ORIGINAL ARTICLE

NOSOCOMIAL BACTERAEMIA IN CHILDREN
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ABSTRACT: In this study 2500 children admitted to tertiary care hospital Gulbarga were observed for nosocomial bacteraemia for 1 year. The blood sample for culture is collected from patient who developed fever 48 hours or more after admission. Incidence of nosocomial bacteremia is 101(4%). The following microorganisms are isolated (Table-1). Staphylococcus aureus is commonest 34(34%) followed by Klebsiella pneumoniae 27(27%), coagulase negative staphylococcus 18(18%), Escherichia coli 14(14%), Pseudomonas aeruginosa 8(8%). Intravenous catheters are a major source of nosocomial blood stream infection. The risk factors for nosocomial bacteraemia are intravenous catheters and mechanical ventilation.

KEYWORDS: Bacteraemia, Nosocomial infection.

INTRODUCTION: The aim of this study was to analyze the hospital data on hospital acquired bacteraemia in children – the pathogens involved, the antibiotic susceptibility pattern and the most common risk factor for hospital acquired bacteraemia.

MATERIAL AND METHODS: Blood cultures were done from patient who developed fever 48 hours or more after admission in tertiary hospital Gulbarga for one year.

For convenient analysis patient were divided into four groups:

| Group  | Description                     |
|--------|---------------------------------|
| I      | 0-1 month old (neonates)        |
| II     | 1 month – 1 year old           |
| III    | 1-5 year old and                |
| IV     | 5-14 years old                 |

0.5ml of blood was inoculated in 5ml of trypticase soy broth with 0.05% liquoid for group-I. Two to three ml of blood was inoculated in 20-30 ml of the same medium, for other groups. Bottles were incubated at 37°C for 10 days. Four subcultures were made, first after 24 hours, then at 72 hours, on the 6th day and on the 10th day, on blood agar and MacConkey agar plates. Organisms were identified by standard methods – Gram staining, motility and various biochemical reactions. Antibiotic sensitivity test of the isolated were performed on Mueller-Hinton agar plates by the disc method of Kirby-Bauer.

RESULTS: Out of the 2500 children admitted in hospital, 101 showed bacterial growth. Incidence of bacteraemia in children is 4%. The incidence is more in neonatal and infants and also mortality is more in age group-I. The table-1 shows the organism isolated.
Table 1: Microorganism isolated

| Organisms                              | Number | Percentage |
|----------------------------------------|--------|------------|
| Staphylococcus aureus                  | 34     | 34         |
| Klebsiella pneumoniae                  | 27     | 27         |
| Coagulase negative staphylococcus      | 18     | 18         |
| Escherichia coli                       | 14     | 14         |
| Pseudomonas aeruginosa                 | 8      | 8          |
|                                        |        | 101        |

Staphylococcus aureus is commonest and the strains are multidrug resistant. Coagulase negative staphylococcus are isolated from Group-I. Coagulase negative staphylococci, formerly regarded harmless inhabitants of the skin and mucosal linings, are now recognized as a major cause of nosocomial infections in neonates. The skin of new born babies is colonized by CONS during the first days after birth. CONS account for a major part of nosocomial bacteraemias, especially those events related to the insertion and maintains of intravascular catheters and risk factors are premature infants, length of stay in the NICU. Klebsiella pneumoniae is isolated more from the age group-II.

Ciprofloxacin, Cefuroxime and Cefotaxime proved to be some effective antibiotics against gram negative bacilli. Polymyxin-B and Ceftazidime showed the highest efficacy of 100% against pseudomonas aeruginosa. Methicillin (cefoxitin) resistance was noted in 6% of staphylococcus aureus and 6% of coagulase negative staphylococcus (Table 3a and 3b).

Table 2: Incidence of bacteraemia in children according to age group

| Groups | Bacteraemia | Percentage |
|--------|-------------|------------|
| I      | 40          | (40%)      |
| II     | 45          | (45%)      |
| III    | 10          | (10%)      |
| IV     | 6           | (6%)       |

Table 3a: Antimicrobial susceptibility of Staphylococcus aureus isolated 34

| Antibiotic     | Staphylococcus aureus isolated 34 | Coagulase Negative Staphylococcus-18 |
|----------------|-----------------------------------|-------------------------------------|
|                | No | Percentage Sensitivity | No | Percentage Sensitivity |
| Penicillin     | 5  | 14                        | 3  | 17                        |
| Cefoxitin      | 32 | 94                        | 17 | 94                        |
| Erythromycin   | 15 | 44                        | 9  | 50                        |
| Ampicillin     | 17 | 50                        | 6  | 33                        |
| Chloramphenicol| 10 | 29                        | 8  | 44                        |
| Cephalexin     | 20 | 60                        | 13 | 72                        |
| Cotrimoxazole  | 20 | 60                        | 10 | 55                        |
DISCUSSION: Incidence of nosocomial bacteraemia in children is 4%. Incidence and mortality is more in neonatal and infants. Our prevalence is much less compared to the report of Karpuch J et al.1 Guha DK et al, study showed blood culture rate was 64.8%, Klebsiella species commonest pathogen. In our study Klebsiella species 2nd commonest and is present in age group 2.2 Winchester PD et al have studied on Bactek PED medium, in their Staphylococcus aureus is predominant followed by enterobacter.3 The risk factor in neonates and infants is low birth weight especially those undergoing interventions such as mechanical ventilation. The finding of present study correlates with Guha DK et al.2 In addition to endogenous flora causing pneumonia, infection can also result from the use of contaminated respiratory equipment.

Fierer J et al, study shows Pseudomonas aeruginosa infection among infants in neonatal ICU that are associated with carriers of organisms on the hand of health care workers4. Colonization of throat in children may occur in hospital. The organism is transmitted by respiratory droplets or direct oral contact with colonized individuals.
Beck Sague CM et al showed that infants in NICU, the blood stream is most frequent site of nosocomial infection followed by pneumonia and CONS is predominant organism. For reducing nosocomial infection, standard labor room and nursery manual should be followed and proper aseptic precaution maintained in the hospital.

When analyzed by age, there was a much higher incidence in the first year of life than in older children, a fact that has been reported previously and probably related to immaturity of the immune system.

Another risk factor for nosocomial bacteraemia is vascular catheter sepsis. The risk of catheter associated sepsis increases by 1-2% per day after 72 hours. Skin flora migrates along the dermal tunnel and settles in the fibrin sheath that forms in 3 days around the intravascular portion of the catheter. Silicon catheters are less thrombogenic and show fewer tendencies to form a fibrin sheath. CONS is commonest catheter induced sepsis in children, similar study is done by Gray JE et al. Goldmann DA et al showed that Cons commonest organism isolated due to catheters that can be left in place for very long period.

Our study differs from Chaturvedi et al, as it shows Klebsiella SpS predominant and our study shows Staphylococcus is predominant.

CONCLUSION: The incidence of nosocomial bacteraemia in infants is more. The risk factors are low birth weight, immature immune system. The risk factors for all age group are contamination of respiratory equipment and vascular cannula. The source of infection is exogenous or colonization of throat from hospital environment.

For reducing nosocomial infection, standard labor room and nursery manual should be followed rigidly and proper aseptic precautions maintained in the hospital.

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