

Original Article

Assessment of prevalence of pathogens causing bacteraemia

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ABSTRACT:

Background: Bacteraemia means presence of microorganisms in circulating blood or blood stream. Septicaemia means multiplication of microorganisms and production of toxins in blood stream. The present study was conducted to assess prevalence of pathogens causing bacteraemia. **Materials & Methods:** 76 patients of clinically diagnosed blood stream infections admitted in various units such as intensive care units (ICU) and health care units of both genders was recorded. The blood samples were collected and processed by standard methods. Isolation and identification of organisms was done as per standard guidelines. **Results:** Out of 76, males were 46 and females were 30. Gram positive organisms isolated were staphylococcus aureus in 22, streptococcus pyogens in 10, coagulase negative staphylococci in 6, streptococcus pneumoniae in 4 and enterococcus species in 2 cases. The difference was significant ($P < 0.05$). Gram negative organisms isolated were Escherichia coli in 12, Klebsiella species in 5, Enterobacter species in 4, Citrobacter species in 3, Acinetobacter species in 5, Salmonella typhi in 2 and Proteus vulgaris in 1 case. The difference was significant ($P < 0.05$). **Conclusion:** Gram positive organisms isolated were staphylococcus aureus and streptococcus pyogens and gram negative organisms isolated were Escherichia coli and Klebsiella species.

Key words: Gram positive organisms, Klebsiella species, Staphylococcus aureus

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INTRODUCTION:

Bacteraemia means presence of microorganisms in circulating blood or blood stream. Septicaemia means multiplication of microorganisms and production of toxins in blood stream. Bacteraemia may be unimicrobial or polymicrobial.¹ Common pathogens causing bacteraemia are Staphylococcus aureus, Coagulase Negative Staphylococci, Streptococci pneumoniae, Enterococcus species, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus vulgaris, Enterobacter cloacae, Salmonella species etc., and rare organisms are Brucella species, HACEK groups (Haemophilus species, Actinobacillus actinomycetem comitans, Cardiobacterium hominis, Eikenella species and Kingella Kingae), Candida species etc.²

Due to symptom overlap bacteraemia is frequently misclassified as malaria and malaria is often over-diagnosed. Malaria may occur concomitantly with and has been indicated as a risk factor for bacteraemia.³ Yet, the World Health Organization's (WHO) guidelines for management of acute paediatric illness primarily focus on malaria and do not include BSIs in the diagnostic algorithm for fever in the absence of general danger signs. The timely detection of bacteraemia, followed by expeditious identification of pathogens and determination of

susceptibility to antimicrobial agents can have great diagnostic and prognostic importance.⁴

Neonatal sepsis is causing 9% of fatal cases. Apart from a few well-equipped hospitals, health facilities lack microbiological diagnostic capacities necessary to diagnose bacteremia and to isolate bacterial pathogens in order to allow targeted treatment. While public interest tends to focus on malaria, tuberculosis and HIV, the morbidity and mortality burden of systemic bloodstream infections are still insufficiently investigated.⁵ Prompt initiation of appropriate antimicrobial therapy is demonstrably important for preventing morbidity and mortality.⁶ The present study was conducted to assess prevalence of pathogens causing bacteraemia.

MATERIALS & METHODS:

The present study comprised of 76 patients of clinically diagnosed blood stream infections admitted in various units such as intensive care units (ICU) and health care units of both genders. The consent was obtained from all enrolled patients.

Data such as name, age, gender etc. was recorded. The blood samples were collected and processed by standard methods. Isolation and identification of organisms was done as per standard guidelines. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS:**Table I Distribution of patients**

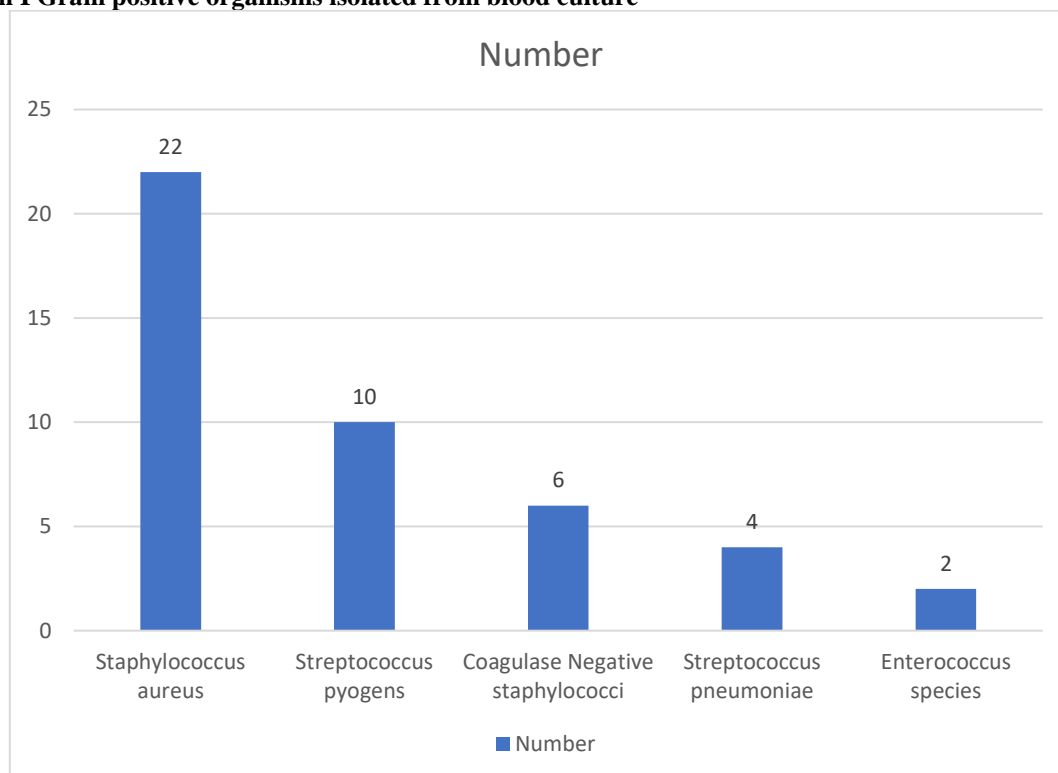
Total- 76		
Gender	Males	Females
Number	46	30

Table I shows that out of 76, males were 46 and females were 30.

Table II Gram positive organisms isolated from blood culture

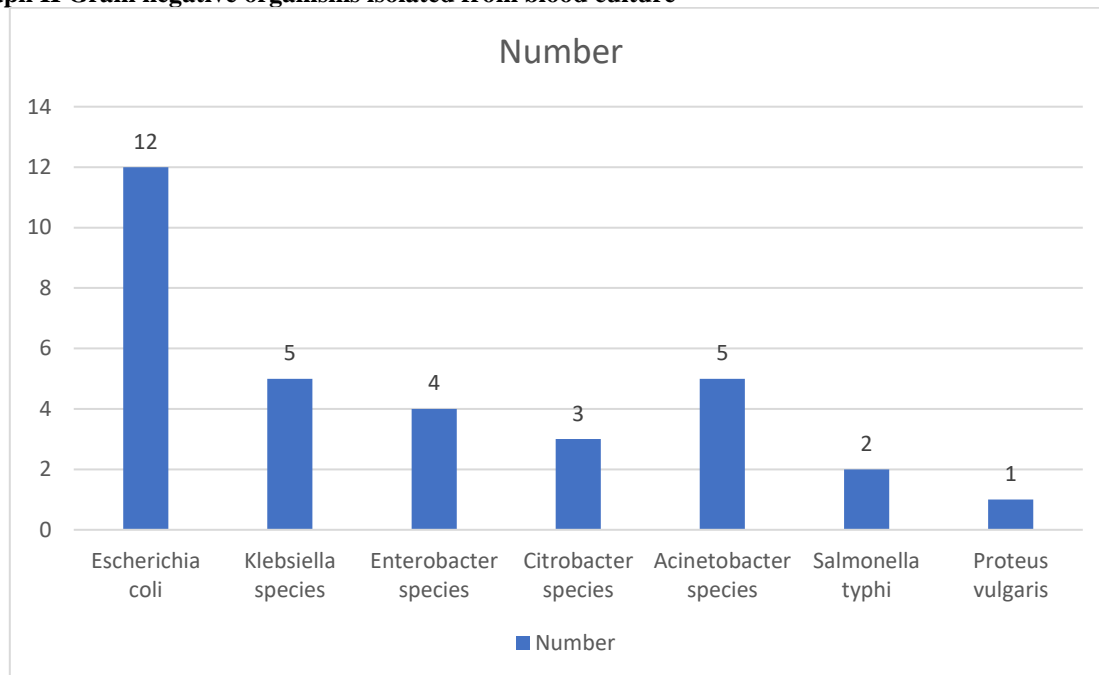
Gram positive organisms	Number	P value
Staphylococcus aureus	22	0.02
Streptococcus pyogens	10	
Coagulase Negative staphylococci	6	
Streptococcus pneumoniae	4	
Enterococcus species	2	

Table II, graph I shows that gram positive organisms isolated were staphylococcus aureus in 22, streptococcus pyogens in 10, coagulase negative staphylococci in 6, streptococcus pneumoniae in 4 and enterococcus species in 2 cases. The difference was significant ($P < 0.05$).

Graph I Gram positive organisms isolated from blood culture**Table III Gram negative organisms isolated from blood culture**

Gram negative organisms	Number	P value
Escherichia coli	12	0.01
Klebsiella species	5	
Enterobacter species	4	
Citrobacter species	3	
Acinetobacter species	5	
Salmonella typhi	2	
Proteus vulgaris	1	

Table III, graph II shows that gram negative organisms isolated were Escherichia coli in 12, Klebsiella species in 5, Enterobacter species in 4, Citrobacter species in 3, Acinetobacter species in 5, Salmonella typhi in 2 and Proteus vulgaris in 1 case. The difference was significant ($P < 0.05$).

Graph II Gram negative organisms isolated from blood culture**DISCUSSION**

The burden of disease attributable to bloodstream infections (BSIs) is insufficiently studied where few healthcare facilities have the capacity to identify invasive diseases.^{7,8} BSIs are increasingly recognized as an important cause of hospitalisation and mortality in the region, and studies indicate that the prevalence of and mortality in bacteraemia parallels or exceeds that of malaria.^{9,10} The present study was conducted to assess prevalence of pathogens causing bacteraemia.

We found that out of 76, males were 46 and females were 30. Isendehl et al¹¹ in their study blood cultures and malaria diagnostics was performed on 372 consecutive children presenting with tachycardia. Bacterial species detection, antimicrobial susceptibility testing and molecular typing were performed. The capacity of clinical parameters to identify bacteraemia was evaluated. Results: The prevalence of bloodstream infection was 12% (46/372) and in 46% (21/46) of the infections the child was non-febrile at presentation to the hospital. The predictive value for bacteraemia was poor for all assessed clinical parameters. *Staphylococcus aureus* accounted for 54% (26/48) of the isolates followed by non-typhoidal *Salmonella*, 10% (5/48), *Streptococcus pneumoniae*, 8% (4/48), and *Salmonella Typhi*, 6% (3/48). Among *S. aureus* there was a large diversity of spa types and 38% produced Pantone-Valentine leukocidin. Antibiotic resistance was low, however two out of three *Klebsiella pneumoniae* isolates produced extended-spectrum beta-lactamases. Malaria was laboratory confirmed in only 5% of the children but 64% (237/372) received a clinical malaria diagnosis.

We found that gram positive organisms isolated were *staphylococcus aureus* in 22, *streptococcus pyogens*

in 10, coagulase negative staphylococci in 6, *streptococcus pneumoniae* in 4 and *enterococcus* species in 2 cases. Karlowsky et al¹² prevalence rate in neonatal age group was 8.7% admitted in NICU. The most organisms isolated in blood culture were *Pseudomonas* species were (40%) followed by *Klebsiella pneumoniae* (20%), CoNS (20%), *Streptococci* species (10%) and *Enterococci* species (10%). A recent study shows, septicemia continues to be a major cause of neonatal mortality and morbidity worldwide. In India, the National Neonatal Prenatal Database (NNPD) reported an incidence of 8.5 per 1000 live births for blood culture proven sepsis for the year 2002–2003. As high as 47.5% - 64% incidence of bacteraemia were reported in neonates previously with gram negative organisms such as *Klebsiella* being the main isolate.

We observed that gram negative organisms isolated were *Escherichia coli* in 12, *Klebsiella* species in 5, *Enterobacter* species in 4, *Citrobacter* species in 3, *Acinetobacter* species in 5, *Salmonella typhi* in 2 and *Proteus vulgaris* in 1 case. Nielson et al¹³ found that among 1,196 hospitalized children, 19.9% (n=238) were blood culture positive. The four most frequent isolated pathogens were nontyphoidal salmonellae (NTS) (53.3%; n=129), *Staphylococcus aureus* (13.2%; n=32), *Streptococcus pneumoniae* (9.1%; n=22) and *Salmonella* ser. Typhi (7.0%; n=17). Yearly cumulative incidence of bacteremia was 46.6 cases/1,000. Yearly cumulative incidences per 1,000 of the four most frequent isolates were 25.2 (CI 21.1–29.4) for NTS, 6.3 for *S. aureus*, 4.3 for *S. pneumoniae* and 3.3 for *Salmonella* ser. Typhi. Wasting was positively associated with bacteremia and systemic NTS bloodstream infection. Children older than three

months had more often NTS bacteremia than younger children. Ninety-eight percent of NTS and 100% of *Salmonella* ser. Typhi isolates were susceptible to ciprofloxacin, whereas both tested 100% susceptible to ceftriaxone. Seventy-seven percent of NTS and 65% of *Salmonella* ser. Typhi isolates were multi-drug resistant (MDR). Systemic bacterial infections in nearly 20% of hospitalized children underline the need for microbiological diagnostics, to guide targeted antimicrobial treatment and prevention of bacteremia. If microbiological diagnostics are lacking, calculated antimicrobial treatment of severely ill children in malaria-endemic areas should be considered.

CONCLUSION

Authors found that that gram positive organisms isolated were staphylococcus aureus and streptococcus pyogens and gram negative organisms isolated were Escherichia coli and Klebsiella species.

REFERENCES

- Pittet D, Li N, Woolson RF, and Wenzel RP: Microbiological factors influencing the outcome of nosocomial bloodstream infections: a 6-year validated, population-based model. *Clin Infect Dis* 1997;24(6):1068-1078.
- B Tarai, P Das, D Kumar, S Budhiraja. Comparative evaluation of paired blood culture (aerobic/aerobic) and single blood culture, along with clinical importance in catheter versus peripheral line at a tertiary care hospital. 2012;30(2):187-192.
- Horan TC, Gaynes RP. Surveillance of nosocomial infections. In: Mayhall CG, editor. *Hospital Epidemiology and Infection Control*. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2004:1659-1702.
- Edwin D. Pasumbal, and Adrian C. Peña. *Epidemiology and Outcome of Bacteremia at St Luke's Medical Center: A OneYear Prospective Study*.
- Diekema DJ, Beekmann SE, Chapin KC, Morel KA, Munson E, Doern GV. Epidemiology of nosocomial and communityonset bloodstream infection. *J Clin Microbiol* 2003;41(8):3655-3660.
- Weinstein MP, Towns ML, Quartey SM. The clinical significance of positive blood cultures in the 1990s: a prospective comprehensive evaluation of the microbiology, epidemiology and outcome of bacteremia and fungemia in adults. *Clin Infect Dis* 1997;24(4):584-602.
- Cheesbrough M. Microbiological tests. In: *district laboratory practice in tropical countries part-2, low price ed.* Cambridge; 2000:64-187.
- CLSI – Clinical and Laboratory Standards Institute 2012. Performance standards for antimicrobial susceptibility testing. Nineteenth informational supplement. Wayne, PA, USA. CLSI; 2012.
- S Bhattacharya Blood culture in India: A proposal for a national programme for early detection of sepsis. *IJMM* 2005;23(4):220-226.
- Adolf W. Karchmer. Nosocomial Bloodstream Infections: Organisms, Risk Factors, and Implications. *Clin Infect Dis* 2000;31(4):139–143.
- Isendahl J, Manjuba C, Rodrigues A, Xu W, Henriques-Normark B, Giske CG, Naclér P. Prevalence of community-acquired bacteraemia in Guinea-Bissau: an observational study. *BMC infectious diseases*. 2013 Dec;14(1):1-9.
- Karlowsky JA, Jones ME, Draghi DC, Thornsberry C, Sahm DF, Volturo GA. Prevalence and antimicrobial susceptibilities of bacteria isolated from blood cultures of hospitalized patients in the United States in 2002. *Ann Clin Microbiol Antimicrob* 2004;3:7.
- Nielsen MV, Sarpong N, Krumkamp R, Dekker D, Loag W, Amemasor S, Agyekum A, Marks F, Huenger F, Krefis AC, Hagen RM. Incidence and characteristics of bacteremia among children in rural Ghana. *PLOS* 2012;1-5.

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