were due to Gram negative bacteria. There are several studies from different parts of the world which show a higher prevalence of Gram-positive over Gram-negative organisms; a study by Wasihun *et al.* 2015[12] showed 72.2% of infections were caused by GPB and 27.8% by GNB, Dagnew *et al* 2013[13] at Gonder Ethiopia (69% and 31% respectively) and Obi and Mazarura in Zimbabwe 1996 (71.9% and 28.1%) [12, 14]. Among GPB, CoNS was the most frequently isolated pathogen and this has also been reported by other studies conducted in the country [15, 17].

On the contrary, in most of the studies from India and other developing counties, Gram-negative bacteria have been reported as the commonest cause of bacteremia in hospitalized patients; studies in India by Singh *et al* 2014 [15] with 51.82% GNB and 46.56% GPB and Alam *et al* in 2011 [16] and a Nigerian study by Nwadioha *et al*. 2010 [18] (69.3 GNB and

30.7% GPB) [15, 16, 18]. Candida was reported in 7.9% of positive blood culture and all were non albicans Candida species. Predominant specie was *Candida utilis* and all the 9 isolates were reported in neonates. There are only few cases in literature that has reported *Candida utilis* candidaemia in neonates [19].

In our study we also notice a significant number of cases with septicemia were in neonates. A higher rate of occurrence in neonatal septicemia has been reported by previous studies also [13, 20].

The antimicrobial resistance profile of both GP and GN isolates showed a high prevalence of resistance among them. CoNS *Enterococcus spp*. Isolates showed higher level of resistance to beta-lactam antibiotics than staphylococcus aureus. However all the three were sensitive to vanomycin which is similar to other studies.

Most of the Gram-negative bacteria were MDR with a very high resistance to beta-lactam antibiotics. Among Gram negative bacterial isolates, *Klebsiella pneumonia* were dominant species. Third cephalosporins Showed avery weakthem. Carbapenem resistance was detected in 64% isolates of *Enterobacter cloacae*. and in 92% of *Klebsiella pneumonia*. This might be due to inappropriate empirical use of meropenem as the first line treatment. As many as 8% isolates of *Klebsiella pneumonia* and 12% of *Acinetobacter spp* were even resistant to colistin.

5. References

1. Mathur P, Varghese P, Tak V. Epidemiology of Blood Stream Infections at a Level-1 Trauma Care Center of India. J Lab Physicians. 2014; 6(1):22-27.
2. Russotto V *et al.* Bloodstream infections in intensive care unit patients: istribution and antibiotic resistance of bacteria. Infection and Drug Resistance, 2015; 8:287-96.
3. Taylor G, Buchanan-Chell M, Kirkland T, Mckenzie M, Wiens R. Long term trends in the occurrence of nosocomial blood stream infection. Can J Infect Dis, 2000; 11:29-33.
4. Passerini R, Ghezzi T, Sandri M, Radice D, Biffi R. Tenyear surveillance of nosocomial bloodstream infections: Trends of etiology and antimicrobial resistance in comprehensive cancer centre. E cancer medical science, 2011; 5:191.
5. Asrat D, Amanuel Y. Prevalence and antibiotic susceptibility pattern of bacterial isolates from blood culture in Tikur Anbessa hospital, Addis Ababa. Ethiopia. Ethiop Med J, 2001, 39:97-104.
6. James AK, Mark EJ, Deborah CD, Clyde T, Daniel FS, Gregory AV *et al.* Prevalence and antimicrobial susceptibilities of bacteria isolated from blood cultures of hospitalized patients in the United States in 2002. Ann Clin Microbio Antimicrobi, 2004, 3:1-8.
7. Rina K, Nadeem SR, Kee PN, Parasakthi N: Etiology of blood culture isolates among patients in a multidisciplinary teaching hospital in Kuala Lumpur. J Microbiol Immuno Infect, 2007; 40:432-437.
8. Manjula M, Pyria D, Varsha G. Antimicrobial susceptibility pattern of blood isolates from a teaching Hospital in north India. Japan J Infec Dis. 2005; 58:174-176.
9. Ali J, Kebede Y. Frequency of isolation and antimicrobial susceptibility pattern of bacterial isolation from blood culture in Gondar University Hospital. Ethio Med J. 2008; 46(2):155-161.
10. Arora U, Devi P. Bacterial profile of blood stream infections and antibiotic resistance pattern of isolates. JK Sci., 2007; 9:186-190.
11. Sharma M, Goel N, Chaudhary U, Agarwal R, Arora DR. Bacteraemia in children. Indian J Pediatr, 2002; 69:1029-32.
12. Wasihun AG, Wlekidan LN, Gebremariam SA *et al.* Bacteriological Profile and Antimicrobial Susceptibility Patterns of Blood Culture Isolates among Febrile Patients in Mekelle Hospital, Northern Ethiopia. Springer Plus, 2015; 4:314.
13. Dagnew M, Yismaw G, Gizachew M, Gadisa A, Abebe T, Tadesse T *et al.* Bacterial profile and antimicrobial susceptibility pattern in septicemia suspected patients attending Gondar University Hospital, Northwest Ethiopia. BMC Res Notes, 2013; 6:283.
14. Obi CL, Mazarura E. Aerobic bacteria isolated from blood cultures of patients and their antibiotic susceptibilities in Harare, Zimbabwe. Cent Afr. J Med. 1996; 42(Suppl,12):332-336.
15. Singh AK, Venkatesh V, Singh RP, Singh M. Bacterial and antimicrobial resistance profile of bloodstream infections: A hospital based study. CHRISMED Journal of Health and Research. 2014; 1(3):140-144.
16. Alam MS, Pillai PK, Kapur P, Pillai KK. Resistant patterns of bacteria isolated from bloodstream infections at auniversity hospital in Delhi. J Pharm Bioallied Sci., 2011; 3:525-30.
17. Khanna V, Mukhopadhayay C, Vandana KE, Verma M, Dabke P. Evaluation of central venous catheter associated blood stream infections: A microbiological observational study. J Pathog, 2013; 2013:936864.
18. Nwadioha I, Nwokedi EOP, Kashibu E, Odimayo MS, Okwori EE. A review of bacterial isolates in blood cultures of children with suspected septicemia in a Nigerian. Afr. J Microbiol Res. 2010; 4(4):222-225.
19. Lukić-Grlić A, Mlinarić-Missoni E, Skarić I, Vazić-Babić V, Svetec IK. Candida utilis candidaemia in neonatal patients. J Med Microbiol, 2011; 60:838-841.
20. Angyo IA, Opkeh ES, Opajobi SO: Predominant bacterial agents of childhood septicemia in Jos. Niger J Med, 2001; 10:75-77.
21. Soriano A, Marco F, Martinez JA, Pisos E, Almela M, Dimova VP *et al.* Influence of vancomycin minimum inhibitory concentration on the treatment of methicillin-resistant S. aureus bacteremia. Clin Infect Dis, 2008; 46:193-200.