Original Research Article

Bacteriological Profile and Antimicrobial Susceptibility Pattern of Blood Culture Isolates Among Septicemia Suspected Children at PMCH Patna

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Abstract

Background: Bacterial infections remain an important cause of pediatric mortality and morbidity. It might be possible to reduce this by early diagnosis and proper management. When the body gets an infection, the immune system fights it. Sepsis happens when the immune system goes into overdrive and attacks the body's own organs and tissues. **Aim:**Bacteriological Profile and Antimicrobial Susceptibility Pattern of Blood Culture Isolates Among Septicemia Suspected Children at PMCH Patna.**Material and methods:** Blood culture reports were studied in 424 suspected septicemias in patients attending the pediatrics department, using the standard technique of Mackie and McCartney. The antibiotic sensitivity was performed by Kirby-Bauer's disc diffusion method. Risk factors for the sepsis were registered. Collected samples were processed at Department of Microbiology, PMCH, Patna.**Result:**Culture positivity was seen in 106 (25%) samples, and 317 (75%) samples were sterile. Gram-negative bacilli (GNB) were most common bacteria isolated 71%, followed by Gram-positive cocci (GPC) which comprises 29%, *E. coli* was the most commonly isolated 41.5% followed by Staph aureus 28.3%, followed by Klebsiella species 13.2%. Another organism isolated were Pseudomonas species 7.5%, Enterobacter 4.7%, Coagulase negative Staphylococcus 1.8%, Citrobacter 1.8% and Acinotobacter 0.9%. E Coli was the most common bacterial isolate in all the age groups of the study. Levofloxacin, linezolid, Ofloxacin, Vancomycin, Ampicillin &Amoxyclav were the most effective drugs for treating septicemia. In this study, it was seen that GPC were 100% sensitive to vancomycin and linezolid.**Conclusion:** Bloodstream infection is a challenging problem, and sometimes, it may be life threatening; therefore, timely detection, identification, and antimicrobial susceptibility testing of blood-borne pathogens are one of the most important functions of a diagnostic microbiology laboratory.

Keywords: Blood culture, septicemia

Introduction

Septicemia constitutes an important cause of morbidity and mortality in the pediatric age group. As with adults, when babies and children develop an infection, their immune system fights the invading culprit whether its bacteria or virus or a fungus. But sometimes, the immune system's response to an infection can spin out of control, leading to a life-threatening condition called septicemia. Sepsis is a serious condition at any age. It is particularly for children because their symptoms can be difficult to detect. Sepsis can develop from an injury as simple as an infected scratch on the arm or it may occur on the top of already life-threatening conditions such as acute appendicitis. Children who have weakened immune systems such as kids undergoing chemotherapy are more prone to develop sepsis. The best way to fight sepsis in infant and children is to prevent an infection from occurring in the first place. The Treatment of bloodstream infections is based on the knowledge of prevalent microorganisms and their antimicrobial sensitivity patterns. In this study[1,2], we aimed to detect the most prevalent microorganisms in the region and their antimicrobial sensitivity patterns.

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Aims & Objective

To perform bacteriological profile and antibiogram patterns of isolates from blood stream infections.

Material & Methods

This prospective study was carried out in the Department of Microbiology Patna Medical College Patna between March 2020 to Feb 2021 of patients belonging to the pediatrics age group (≤ 15 yrs.) Details like hospital identity, number, age, gender of the patients, and type and place of collection of specimens were recorded on a formatted proforma. Collected samples were processed at Department of Microbiology, PMCH, Patna. A total of 424 clinically suspected septicemia patients attending the Pediatrics department were included in the study. Sign and symptoms of sepsis included: temperature instability, nausea, vomiting, slurred speech, altered level of sensorium, insufficient urine production. Written and informed consent was taken from all who were willing to participate in this study and fulfilled the criteria.Blood was collected with all aseptic precautions from the bedside of the patients suspected of having bloodstream infection using a sterile syringe. The rubber cap of each of the culture bottles were immediately cleaned with 70% alcohol. The used needle was replaced with a new needle and then the venous blood was injected into Brain heart infusion and sodium thioglycolate broths in the ratio of 1 part of blood to 5 parts of the broth.The blood samples were categorized into three different age groups. Group A 0-28 days (Neonates), group B >28 days to < 1 year and group C 1 year to <15 years respectively. The blood culture bottles were immediately taken to the laboratory.

These were then incubated aerobically at 37^0 C for 7 days. Three subcultures were made at 24 hours, 72 hours and 7^{th} day was done on MacConkey agar, blood agar, Chocolate agar media and incubated in appropriate temperature and atmosphere. All the negative bottles were incubated for 7 days and another blind subculture was done at the end of 7th day of incubation before reporting them as negative. Gram staining was performed for the positive culture[3-5].Growths were identified using colony character, biochemical tests. Antibiotic susceptibility testing was performed according to Kirby- Bauer's disc diffusion methods and interpreted according to CLSI guidelines[6].

Identification of the bacterial isolates

Subculture was made on MacConkeyAgar , Blood Agar and chocolate agar from the incubated aerobically blood culture bottles. The organisms were identified as per standard protocol.

Gram-negative bacilli

The colony character on culture media was observed, and Gram staining, motility, and biochemical tests – indole, methyl red, Voges–Proskauer, citrate utilization, urease test, phenyl pyruvic acid test, triple sugar iron agar, oxidase, amino acids decarboxylase test, and sugar fermentation reaction – were conducted (Figure 1a and 1b).

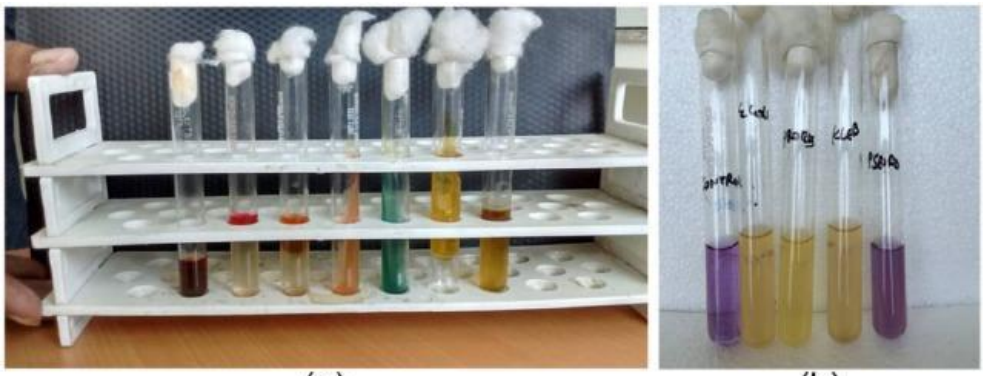

Fig 1(a),(b):Test conducted

IMVIC test for Escherichia coli and (b) fermentation test for GNB

Gram-positive cocci: On the basis of colony character, Gram stain, catalase test, and coagulase test.

Antimicrobial susceptibility testing: This was performed by Kirby Bauer disk diffusion method as per the Clinical and Laboratory Standards Institute (CLSI, [2013]) guidelines. The antibiotics disks were used as mentioned in Table 1

Table 1: Antibiotic for GPC

Antibiotic	Potency(µg)	Symbol
Amikacin	30	AK
Cefoxitin	30	CX
Clindamycin	2	CD
Erythromycin	15	E
Linezolid	30	LZ
Penicillin	10	P
Vancomycin	30	VA

Table 2: Antibiotic for GNB

Antibiotic	Potency(µg)	Symbol
Ampicillin	10	AMP
Ceftriaxone	30	CRT
Piperacillin/tazobactam	100/10	PIT
Gentamycin	10	GEN
Cefoperazone/sulbactam	75/30	CFS
Chloramphenicol	30	C
Ofloxacin	5	OF
Cefepime	30	CPM
Amikacin	30	AK

Results

This study was carried out from April 2020 to April 2021 with 424 non-repetitive blood samples collected from patients suspected of having bloodstream infections attending and admitted in Pediatrics Department, Patna Medical College & Hospital Patna. Among 424 patients 240 (56.6%) were males and 184 (43.4%) were females. Details like hospital identity, registration number, laboratory number, age and sex of the patients, and type and place of collection of specimens were recorded in a formatted proforma.

Culture positivity was seen in 106 (25%) samples, and 317 (75%) samples were sterile. Gram-negative bacilli (GNB) were most common bacteria isolated 71%, followed by Gram-positive cocci (GPC) which comprises 29%, *E. coli* was the most commonly isolated 41.5% followed by Staph aureus 28.3%, followed by Klebsiella species 13.2%. Another organism isolated were Pseudomonas species 7.5%, Enterobacter 4.7%, Coagulase negative Staphylococcus 1.8%, Citrobacter 1.8% and Acinotobacter 0.9%.

E Coli was the most common bacterial isolate in all the age groups of the study. Levofloxacin, linezolid, Ofloxacin, Vancomycin, Ampicillin & Amoxyclav were the most effective drugs for treating septicemia. In this study, it was seen that GPC were 100% sensitive to vancomycin and linezolid

Table 3:Comparison of different groups

Bacteria	Group-A	Group-B	Group-C	Total	Percentage
E. coli	25	10	9	44	41.5
S. aureus	13	9	8	30	28.3
Klebsiella	6	4	4	14	13.2
Pseudomonas sp.	3	2	3	8	7.5
Enterobacter	2	1	2	5	4.7
CONS	0	2	0	2	1.8
Citrobacter	1	1	0	2	1.8
Acinotobacter	1	0	0	1	0.9

Discussion & Conclusion

Bloodstream infection is a challenging problem, and sometimes, it may be life threatening; therefore, timely detection, identification, and antimicrobial susceptibility testing of blood-borne pathogens are one of the most important functions of a diagnostic microbiology laboratory. Delay in therapy initiation is associated with an average decrease in survival of 8%. In this study, the culture positivity of the blood culture was 25% were comparable to reported by various other authors (36%-56%). In the study conducted by Sharma et al. culture positivity was report ed to be as high as 56%[7]whereas in study conducted by Mondal et. al. positivity rate was reported 36%[8], which is comparable with the culture positivity reported in this study. In present study gram negative septicemia occurred in 71%, which was comparable to that observed by Mathur et.al[8] in his study followed by gram positive septicemia seen in 29%.The best way to fight sepsis in infants and children is to prevent an infection from occurring in the first place. It can be accomplished by frequent handwashing which will help to prevent the introduction of germs into the body. Vaccination is an important measure to prevent sepsis. Every child should be vaccinated for Diphtheria, tetanus, pertussis, measles and polio etc.Lastly, if the child receives timely medical treatment, there will be greater chance that sepsis can be avoided.

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