Bloodstream Infections in Pediatric Population in a Tertiary Care Hospital

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ABSTRACT

Introduction: In paediatric patients blood stream infection (BSI) is the leading cause of mortality and morbidity. The emerging of causative agents and resistance to various antimicrobial agents are increased from time to time. The aim of this study was to describe the microbiological characteristics of BSI in paediatric patients (<12 years). Neonates were excluded.

Material and Methods: Data was collected from paediatric patients who had BSI. Blood culture was done in BacT Alert 3D. Isolates from these patients were identified on Vitek II Compact. Study was done between from January 2018 to December 2018 at Paediatric hospital GMC Srinagar.

Results: A total of 120 patients had BSI. All episodes were monomicrobial.78 (65%) were males and 42 (35%) were females. 67 (56%) of the isolates were Gram positive bacteria and 53 (44%) were Gram negative. The commonest Gram positive bacterial isolates were *Staphylococcus aureus* 52 (78%) followed by Coagulase negative *Staphylococci* (CoNS) 8 (12%), *Enterococcus fecalis* 4(6%) and *Streptococcus pneumonia* 3(4%).

Conclusion: Majority of the isolates were multidrug resistant. These higher percentages of multi-drug resistant emerged isolates urge us to take infection prevention measures and to conduct other large studies for appropriate empiric antibiotic choice.

Keywords: Bloodstream Infections, Pediatric Population

INTRODUCTION

Sepsis is a systemic illness caused by microbial invasion of normally sterile parts of the body. It is a serious, life-threatening infection that gets worse very quickly due to the spread of microorganisms and their toxins in the blood. It accounts for 10- 15% of nosocomial infections and is the second most frequent infection site representing 20% of all infections and the eighth leading cause of mortality in the United States.[1,2]

Blood stream infections are very common in the pediatric age groups which are one of the common causes of morbidity and mortality in neonates and children.[3] Blood stream infection may be transient bacteremia, an indication of true systemic infection (endocarditis, osteomyelitis and pneumonia) or otherwise, contamination from skin flora. Infants and children are among the most vulnerable population groups to contract illnesses because of their weak immune barrier Pediatric patients with BSI may present a diagnostic and therapeutic challenge where they often present with fever; however, sometimes they may present with normal or even low body temperature.[4,5]

The incidence of bacteremia in children varies widely. About 20–50% positivity has been reported by many studies. In general sepsis is a medical emergency that requires timely detection and identification of blood borne pathogens with urgent rational antibiotics therapy.[6,7,8,9]

One key determinant in the ultimate outcome of patients with sepsis is institution of early and appropriate antimicrobial therapy. It is a common practice to institute early empirical therapy with broad spectrum antibiotics in patients presenting with clinical features suggestive of septicaemia or bacteraemia given the severity of septicaemia, such empirical therapy may be justified, but the specific therapy based on the antibiogram of the isolate will definitely improve the therapeutic outcome.[10,11]

Thus, rapid detection and identification of clinically relevant microorganisms in blood cultures is very essential and determination of antimicrobial susceptibility pattern for rapid administration of antimicrobial therapy has been shown to reduce the morbidity and mortality associated with blood stream infections. Therefore, blood culture remains the mainstay of investigation of definitive diagnosis and management of blood stream infection in infants and children, despite recent advances in the molecular diagnosis of bacterial sepsis.[12,13,14]

The present study was undertaken to determine the bacterial flora of the blood stream infections in paediatric patients excluding neonates and their antibiotic susceptibility pattern.

MATERIAL AND METHODS

A hospital based cross-sectional study was conducted at Pediatric hospital in GMC srinagar after ethical clerence from the ethical board. Analysis of retrospective data on all blood cultures taken from pediatric patients <12 years of age during the year 2018 was done. Blood culture testing was carried out using Automated Blood Culture System (BacT/ALERT 3D from Biomerieux, Germany). It was a

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quantitative blood culture system, continuously monitoring the blood for bacteria and fungus every 10 min. It works on colorimetric detection of carbon dioxide (CO_2) produced by the organisms inside the blood culture bottles, which is sensed by a CO_2 sensor. Positive cultures are recognized by a computer-driven algorithm that monitors both initial and increased concentrations of CO_2. The bacterial isolates from the blood culture samples were identified by VITEK 2, which is an automated microbiology system utilizing growth-based technology. Antibiotic susceptibility profile was also determined by the same machine.

RESULTS

A total of 856 blood culture samples were taken from pediatric patients less than the age of 12 years during the year 2018 excluding the neonates. There were 120/856 (14%) positive blood cultures. All episodes were monomicrobial.78 (65%) samples were received from males and 42 (35%) were from females. Gram-positive organisms accounted for 67 (56%) of all positive cultures and Gram- negative organisms accounted for 53 (44%) of all positive cultures.

The commonest Gram positive bacterial isolates were *Staphylococcus aureus* 52 (78%) followed by Coagulase negative *Staphylococci* (CoNS) 8 (12%), *Enterococcus fecalis* 4(6%) and *Streptococcus pneumonia* 3(4%). Among Gram negative bacterial isolates the most common organisms were *Klebseiella pneumonia* 24(45%) followed by *Acinetobacter baumanni* 15 (28%), *Escherichia coli* 10 (18%), *Salmonella spp* and *Enterobacter cloacae* 2(4.5%) each

	Staph aureus	CoNS	Enterococcus fecalis
Ampicillin	0	0	50
Cefoxitin	28	50	-
Clindamycin	40	50	-
Cotrimoxazole	15	23	-
Vancomycin	100	100	100
Linezolid	100	100	100
Daptomycin	100	100	100
Tiecoplanin	100	100	100
Tigecycline	100	100	100

Table-1: Common Gram-positive isolates and their sensitivity in blood-n (%)

	Klebsiella pneumoniae	Acinetobacter baumani	Ecoli
Ampicillin	-	-	20
Ceftriazone	12.5	0	30
Pip/tazobactam	12.5	20	40
Amikacin	37.5	40	60
Gentamicin	0	20	60
Imipenem	25	40	80
Meropenem	37.5	40	100
Ciprofloxacin	0	0	60
Colistin	100	100	100

Table-2: Common Gram-negative isolates and their sensitivity in blood-n (%)

Among gram positive organisms the most sensitive antibiotics included Vancomycin, linezolid, daptomycin, teicoplanin and tigecycline with no case of resistance shown to these. Methicillin resistance was seen in 72% of *staph aureus* isolates and 50% of CoNS. Amongest Gram negative isolates only Colistin was uniformfly sensitive in all isolates. Ampicillin, Ceftriaxone, ciprofloxacin and piperacillin tazobactam showed higher degree of resistance (table-1,2).

DISCUSSION

The prevalence of blood stream infection varies across regions and even among hospitals in the same city.[15,16] Despite advances in diagnosis and treatment, bacterial sepsis remains a major cause of pediatric morbidity and mortality, particularly among neonates in developing countries. The causative agents of sepsis and their antibiotic susceptibility patterns also become varied from time to time and from place to place. Detection of bacteria in blood has an important role in diagnosis for a febrile patient; to establish the presence of infection, to reassure the clinician about the chosen empirical therapy, and to provide up-to date information on the local etiologic patterns and antibiotic sensitivities as this will guide the clinician in the management of the patient. Therefore for the effectual management of septicemia in children, study of bacteriological profile along with the antimicrobial sensitivity pattern plays a great role.

In this study, out of 856 blood cultures that were received in department from children who visited the study site with suspicion of septicaemia during the study period, blood culture confirmed septicaemia was 120 (14%). These findings are consistent with reports from other studies done in Tanzania (13.4%)[17] Uganda (17.1%)[18] but is lower than observed in studies done in Lahore (27.9%), Cameroon (28.3%), and Nigeria (22%).[19,20,21]

Gram-positive organisms accounted for 67 (56%) of all positive cultures and Gram- negative organisms accounted for 53 (44%) of all positive cultures. These finding are similar to several other studies done in Cameroon (56.2% versus 43.8%), Tanzania (82.1% vs 17.9%).[20,17] However other studies have shown a higher prevelance of Gram negative organisms ie Lahore (50.1% vs 47.5%) Uganda (58% vs 42%)[19,18]

Most common Gram positive isolate was *Staphylococcus aureus* 52 (78%) followed by Coagulase negative *Staphylococci* (CoNS) 8 (12%). Similar results were seen in a study done in Jimma & Jordan.[22,23]

Among Gram negative bacterial isolates the most common organisms were *Klebseiella pneumonia* 24 (45%) followed by *Acinetobacter baumanni* 15 (28%). Similar results were seen in studies done in Jordan, Nepal & Cameroon.[23,24,20] Staphylococcus aureus was the most resistant to Ampicillin (100%), Co-trimoxazole (85%) and cefoxitin (72%). This finding is similar with other investigators as reported by Mehta et al.[25]

CONCLUSION

The higher percentages of multi-drug resistant emerged

isolates urge us to take infection prevention measures and to conduct other large studies for appropriate empiric antibiotic choice.

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