"A Study on the Microbiological Profile of Blood Stream Infections in Patients Admitted in Intensive Care Unit in a Tertiary Care Hospital"

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Abstract:

Background: Blood stream infections (BSI) are the major cause of morbidity & mortality among patients admitted in Intensive care unit & surveillance of etiological agents in these infections are important for their prevention & treatment.

Aim and objectives: This study was taken in our institution to evaluate the prevalence of bactericidal in ICU patients in our setup.

Methods: A prospective study was conducted in tertiary care hospital. During the study all the patients were monitored for blood stream infection. Blood sample collected from suspected patient of blood stream infection for detection of causative organism & antimicrobial susceptibility pattern.. All bacteriological isolates were examined and confirmed by biochemical tests as per the standard operative procedures.

Results: A total of 314 blood samples, Blood culture was found to be positive in 27 (8.59%) cases. In BSI positive cases 17(62.29%) were males and 10(37.03%) were females. Maximum number of blood stream infections were from pediatric ICU (66.66%), followed by Medical ICU (33.33%). In the present study incidence of length of stay is more after five day of admission in ICU (74.07%). Total Culture positive cases were 27.Gram positive cocci were 15 (55.55%), Gram negative bacilli were 10 (37.03%) & Candida spp was isolated in 2 (7.40%) of cases. Among GPC, Staphylococcus aurous were 10 (66.66%) was most common organism. Gram negative organism were quite low 37.03% among them Klebsiella spp. (70%) was most common. The antimicrobial susceptibility pattern of isolated organisms showed high resistance to routinely used antimicrobial agents. Fever was presenting symptom in all 100% of cases in the present study. Also the patients with BSI presenting clinically had other conditions like Urinary symptoms & Respiratory distress were seen in 10% of cases.

Conclusion: The systemic approach by studying the culture of organisms from the foci and blood culture and the antibiotic profile may help the clinician to select appropriate empirical antimicrobial agents.

Keywords: Blood culture, Microbiological profile

Introduction

Blood stream infections (BSI) are the major cause of morbidity & mortality among patients admitted in Intensive care unit & surveillance of etiological agents in these infections are important for their prevention & treatment. Blood stream infection is the infection that required one or more cultures positive for a bacteria or a fungus of blood samples obtained in the presence of fever(>380C) not attributable to other causes(based on US centers of Disease control & prevention[1]. Community acquired Bacteremia (CAP) was defined if the first positive blood culture was obtained before or within 48 hours of hospitalization. Blood stream infections are considered to be nosocomial if signs & symptoms of these infections became evident after 48 Hours following hospital admission and/or if the patient had been hospitalized during the 2 weeks before the current admission. The invasion of microorganisms in the circulating blood pose a major threat to every organ in the body leading to serious consequences including shock, multiple Organ failure, DIC & Death. Blood stream infections with primary diseases admitted in ICU are Infective Endocarditis, CAP (community acquired pneumonia), Uro-sepsis & Meningitis [2]. BSI with Secondary Bacteremia are infections resulting from health care interventions such as Vascular catheter insertion, infection following Urinary catheter related sepsis, infection of Surgical sites & infection arising out of hospital acquired or ventilator associated pneumonia. Vascular access devices are inserted in critically ill patients for the maintenance of fluid Electrolyte Balance, administration of Drugs, maintaining nutritional requirements, monitoring vital parameters, promoting vital organ support & doing essential investigation[3]. The only way to avoid infections from this intervention is strict attention to asepsis during insertion of vascular access devices, regular review of each vascular channel so that they are kept as long as essential. The use of Chlorhexidine-

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based preparations & insertion of Central line through the Subclavian access reduce infection rate [4, 5].

The patients with BSI manifest clinically with systemic signs of infection such as Fever, Leucocytosis, raised inflammatory markers. Blood cultures obtained from both peripheral &vascular access device are to be taken within 15 minute.[6]detects CR-BSI .So the patients in ICU with sepsis are empirically treated with Glycopeptide antibiotics like Vancomycin to cover Gram positive pathogens (Methicillin resistant Staphylococcus aureus and S.epidermidis). In many cases of CRBSI removal of vascular access device is the mainstay of treatment to prevent further complication [2, 3]. According to one American study, the incidence of Bacteremia in critical care settings was estimated to be 3 cases per 1000 population [7] with Mortality rate between 20 % to 50 % & Mean mortality rate of 28.6%. . The most common bacteria isolated from patients in ICU are gram positive aerobic bacteria (S.aureus, Enterococcus) and gram negative aerobic bacteria (Enterobacteriaceae, Pseudomonas aeruginosa) & the common fungi include Candidaalbicans in both immune competent & immune compromised patients [2]. CONS which were previously considered as contaminants have increased in clinical importance & are now recognized as pathogens [4, 8]. They are the etiologic agents of catheter associated bacteremia in patients with Vascular & other prosthesis. So judging its clinical significance is very challenging. Blood cultures are the most important laboratory test performed in the diagnosis of serious infection and leads to a definitive diagnosis against the causative organisms. So the Blood culture is considered as the gold standard for the detection of bacteremia. This study was taken in our institution to evaluate the prevalence of Septicaemia in ICU patients in our setup. It is done to ascertain the importance of Blood culture examination for the detection of BSI in ICU patients that helps in treating and decreasing is the morbidity & mortality due to Community acquired & Nosocomial Blood stream infections. There is considerable increase in incidence of vascular infection caused by bacteria that are normally considered a virulent. So it is important to distinguish between contaminants & pathogen.

Material and Methods

This is a prospective study in tertiary care hospital. Samples are collected from different ICUs (Pediatric ICUs, **medica** ICU) at Tertiary care Hospital, patient having at least one of the following criteria: Patient has a recognized pathogen cultured from one or more blood cultures and the organism cultured from blood is not related to an infection at another site or Patient has at least one signs or

symptoms like raise respiratory rate, abnormally rise heart rate, low or high blood pressure, fever (> 38°C) or hypothermia, rigors, chills, severe local infections

(Pneumonia, endocarditic, intra-abdominal suppuration, pyelonephritis, meningitis, etc...) Or At least one of the Common skin contaminant (e.g, Bacillus sp., micrococci, Coagulase-negative staphylococci or Diphtheria's) is isolated from two or more blood cultures collection on separate occasions. The Signs and symptoms of nosocomial infection appear after 48 hours of hospital admission, and there are no any signs and symptoms of infection at the time of admission confirm by history and clinical examination of patient. Blood was collected from clinically suspected cases blood stream infection following strict aseptic precautions. Withdraw 5 ml of an adult or about 2ml from a young child Blood was inoculated aseptically into 50ml(for adult) & 20ml (for pediatric) Glucose broth (1:10 ratio). After that culture bottles were incubated at 37°C aerobically in incubator and periodic subcultures done in solid media like, Mac Conkey agar media, blood agar media and chocolate agar media after overnight incubation on day 1, day 3, for isolation. The growth obtained was identified by conventional biochemical test. [7] And isolated organism's Antibiotic Susceptibility Testing was done by Kirby-Bauer disk diffusion method by using Mueller Hinton agar plate. The turbidity of broth containing test organism compare with 0.5 McFarland standard and it inoculate a Lawn culture on a Muller Hinton agar plate The inoculated plated was allowed to dry for few minutes in room temperature with lid closed and then the appropriate antibiotic discs were placed on the agar surface with the sterile forceps and pressed gently to make sure that the disc was in even contact with the medium. The discs were placed in such a way that they were 15mm away from the edge of the plate and the distance between each disc was not less than 25mm. Only 6 discs were placed per petri plate then plates were incubated at 37°C aerobically overnight. Interpretation of result measured as susceptible, Intermediate or resistant identified by measuring diameter of the zones as per as per CLSI guidelines. Utilisation of drug is an–amikacin, g – gentamycin, ba/ct - co-trimoxazole, cip / rc – ciprofloxacin, ctx – ceftriaxone, cf – cefotaxime, nr – norfloxacin, slb/as - ampicillin/sulbactam, pc – piperacillin, ch –chloramphenicol, ci – ceftizoxime, zn – ofloxacine, pr – cephalexin, az – azithromycin, lz – linezoid, cx –cloxacillin, te – tetracycline

Results

A total of 314 blood samples, Blood culture was found to be positive in 27 (8.59%) cases.

Table 1: Distribution of positive blood culture

Blood Culture	No. of cases	%
Positive	27	8.59
Negative	287	91.4

Blood culture was found to be positive in 27 (8.59%) cases. In BSI positive cases 17 were males and 10 were females. Most common age group associate

with BSI was <10 years (85%) and the next common age group were 10 to 20 years (8%).

Table 2: Age and gender wise distribution of positive cases

Age	No. of cases			Percentage
	Male	Female	Total	%
<10	14	9	23	85.18
20-Nov	1	1	2	7.4
21-40	1		1	3.7
41-60	1	-	1	3.7
>61	-	-	-	0
Total	**17**	**10**	**27**	**100**

Majority of the male cases belong to the age group of <10 yrs (85.33%) and the next commonest age group is 11 to 20 yrs (07.40%). Males outnumbered female in this study63% of cases were males and 37% of cases were females. Male outnumbered females in this study. Fever (100%) was present in all cases and blood culture positive cases. Also the patients with BSI presenting clinically had other conditions like Urinary symptoms & Respiratory distress were seen in 10% cases.

Table 3: Organisms isolated by Blood Culture in Bacteriaemic Patients (n=27)

Organisms	No. of cases (n=27)	%
Gram Positive Cocci	**15**	**74.07**
Staphylococcus aureus	10	66.66%
Staphylococcus epidermidis	4	26.66%
Enterococcus fecalis	1	6.66%
Gram Negative Bacteria	**10**	**37.03%**
Klebsiella pneumonia	7	70%
Pseudomonas aeruginosa	1	10%
Escherichia coli	1	10%
Acinetobacterspp	1	10%
Fungi	**-**	**-**
Candida albicans	**2**	**7.40%**
Total	**27**	**100**

Maximum numbers of blood stream infections were from pediatric ICU (66.66%), followed by Medical ICU (33.33%).In the present study incidence of length of stay is more after five day of admission in ICU (74.07%). Total Culture positive cases were 27.Gram positive cocci were 15 (55.55%) , Gram negative bacilli were 10 (37.03%) & Candida spp was isolated in 2 (7.40%) of cases. Among GPC, Staphylococcus aurous were 10 (66.66%) was most common organism. Gram negative organism were quite low 37.03% among them Klebsiella spp. (70%) was most common. The antimicrobial susceptibility pattern of isolated organisms showed high resistance to routinely used antimicrobial agents

Discussion

Blood stream infections are a major cause of morbidity and mortality among patients in intensive care units (ICUs). The cause of infection in ICU is multifactorial and consequences depends on pathogens associated, source of infection in ICU underlying risk factors, timely intervention and appropriate treatment received..
In the present study, majority of the patients admitted in ICU with clinical signs of sepsis were in the age group of <10 yrs. This results [Table 2] is in contrast with the study of Nishant Kumar et al,critical care 2020 9 in which majority of the patients were from 49-73 yrs and the mean age is 61 yrs. In another study done by Van Gestel et al10, 2004, majority of the patients belonged to the age group 64 ± 15 yrs and the male : female ratio is 1:7:1.

There was a male preponderance accounting for 62.96% in this study [Table3]. Orsi GB et al11, also reported similar results in which male accounted for 64.8% & females accounted for 35.2%. In another study done by Derek et al 200112, Males (56.1%) outnumbered females.

Fever was presenting symptom in all 100% of cases in the present study. Since the patients with BSI presenting clinically had other conditions like Urinary symptoms & Respiratory distress were seen in 10% of cases, tubercular infection in 16% and neurological manifestations in 8% of patients. Anemia (43%) was consistently present in majority of cases as in. In this study, blood stream infections were found to be positive in 27 (8.59%) of 314 cases. This is in contrast with the study of Jordivalles et al, 200913, in which the prevalence rate of blood stream infection was 30 - 40% of cases.Similar study by Pittet et al 200914&Rello et al 200915, also gave the prevalence of Bacteremia was 30%. Etiological agents of these studies correlated with our study where more commonly Gram positive bacteremia (74.05%) with CoNS being the most common isolates. Gram Positive bacteremia (74.04%) is greater than gram negative bacteremia (37.03%). Gram positive bacteria isolated from the BSI culture positive cases include (74.07%), CoNS (48.87%), Staphylococcus aureus (18.87%), Enter ococcus spp (7.40%). Gram negative bacteria accounted for 55.55 % of the isolates. Among gram negative with E.coli being the most common isolate. Gram negative bacteremia (55.55%) is lesser than gram positive bacteremia (74.07%). E.coli (14.81) Gram negative bacteria isolated from the BSI culture positive cases include Pseudomonas aeroginosa (4.17%), lebsiellapneumoniae

(4.16%), Acinetobacterspp (4.16%), Jamal et al162009 found that most common isolate in BSI was Coagulate negative staphylococci (46%). In a similar study done by Rello et al &Valles15 et al 2009, CONS accounted for 49.8% and Pseudomonas aeruginosa accounted for 32.6 % of the BSI which correlated well with this study. Similarly Ogstonet al162009 reported coagulate negative staphylococcus to be the most common isolate. In a study conducted in Brazilian hospital ICU & Staphylococcus aureus was found to be common isolate which was in contrast to our study. In the present study, aerobic gram positive cocci were isolated in (74.07)%, aerobic gram negative bacilli in 37.03%%. This correlates with the study done by S Bhattacharya et al17, 2002 where GNB accounted for 56.2 % & GPC accounted for 24%. From 27 BSI positive cases CONS was the most common pathogen isolated in 13 (48.8%) followed by Staphylococcus aureus (18.87%).In coagulase negative staphylococci, S. epidermidis was isolated in (48.28%) of cases and Enterococcus faecalis(7.40%) . E.coli was isolated in (14.81%), Klebsiella in (4.17%), Acinetobacter in (4.17%).

Conclusion

The systemic approach by studying the culture of organisms from the foci and blood culture and the antibiotic profile may help the clinician to select appropriate empirical antimicrobial agents.

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