



Incidence of Early Onset Septicemia, Isolation and Resistant Patterns of Causative Organisms: A Study in a Tertiary Care Hospital A.P. (Original Research Paper)

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Abstract

Septicemia is a major problem in neonates with multiresistant organisms.

Aim: *This study is aimed to know the prevalence and resistant patterns of the isolated organisms.*

Materials & Methods: *A total of 426 neonates (< 1 week of age) suspected septicemia admitted in NICU enrolled over a period of 6 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, MacConkey 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 426 cases studied, growth of bacteria was obtained in 44.1% of blood samples. Most frequent organism was Klebsiella spp (25.5%). followed by E. coli (22.3%) Enterobacter spp (18.6%), CONS (14.8%), S. aureus (11.7%). There is significant association with maternal & fetal risk factor like preterm labour and LBW. The antimicrobial susceptibility testing revealed that resistance to penicillin was frequent. Resistance to amikacin was not common for GPC. 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. Resistance to amikacin was less frequent than resistance to gentamicin. Enterobacteriaceae were less frequently resistant to ciprofloxacin.*

Conclusion: *Our study highlights the need of empirical therapy in neonates with risk factors and importance of knowledge about the causative agents and their sensitivity patterns to reduce the mortality rate of neonates.*

Key Words: *Septicemia, Kirby-Bauer disk diffusion, Antimicrobial resistance, Enterobacteriaceae.*

Introduction

Septicemia continues to be a major cause of mortality and morbidity among neonates around the world.¹ It is responsible for 30- 50% of the total neonatal deaths in developing countries^{2,3} Neonates are particularly vulnerable to infections because of weak immune barrier. Moreover several risk factors have been identified both in the neonates and in the mother which make them susceptible to infections. 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) has its origin either from the community or from hospital.⁴ PROM is considered as a major risk factor for sepsis due to danger of ascending infection. Other maternal risk factors are infection and fever of mother during labour, foul smell of amniotic fluid, meconium stained amniotic fluid, multiple gestations and caesarean section. Neonatal risk factors which have been shown to contribute to neonatal sepsis are prematurity, low birth weight, asphyxia, congenital anomaly and long stay in neonatal intensive care unit (NICU)⁵. The gold standard for diagnosis of septicemia is the isolation of bacterial agents from the blood culture⁶. A very wide spectrum of organisms has been described for cases of neonatal septicemia and this spectrum is subject to geographical alterations. Moreover, the organisms isolated are often resistant to multiple antimicrobials which make the treatment difficult. Thus, the need for bacteriological monitoring in neonatal wards cannot be overemphasized. The present study was undertaken to describe the spectrum of isolates in

cases of neonatal septicemia, and their antimicrobial susceptibility pattern.

Materials and Methods

This study was done in Narayana Medical College and Hospital over a period of 6 months. A total of 426 neonates (<1 week of age) suspected septicemia admitted in NICU were enrolled. All the babies born to mothers with or without risk factors were prospectively enrolled. One to two ml of blood was collected from each patient using 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 on the same day from a different site after few hours to rule out contamination with skin flora. The broths were subcultured after overnight incubation on chocolate agar, MacConkey agar and 5% sheep blood agar. A negative result was followed up by examining the broth daily and doing a final subculture at the end of 7 days or at appearance of turbidity, whichever was earlier. Any growth was identified by colonial characteristics and standard biochemical tests.⁷ Antimicrobial susceptibility testing was performed by the Kirby-Bauer disc diffusion method as per the NCCLS recommendations.⁸

Results

Out of 426 cases studied, growth of bacteria was obtained in 188 (44.1%) blood samples. Multiple bacterial growths was obtained from 2 samples (1.06%). Total number of bacterial isolates was 190

and *Candida* spp was isolated from 16 samples (3.7%). Of the bacterial isolates the most frequent organism was *Klebsiella* spp (25.5%). followed by *E. coli* (22.3%) *Enterobacter* spp.(18.6%), *CONS* (14.8%), *S. aureus* (11.7%).(Table:1) and other less frequent isolates. Study of maternal risk factors revealed 32.4% of mothers had preterm labor, 22.8% had PROM and 1.06% had intrapartum fever(Table:2). The most frequent neonatal risk factor was low birth weight affecting 67.5% of the neonates The antimicrobial susceptibility testing revealed that resistance to penicillin was frequent in *S. aureus*(90.9%) and *CONS* (85.7%) than in *Enterococcus* spp (50%)

.(Table: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. Resistance to cefotaxime ranged from 60% to 66% and that to ceftazidime ranged from 39.5% to 66% of isolates. Resistance to amikacin was less frequent than resistance to gentamicin. *Enterobacteria* were less frequently resistant to ciprofloxacin.(Table:4)

1.Disribution of organisms in total samples.

Organism	Total number	%
<i>Klebsiella</i>	48	25.5
<i>E.coli</i>	42	22.3
<i>Enterobacter</i> spp	35	18.6
<i>CONS</i>	28	14.8
<i>S.aureus</i>	22	11.7
<i>Citrobacter</i> spp	05	2.6
<i>Pseudomonas</i> spp	03	1.6
<i>Acinetobacter</i> spp	03	1.6
<i>Enterococcus</i> spp	02	1.06

2.Risk factors associated with EONS

Neonatal factors		Maternal factors	
Perinatal asphyxia	62(32.9%)	PROM	43(22.8%)
Prematurity	43(22.8%)	Intrapartum fever	02((1.06%)
Low birth weight	127(67.5%)	Preterm labour	61(32.4%)

3. Resistant pattern of Gram positive isolates

Drug	S.aureus	CONS	Enterococcus
Penicillin	20	24	01
Erythromycin	12	14	01
Cotrimaxazole	13	26	01
Cephalexin	06	04	02
Ciprofloxacin	16	15	01
Ceftriaxone	14	16	00
Gentamycin	10	18	01
Amikacin	02	09	01
Tetracycline	04	16	02
Vancomycin	00	00	00
Teicoplanin	00	00	00

4. Resistant pattern of Gram negative isolates

	Klebsiella	E.coli	Enterobacter spp	Citrobacter spp	Pseudomonas spp	Acinetobacter spp
Ampicillin	48	42	35	05	03	03
Amoxycillin	48	42	35	05	03	03
Cotrimoxazole	26	23	13	02	02	02
Tetracycline	32	28	30	04	03	03
Gentamycin	18	14	26	03	02	02
Amikacin	08	04	07	01	01	01
Cefotaxime	29	26	23	03	02	02
Ceftazidime	19	17	21	03	02	03
Ciprofloxacin	11	09	12	01	01	01
Amoxyclav	33	29	18	04	03	03
Imepenem	06	02	07	02	01	00

Discussion

Incidence of neonatal septicaemia to vary between 36% to 55%.⁹⁻¹¹ In our study, incidence of neonatal septicaemia confirmed by culture was 44.1%. The knowledge of the bacteriological spectrum is essential because the first antibiotic administered will not wait for the culture results and keeping in mind the high morbidity and

mortality associated with neonatal sepsis, a right choice for such empiric therapy is of utmost importance. 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*.¹²In our study, the most frequent isolate was *Klebsiella* (25.5%) and this was in accordance with other Indian studies.^{9,13} The spectrum of bacteria causing neonatal septicaemia 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 14.8% 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*¹⁴ opined that the presence of this bacterium in the blood can no longer be taken as contamination especially in patients in critical care units. Administration of empiric antimicrobial therapy aimed at gram negative bacteremia in suspected cases of neonatal septicaemia is suggested. The major gram positive isolates *S. aureus* and CONS were frequently found to be penicillin resistant. Resistance percentage to other antimicrobials 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 MRCNS.¹⁵ 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. A study by Khaneja *et al* (1999)¹⁶ 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, ciprofloxacin and amikacin are good alternatives .

Conclusion

Our study highlights the need of empirical therapy in neonates with risk factors and importance of knowledge about the causative agents and their sensitivity patterns to reduce the mortality rate of neonates.

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