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Bacterial Profile and Antibiotic Susceptibility Pattern of Blood Culture Isolates from Pediatric Age Group Attending A Tertiary Care Centre

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ABSTRACT

Blood stream infections (BSIs) are the major cause of morbidity and mortality in the pediatric age group, worldwide. There is changing trends in epidemiological profile of bacterial isolates as well as the antibiotic susceptibility pattern. Hence this study was done to determine bacterial profile and antibiogram of blood isolates of paediatric age group in a tertiary care. All blood cultures (n = 170), obtained during January 2013 to June 2013 from patients with fever in the Pediatrics department and neonatal intensive care unit (NICU) in a tertiary care centre were analyzed, and the susceptibility patterns were recorded. The positivity of blood culture was 29.5 % (50/170). Gram-negative organisms were isolated in 15 of 170 cases, with *Pseudomonas* spp., (n=4) *Klebsiella* spp., (n=4), *Escherichia coli* (n=3), *Salmonella* Typhi (n=1), *Flavobacterium* spp. (n=1), *Branhamella catarrhalis* (n=1), and *Proteus* sp (n=1). *Staphylococcus aureus* (n=28) and coagulase-negative *Staphylococcus* (CoNS, n=7) were the Gram-positive isolates recovered. Mostly 60-80% of the Gram-positive isolates were susceptible to cephalosporins, but to resistant to penicillin, cotrimoxazole and erythromycin. All the Gram-negative isolates were sensitive to amikacin. It is concluded that *Staphylococcus aureus* remains the principal organism responsible for sepsis in a tertiary care setting. Resistance to commonly used antibiotics was seen in more than 35% of isolates.
Keywords: Blood stream infections, Antibiogram, Gram positive isolates, Gram negative isolates.

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INTRODUCTION

Blood stream infections (BSIs) are the major cause of morbidity and mortality in neonates and children. There are several risk factors that make them susceptible to infection, such as prolonged rupture of membranes, prematurity, preterm labour, fetal distress, maternal fever or other evidence of infection, infants with indwelling vascular catheter, central lines, chest drains, noscomial infection, urinary tract infection, and intra abdominal foci. In developing countries the rate of BSIs is 20- 50%. Illnesses caused by BSIs ranges from self limited to life threatening sepsis and, as a result, timely detection of pathogen related to septicemia is important. In the present time, drug resistance is a major problem; the resistance pattern of isolates differs with different region time to time due to social, economical & technical reasons. Hence there is need for constant antimicrobial susceptibility surveillance. As these infections are caused by a wide range of organisms there is need to know the changing trends in epidemiological profiles and resistance patterns of isolates for a given period in the particular region for management of infections through appropriate empirical treatment.

MATERIALS AND METHODS

The study was conducted at the department of Microbiology during a period January 2013 to June 2013. A total of 170 samples were collected from the cases admitted in paediatric department and NICU with fever. One ml of blood from neonates and 5ml of blood from children were collected aseptically for culture. The specimens were inoculated directly into 10 ml and 50 ml of Brain Heart Infusion (BHI) broth [HiMedia, Mumbai, India] respectively. The inoculated broth bottles were incubated at 37°C in upright position. The subcultures were done on nutrient agar, blood agar and MacConkey agar plates on days 1, 2, 3, and 5. The colonies isolated were identified by Gram's stain, motility, catalase, oxidase and conventional biochemical tests. Antibiotic susceptibility pattern of the isolates was studied by using Modified Kirby Bauer disc diffusion technique. *Staphylococcus aureus* ATCC 25932, *Escherichia coli* ATCC 25922 and *Pseudomonas aeruginosa* ATCC 27853 were included as control strains for antibiogram testing.

RESULTS

During the 6 month study period, 170 blood cultures were analyzed. The distribution of species cultured from blood is reported in **Table 1**. Antimicrobial susceptibility patterns of the Gram positive and Gram negative blood stream isolates are shown in **Table 2** and **Table 3** respectively.

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Table1: Incidence and Distribution of Microorganism isolated from blood culture

Sl. No	Organism Isolated	Number (%)
1.	*Staphylococcus aureus*	28 (56)
2.	Coagulase negative *Staphylococcus*	7(14)
3.	*Pseudomonas* Spp.	4(8)
4.	*Klebsiella* spp.	4(8)
5.	*Escherichia coli*	3(6)
6.	*Salmonella* Typhi	1(2)
7.	*Branhamella catarrhalis*	1(2)
8.	*Flavobacterium* spp.	1(2)
9	*Proteus* spp.	1(2)
	Total	**50**

Table 2: Antibiotics susceptibility pattern of Gram positive bacterial blood isolates

Sno	ANTIBIOTIC	*Staphylococcus aureus*		Coagulase negative *Staphylococcus* (CoNS)	
		S (%)	R (%)	S (%)	R (%
1	Penicillin	8 (28.5)	20(71.4)	2(28.5)	5(71.5)
2	Amoxycillin	9(32.1)	19(67.8)	4(57.2)	3(42.8)
3	Amoxycillin/Clavulanic acid	20(71.4)	8(28.6)	6(85.7)	1(14.3)
4	Cotrimoxazole	11(39.2)	17(60.8)	2(28.5)	5(71.5)
5	Cephalexin	22(78.6)	6(21.4)	6(85.7)	1(14.3)
6	Cefazolin	23(82.1)	5(17.9)	6(85.7)	1(14.3)
7	Cefuroxime	24(85.7)	4(14.3)	6(85.7)	1(14.3)
8	Erythromycin	12(42.8)	16(57.2)	1(14.3)	6(85.7)
9	Chloramphenicol	**27(96.4)**	1(3.6)	**6(85.7)**	1(14.3)
10	Ciprofloxacin	22(78.5)	6(21.5)	5(71.5)	2(28.5)
11	Ofloxacin	21(75)	7(25)	5(71.5)	2(28.5)
12	Piperacillin	20(71.4)	8(28.6)	6(85.7)	1(14.3)
13	Tetracycline	26(92.9)	2(7.1)	4(57.2)	3(42.8)

Table 3: Antibiotic susceptibility pattern of Gram negative bacterial isolates in percentage

Gram negative isolates	NF	AT	CX	CZ	FX	CN	FR	OF	CI	AK	NA	GM	FU	CR
Resistant (%)	29	29	36	7	36	36	29	29	29	0	50	21	35	43
Susceptible (%)	71	71	64	**93**	64	64	71	71	71	**100**	50	79	64	57

Nf- Norfloxacin, AT- Aztreonam, CX- Cefotaxime, CZ-Ceftazidime, FX- Cefixime, CN- Cefdinir, FR-ceftriaxone, OF-Ofloxacin, CI- Ciprofloxacin, AK- Amikacin, NA-Nalidixic acid, GM- Gentamicin , FU- Nitrofurantoin, CR-cefuroxime

DISCUSSION

During the 6 month study period, 170 blood culture samples were analyzed. The positivity of blood culture was 29.5 % (50/170). The positivity rate is in accordance with the study of other workers.[2-5] However, the blood culture positivity rate was higher (43.78%) in a study from Mangalore, Karnataka.[6] Several researchers have studied the wide range of organisms that cause BSIs. In the present study, 70% of the infections were caused by Gram positive and 30% by Gram negative bacteria, which is in concordance with other studies.[4-8] In contrast many others have reported Gram negative organisms to be the more common cause of BSIs.[9,11] Blood culture positivity may vary due to the variation in the methods used or could be also due to regional variation.

Only a single pathogen each was isolated from the 50 positive blood cultures. Of the blood culture isolates, one organism was *Flavobacterium* spp., an unusual blood pathogen isolated from a female child who had jaundice. Although polymicrobial infection in BSIs have also been reported in various studies.[9,10] Most clinical bacteriologists failed to report polymicrobial sepsis because of misconception of contamination, ignorance of its significance or disregard for the second organism in an already positive culture.[11] However, there is a need to correlate the occurrence of polymicrobial sepsis with clinical outcome in septicemia. A patient already infected with one microbe may acquire the second one from the hospital environment or both the bacteria could be nosocomial in origin.[12]

In our study, overall 60-80 % of Gram positive isolates were resistant to penicillin, amoxicillin, cotrimoxazole and erythromycin, which is often used for initial and empirical treatment of staphylococcal infections. However, 65-90% of Gram positive isolates were susceptible to chloramphenicol, cephalosporin, ciprofloxacin, ofloxacin, azithromycin, amoxicillin, clavulanic acid and piperacillin.

Overall, 93% of gram negative isolates were sensitive ceftazidime; 70-90% were sensitive to commonly used antibiotics. *Proteus* spp. was the only strain resistant to all the drugs except amikacin. Further, all the Gram negative isolates were susceptible to amikacin.

In the present study, the organisms isolated were nevertheless highly susceptible to cephalosporins. But the high cost of cephalosporin group of drugs precludes their use as first choice in the treatment of septicemia. The fluoroquinolones, ofloxacin and ciprofloxacin were found to be effective against both Gram positive and Gram negative isolates.

CONCLUSION

In our setting, *Staphylococcus aureus* was the leading cause of BSIs, followed by CoNS, and gram negative isolates. Overall, quite a high percentage (30-35%) of the isolates cultured

were resistant to cephalosporins. Hence, rational use of antibiotic, proper infection control practices and antibiotic cycling may still help us to reduce emergence of antimicrobial resistance. Periodic analyses of local epidemiological profile and antibiogram pattern of isolates is mandatory to make antibiotic policies for treating the neonates and children empirically.

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