Bacteriology of Early Onset Neonatal Septicaemia in a Tertiary Care Hospital

Munagala Venkata Krishna D.N.B¹, P. Muni Lakshmi M.D²

¹Assistant Professor, Department of Paediatrics, Narayana Medical College, Nellore, A.P., India
²Assistant Professor, Department of Microbiology, Narayana Medical College, Nellore, A.P., India

Abstract: Neonatal sepsis is the commonest causes of neonatal mortality in the developing world. Aims & Objective: To determine the bacteriological profile of neonatal septicemia, their antibacterial susceptibility pattern. Materials &Methods:A total of 486 neonates(< 1 week of age) suspected septicemia admitted in NICU enrolled over a period of 10 months. 1-2 ml of blood collected in aseptic conditions inoculated immediately into 5 ml of brain heart infusion broth with 0.025% Sodium polyanethol sulfonate as anticoagulant. The broths were subcultured after overnight incubation on chocolate agar, Mac Conkey agar and 5% sheep blood agar. organisms isolated kept for biochemical tests for confirmation then checked for Antibiotic sensitivity by Kirby-Bauer disk diffusion method. Results: Out of 486 cases studied, growth of bacteria was obtained in 44.03% blood samples. The most frequent offender was Klebsiella spp 25.7%, followed by E. coli 22.4% Enterobacter spp 18.6%, CONS 14.9%, S. aureus 11.2% and other less frequent isolates. Study of maternal risk factors revealed 30.8% of mothers had preterm labor, 22.4% had PROM and 1.4% had intra partum fever. The most frequent neonatal risk factor was low birth weight affecting 64% of the neonates. The antimicrobial susceptibility testing revealed that resistance to penicillin was frequent in S. aureus 95.8% and CONS 87.5% than in Enterococcus spp 33.3%. Resistance to amikacin was relatively uncommon in the former two isolates. None of the gram positive isolates were resistant to the glycopeptides - vancomycin and teicoplanin. Most of the gram negative isolates of Enterobacteriaceae family were resistant to ampicillin and amoxicillin.

Keywords: Septicemia, Kirby-Bauer disk diffusion, Antimicrobial resistance, Enterobacteriaceae, LBW.

1. Introduction

Septicemia continues to be a major cause of mortality and morbidity in neonates around the world.¹ It is responsible for 30-50% of the total neonatal deaths in developing countries²⁻³. Neonates are more vulnerable to infections because of weak immune barrier. Several risk factors have been identified both in the neonates and mothers. Early onset (within first week of life) neonatal sepsis is generally acquired from pathogens of maternal genital tract, whereas late onset sepsis (after first week till 28 days of life) acquired from the community or from hospital.⁴ PROM is considered as a major risk factor for sepsis which leads to ascending infection. Other factors are fever and infection of mother during labour, foul smell, meconium stained amniotic fluid, multiple gestations and caesarean section. Neonatal risk factors are prematurity, low birth weight, asphyxia and long stay in neonatal intensive care unit (NICU)⁵. The gold standard for diagnosis of septicemia is the isolation of organisms from the blood culture⁶. Number of organisms is described as causative agents of neonatal septicaemia and it has geographical alterations. Moreover, the isolated organisms are often resistant to multiple antimicrobial drugs which make the treatment difficult. Thus, there is the need for bacteriological monitoring in neonatal wards. The present study was undertaken to describe the spectrum of isolates in cases of neonatal septicemia, and their antimicrobial susceptibility pattern, to know the empirical treatment to reduce the morbidity and mortality rates in neonatal septicemia cases.

2. Materials and Methods

This study was done in Narayana Medical College & Hospital from March 2014 to December 2014. All neonates of either sex admitted in NICU with suspected clinical sepsis were included in the study. A total of 486 neonates (< 1 week of age) were enrolled. All the babies born to mothers with or without risk factors were prospectively enrolled. 1 to 2 ml of blood was collected from each patient under proper aseptic precautions and inoculated immediately into 5 ml of brain heart infusion broth with 0.025% Sodium polyanethol sulfonate as anticoagulant (HiMedia Laboratories, Mumbai). A second similar sample was obtained from a different site after few hours to rule out contamination with skin flora. The broths were subcultured after overnight incubation on Blood agar, Mac Conkey agar and Chacolate agar. Growth was identified by colonial characteristics and standard biochemical tests. Antimicrobial susceptibility testing was performed by the Kirby-Bauer disc diffusion method as per the NCCLS recommendations.

3. Results

Out of 486 cases studied, growth of bacteria was obtained in 214 (44.03%) blood samples. Multiple bacterial growth was obtained from 3 samples (1.4%). Total number of bacterial isolates was 217 and Candida spp. was isolated from 16 samples (3.3%). Of the bacterial isolates the most frequent offender was Klebsiella spp (25.7%). followed by E. coli (22.4%) Enterobacter spp (18.6%), CONS (14.9%), S. aureus (11.2%) and other less frequent isolates (Table 1). Study of maternal risk factors revealed 30.8% of mothers had preterm labor, 22.4% had PROM and 1.4% had intra partum fever. The most frequent neonatal risk factor was low birth weight affecting 64% of the neonates. The antimicrobial susceptibility testing revealed that resistance to penicillin was frequent in S. aureus (95.8%) and CONS (87.5%) than in Enterococcus spp (33.3%) (Table 3). Resistance to amikacin was relatively uncommon in the
former two isolates. None of the gram positive isolates were resistant to the vancomycin and teicoplanin. Most of the gram negative isolates of Enterobacteriaceae family were resistant to ampicillin and amoxyccillin. Resistance to cefotaxime ranged from 58% to 67.5% and that to ceftriaxone from 39.5% to 66% of isolates (Table 4). Resistance to amikacin was less frequent than resistance to gentamicin. Enterobacteriaceae were less frequently resistant to ciprofloxacin.

4. Discussion

Incidence of neonatal septicemia to vary between 36% to 55%. In our study, incidence of neonatal septicemia confirmed by culture was 44.03%. The varying microbiological pattern of neonatal septicemia emphasizes the need for having the knowledge about the causative organisms and their antibiotic sensitivity pattern. This is essential because the first antibiotic administered will not wait for the culture results. Empirical therapy is important to reduce morbidity and mortality associated with neonatal sepsis. In western countries, antibiotics of choice are directed towards group B Streptococcus and E. coli. But in tropical areas, early onset neonatal infections may be caused by multi resistant hospital acquired bacteria, which are transmitted during delivery by lack of hygiene. These organisms are usually resistant genera of Enterobacteriaceae family, Pseudomonas spp. And Staphylococcus. In our study, the most frequent isolate was Klebsiella (25.7%) and this was in accordance with other Indian studies. The spectrum of bacteria causing neonatal septicemia in our hospital is comparable to that of National Neonatal Perinatal Network Database report. Group B Streptococcus, as is evident from the same report, is not common in our country and we also did not isolate group B Streptococcus from our cases. An incidence of 14.9% for CONS in the first week of life is also a matter of concern. This bacterium is often regarded as a contaminant, possibly from the skin, but Leon et al opined that the presence of this bacterium in the blood can no longer be taken as contamination especially in patients in critical care units. Most of the cases detected by blood culture occurred in the first week of life (71.3%). This calls for close monitoring of the newborns especially those in high risk categories as soon as they are born. Administration of empiric antimicrobial therapy aimed at gram negative bacteria in suspected cases of neonatal septicemia is suggested. The major gram positive isolates viz. S. aureus and CONS were frequently found to be penicillin resistant. Resistance percentage to other antimiocobials like erythromycin, gentamicin, tetracycline and ciprofloxacin were above 40%. High frequency of resistance against these β lactam and non β lactam antibiotics have been seen in MRSA and MRCONS. None of our strains showed resistance against vancomycin or teicoplanin and these drugs therefore can be effectively used if methicillin resistance is suspected during treatment.

Gram negative isolates of Enterobacteriaceae family offered resistance to anti gram negative Penicillins as well as to extended spectrum cephalosporins in quite large numbers, making it clear that the use of these drugs alone may be ineffective. It was however interesting to note that ciprofloxacin resistance was less frequent among these bacteria. This fact was further supported by in vivo results of the drug as could be learnt from the clinical side. A study by Khaneja et al (1999) also found quinolones to be effective in the treatment of multidrug resistant gram negative infections in patients including premature and extremely low birth weight infants. The high frequency of resistance to β lactam antibiotics can well be due to their indiscriminate use as first line drugs. This can be avoided by using drugs to which most organisms were susceptible. In case of gram negative isolates, which turned out to be the major pathogens, ciprofloxacin and amikacin are good alternatives and they will also provide some economical relief to the patient.

5. Conclusion

To conclude Klebsiella was the most common gram negative pathogen in our study. We highlight the need of the knowledge about resistant patterns of the organisms to give empirical therapy for suspected cases of neonatal sepsis to reduce the morbity and mortality.

References

Tables:

4. Resistant pattern of Gram negative isolates

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<tr>
<th>Drugs</th>
<th>Klebsiella</th>
<th>E.coli</th>
<th>Enterobacter spp</th>
<th>Citrobacter spp</th>
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July 2002 Roy et al - Neonatal Septicaemia in Tertiary Care Hospital 159