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

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Introduction

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. Antibiogram 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

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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 5 ml 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. While others have reported higher rates of 43.78%, 44.4% and 72.7%. 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.

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%. 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., While studies by Sarangi 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. While studies by Pooja et al., Negussie et al., Enrera et al., Bhaumik 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%) Negussie et al., (38.5%) K. pneumoniae (32.3%)

Kumar et al., (17.2%) 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**

| Gender | No of children | Positive cultures (no) | (%)   |
|--------|----------------|------------------------|-------|
| 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 | (%)   |
|-----------------------------|--------|-------|
| *Escherichia coli*          | 13     | 19.1% |
| *Klebsiella pneumonia*      | 22     | 32.3% |
| *Citrobacter freundii*      | 03     | 4.4%  |
| *Pseudomonas aeruginosa*    | 06     | 8.8%  |
| *Salmonella typhi*          | 03     | 4.4%  |
| *Staphylococci*             | 12     | 17.6% |
| CONS                        | 09     | 13.2% |
| Total                       | 68     |       |

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

| Antibiotics | *Staphylococcus aureus* (n=12) | CONS (n=09) |
|-------------|--------------------------------|-------------|
|             | No    | %    | No    | %    |
| Penicillin  | 06    | 50%  | 03    | 33.3%|
| Amoxyclov   | 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                  | Escherichia coli (n =13) | Klebsiella pneumonia (n = 22) | Citrobacter freundii (n =03) | Pseudomonas aeruginosa (n = 06) | S. typhi (n =03) |
|------------------------------|--------------------------|------------------------------|-----------------------------|--------------------------------|-----------------|
| Ampicillin                   | 08                       | 06                           | 01                          | 0                              | 01              |
| Amoxyclav                    | 05                       | 09                           | 0                           | 0                              | 0               |
| Amikacin                     | 0                        | 07                           | 01                          | 0                              | 0               |
| Cotrimaxazole                | 07                       | 07                           | 0                           | 0                              | 0               |
| Gentamycin                   | 02                       | 03                           | 0                           | 0                              | 0               |
| Ciprofloxacin                | 04                       | 07                           | 01                          | 0                              | 02              |
| Ceftaxime                    | 08                       | 07                           | 01                          | 03                             | 50              |
| Ceftazidime                  | 06                       | 06                           | 0                           | 04                             | 66.6            |
| Imipenem                     | 0                        | 0                            | 0                           | 0                              | 0               |
| Piperacillin+Tazobactum       | 0                        | 02                           | 0                           | 2                              | 33.3            |
| Ceftriaxone                  | 04                       | 0                            | 0                           | 0                              | 0               |

High resistance to Ampicillin was noted by most of *Enterobacteriaciae*. *Klebsiella* species showed highest resistance to almost all the drugs tested (Table 3) except Imipenem and Ceftriaxone. Among the other members of family *Enterobacteriaciae* 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.

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