

Original Research Article

<https://doi.org/10.20546/ijcmas.2017.611.139>

Bacteriological Profile and Antimicrobial Susceptibility Pattern of Blood Culture Isolates among Septicemia Suspected Children in a Rural Tertiary Care Hospital

Sreedevi Hanumantha and Nazeema Tabaseera*

Kodagu Institute of Medical Sciences, Madikeri – 571201, Kodagu, Karnataka, India

*Corresponding author

ABSTRACT

Blood stream infections are very common in paediatric age group and are one of the common causes of morbidity and mortality. Septicaemia gradually leads to serious consequences like shock, multi organ failure, DIC etc. Timely identification of causative pathogen by blood culture (*gold standard*) is important. Antibio gram also helps us to elevate consciousness on resistance problems and recognise prospect to decrease the use of inappropriate antibiotics. The study was undertaken to evaluate major bacterial isolates causing septicaemia and their antibiogram pattern. The present study was carried out on 252 clinically diagnosed septicaemia cases. The growth was identified by conventional biochemical tests. Antibiotic susceptibility test was done by modified Kirby – Bauer method. Drug resistant strains in primary screening were further processed for the detection of ESBL and MRSA strains. Bacteremia was more prevalent in ≤ 28 days children which was statistically significant. Majority of the female children showed significant bacteremia compare to male children. *K pneumonia* was more prevalent, *C. freundii* and *S. typhi* were the least prevalent bacteria. 50% of *S aureus* were MRSA which is matter of concern. Sepsis is a medical emergency which requires timely detection and identification of blood borne pathogens with urgent rational antibiotic therapy. Infants and children are the vulnerable population to contract illness because of their weak immune barrier. Antibiotic sensitivity pattern to common pathogens has been changing from day to day and it is important to have latest information for guiding local empirical

Keywords

Sepsis, Neonates, MRSA.

Article Info

Accepted:

10 September 2017

Available Online:

10 November 2017

Introduction

Blood stream infections are very common in paediatric age group and are one of the common causes of morbidity and mortality.^{2,5} Children with septicaemia present with fever, difficulty in breathing, tachycardia, malaise, refusal of feeds/lethargy which may gradually lead to serious consequences like shock, multi organ failure, DIC etc requiring rapid and aggressive antimicrobial treatment.⁵ Hence, blood stream infections constitute one of the

most serious situations and timely identification of causative pathogen by blood culture (*gold standard*) is important.

The success of recovery of microorganisms from blood depends upon specimen collection, methods, blood volume, number and timing of blood cultures, interpretation of results and type of patient population being served by laboratory. Adequate rational data

on bacterial pathogens causing neonatal sepsis along with their antibiogram aids the clinicians in the exponential treatment of infections prior to availability of antimicrobial susceptibility results. Antibiogram also helps us to elevate consciousness on resistance problems and recognise prospect to decrease the use of inappropriate antibiotics. Hence, the study was undertaken to evaluate major bacterial isolates causing septicaemia and their antibiogram pattern.

Materials and Methods

The present study was carried out between April 2012 and March 2013 in Department of Microbiology, Adichunchanagiri Institute of Medical Sciences, B.G.Nagara.

Under aseptic precautions, blood for culture and AST was collected from 252 clinically diagnosed septicaemia cases (Table 1). 1 ml from neonates and 5ml from children was collected and inoculated into 10 and 50 ml respectively into BHI broth (1:10 dilution). The culture bottles were incubated at 37° C aerobically and periodic subcultures were done onto Mac conkey's agar, Blood agar and Chocolate agar after overnight incubation on 3, 5, and on day 7. The obtained growth was identified by conventional biochemical tests.

Antibiotic Susceptibility Test: The standard disc diffusion test for susceptibility to routine antibiotics was done by modified Kirby – Bauer method. Zone sizes were measured and interpreted according to CLSI standards. Drug resistant strains in primary screening were further processed for the detection of ESBL strains and MRSA strains.

Results and Discussion

Chi-square test and ANOVA is applied for statistical analysis to show the association between bacteraemia.

Of the total 252 clinically diagnosed septicaemia cases culture positivity was seen in 26.9% which was in concordance with studies by Tiwari, Mehrotra, Negussie with 25%, 23.1%, 27.9% respectively.^{2,3,5} While others have reported higher rates of 43.78%, 44.4% and 72.7%.^{1,2,6}

In our study, bacteraemia was significant in females with 30.3% than males 23.07% which was statistically significant ($p < 0.01$). Whereas studies by Mehrotra *et al.*, Pooja *et al.*, Sarangi *et al.*, have reported higher rates in males.^{3,4,6}

According to age, bacteraemia was more prevalent in ≤ 28 days with 26.5% which was statistically significant ($p < 0.05$), and was in concordance with Sarangi *et al.*, with 46.3%.⁶ The isolation of gram negative organisms was 69.1% and that of gram positives was 30.8%, similar results have been given by studies of Tiwari *et al.*, Mehrotra *et al.*, Pooja *et al.*, Negussie *et al.*,^{2,3,4,5} While studies by Sarangi⁶ have reported higher incidence of gram positives (75%) than the gram negatives (59%). *K. pneumoniae* (32.3%) was more prevalent and *C. freundii* (4.4%) and *S. typhi* (4.4%) were the least prevalent in present study.

This was in concordance with the studies by Tiwari *et al.*, Mehrotra and Mishra.^{2,3} While studies by Pooja *et al.*, Negussie *et al.*, Enrera *et al.*, Bhaumik^{4,5,7,8} have reported higher incidences of *B cepacia*, *Serratia* species, *Enterobacter* species and *Pseudomonas* species respectively. 50 % of *S. aureus* were MRSA which is a matter of concern in present study (Table 2).

A similar high incidence of MRSA was reported by Pooja *et al.*, (52%)⁴, Negussie *et al.*, (38.5%)⁵, Kumar *et al.*, (17.2%)⁹, Mehrotra and Mishra² and Tiwari *et al.*,³ with 33.33% respectively.

Table.1 Association between bacteraemia and demographic profile of study group

| Age Group | No of children | Positive cultures (no) | (%) |
|-----------------------|----------------|------------------------|--------|
| 1. ≤ 28 days | 162 | 43 | 26.5% |
| 2. >28 days – 2 years | 48 | 07 | 14.5 % |
| 3. > 2 – 12 years | 42 | 18 | 42.8% |
| Gender | | | |
| 1. Male | 117 | 27 | 23.07% |
| 2. Female | 135 | 41 | 30.3% |
| Total | 252 | 68 | |

Table.2 Distribution of pathogenic isolates obtained from blood cultures

| Bacterial Isolates | Number | (%) |
|-------------------------------|--------|-------|
| <i>Escherichia coli</i> | 13 | 19.1% |
| <i>Klebsiella pneumonia</i> | 22 | 32.3% |
| <i>Citrobacter freundii</i> | 03 | 4.4% |
| <i>Pseudomonas aeruginosa</i> | 06 | 8.8% |
| <i>Salmonella typhi</i> | 03 | 4.4% |
| <i>Staphylococci</i> | 12 | 17.6% |
| CONS | 09 | 13.2% |
| Total | 68 | |

Table.3 Antibacterial resistance pattern of the Gram positive blood stream isolates

| Antibiotics | <i>Staphylococcus aureus</i> (n=12) | | CONS (n=09) | |
|----------------|-------------------------------------|-------|-------------|-------|
| | No | % | No | % |
| Penicillin | 06 | 50% | 03 | 33.3% |
| Amoxyclav | 04 | 33.3% | 02 | 22.2% |
| Amikacin | 01 | 8.3% | 0 | 0 |
| Cefoxitin | 06 | 50% | 02 | 22.2% |
| Ciprofloxacin | 03 | 25% | 02 | 22.2% |
| Vancomycin | 0 | 0 | 02 | 22.2% |
| Gentamycin | 03 | 25% | 01 | 11.1% |
| Cefotaxime | 03 | 25% | 01 | 11.1% |
| Co-trimaxazole | 03 | 25% | NT | |

Table.4 Antibacterial resistance pattern of the Gram negative blood stream isolates

| Antibiotics | <i>Escherichia coli</i> | | <i>Klebsiella pneumonia</i> | | <i>Citrobacter freundii</i> | | <i>Pseudomonas aeruginosa</i> | | <i>S. typhi</i> | |
|-------------------------|-------------------------|------|-----------------------------|------|-----------------------------|------|-------------------------------|------|-----------------|------|
| | (n =13) No | % | (n = 22) No | % | (n =03) No | % | (n = 06) No | % | (n =03) No | % |
| Ampicillin | 08 | 61.5 | 06 | 27.2 | 01 | 33.3 | 0 | | 01 | 33.3 |
| Amoxyclav | 05 | 38.4 | 09 | 40.9 | 0 | | 0 | | 01 | 33.3 |
| Amikacin | 0 | | 07 | 31.8 | 01 | 33.3 | 0 | | 0 | |
| Cotrimaxazole | 07 | 53.8 | 07 | 31.8 | 0 | | 0 | | 01 | 33.3 |
| Gentamycin | 02 | 15.3 | 03 | 13.6 | 0 | | 0 | | 0 | |
| Ciprofloxacin | 04 | 30.7 | 07 | 31.8 | 01 | 33.3 | 0 | | 02 | 66.6 |
| Cefotaxime | 08 | 61.5 | 07 | 31.8 | 01 | 33.3 | 03 | 50 | 0 | |
| Ceftazidime | 06 | 46.1 | 06 | 27.2 | 0 | | 04 | 66.6 | 01 | 33.3 |
| Imipenem | 0 | | 0 | | 0 | | 0 | | 0 | |
| Piperacillin+Tazobactam | 0 | | 02 | 9.1 | 0 | | 2 | 33.3 | 0 | |
| Ceftriaxone | 04 | 30.7 | 0 | | 0 | | 0 | | 0 | |

High resistance to Ampicillin was noted by most of *Enterobacteriaceae*. *Klebsiella* species showed highest resistance to almost all the drugs tested (Table 3) except Imipenem and Ceftriaxone. Among the other members of family *Enterobacteriaceae* except *S.typhi* and *C. freundii*, high resistance was seen to third generation Cephalosporins (Table 4).

Sepsis is a medical emergency which requires timely detection and identification of blood borne pathogens with urgent rational antibiotic therapy. Infants and children are the vulnerable population to contract illness because of their weak immune barrier. Antibiotic sensitivity pattern to common pathogens has been changing from day to day and it is important to have latest information for guiding local empirical choice of antibiotics.

References

Bhaumik. P. V, Purav. G. P, Payal. R. N, Mitesh.P. H, Piyusa P. H, Mahendra V.M. Bacteriological profile and antibiogram of gram negative organisms

isolated from medical and neurology intensive care unit with special reference to multi- drug resistant organisms. Nat J Med Res 2012; 2(3):335-8.

Enrera J.A, Alcantara T Y, Shammari A A, Rashidi A E F A, Edelee H A A and Rashidi S M A. Antibiogram of bacterial isolates at Hail general hospital, KSA June 1- December 31, 2012. IOSR-JNHS 2015; 4(1):21-6.
 Kumar. S, Joseph. N, Eason. J, Singh.R, Umadevi. S and Pramodini.S *et al.*, Prevalence and current antibiogram of *Staphylococci* isolated from various clinical specimens in a tertiary care hospital in Pondicherry. Internet J Microbiol 2012; 10(1):1-6.
 Mehrotra. A, Mishra. S. Determination of the causative agents of bacteremia in children under 5 years and their susceptibility pattern to the antibiotics. Global J Med Res 2014; 14(1):19-23.
 Negussie A, Mulageta. G, Bedru A, Ali I, Shimeles D, Lema T *et al.*, Bacteriological profile and antimicrobial susceptibility pattern of blood culture isolates among septicemia

- suspected children in selected hospitals Addis Ababa, Ethiopia. *Int J Biol Med Res.* 2015;6(1):4709-17.
- Parashar. S. coagulase negative *Staphylococcus* : a cause of nosocomial blood stream infection. *IJSR* 2014; 3(6):277-78.
- Pooja. R, Sowmya. K. N, Shrikala. B, Radhakrishna. M and Keerthiraj Bele. A spectrum of Bacterial Pathogens and its Antibiotic Susceptibility pattern Isolated from Neonatal Sepsis in an NICU in a Government Paediatric Hospital. *Int. Res. J. Biological Sci* 2015; 4(5):50-4.
- Prabhu. K., Bhat. S, Rao. S. Bacteriologic Profile and Antibigram of Blood Culture Isolates in a Pediatric Care Unit. *JLP* 2010; 2(2):85-7.
- Sarang K.K, Pattnaik. D, Misra S. N, Nayak M.K, Jena. J. Bacteriological profile and antibiogram of blood culture isolates done by automated culture and sensitivity method in a neonatal intensive care unit in a tertiary care hospital in Odisha, India. *Int J Adv Med* 2015; 2(4): 387-92.
- Tiwari DK, Golia S, K.T Sangeetha, C. L Vasudha. A study on the bacteriological profile and antibiogram of bacteremia in children below 10 years in a tertiary care hospital in Bangalore, India. *JCDR* 2013; 7(12):2732-35.

How to cite this article:

Sreedevi Hanumantha and Nazeema Tabaseera. 2017. Bacteriological Profile and Antimicrobial Susceptibility Pattern of Blood Culture Isolates among Septicemia Suspected Children in a Rural Tertiary Care Hospital. *Int.J.Curr.Microbiol.App.Sci.* 6(11): 1167-1171. doi: <https://doi.org/10.20546/ijcmas.2017.611.139>