Neonatal Septicemia: Bacterial Isolates & Their Antibiotics Susceptibility Patterns

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Abstract : Background: Septicemia remains a significant cause of morbidity and mortality in the newborn, more so in developing countries due to delivery and postnatal follow up in an unclean environment having more chance of contamination with infective organisms. Moreover these infants are deficient in their inherent protective mechanisms, humoral and cellular immunity. The changing pattern and frequent emergence of resistant bacteria make the problem more difficult. **Objectives:** (1) To know the etiology of septicemia in neonates. (2) To detect the antibiotic susceptibility pattern of the isolates. **Methods and Material:** Blood samples were collected aseptically from 303 newborns admitted in NICU, Sir T Hospital, Bhavnagar during Jan-2006 to August-2008 with sepsis. The specimens were inoculated into brain heart infusion broth & subcultures were performed. The isolates were identified by standard biochemical tests. Antibiotic sensitivity pattern of isolates was studied by Modified Kirby Bauer Disc diffusion technique. **Results:** A total 140 (46.20%) organisms were isolated. These included Klebsiella (66, 47.14%), Staphylococcus aureus (35, 25%), Coagulase negative staphylococci (CONS) (5, 3.57%), E.coli (15, 10.71%), Proteus (5, 3.57%), Acinetobactor (3, 2.14%), Pseudomonas (6, 4.28%) and Candida (5, 3.57%). Majority of organisms isolated were resistant to commonly used antibiotics. Maximum sensitivity was seen by Cefoperazone/sulbactum (97%) & Piperacillin/tazobactum (98%) for Gram negative organisms & Vancomycin(100%) for Gram positive organisms. **Conclusions:** Multi-drug resistance organisms were isolated from septicemia in neonates. Therefore great caution is required in selection of antibiotic therapy.

Key-words: Neonatal septicemia, antibiotic sensitivity test, Klebsiella

INTRODUCTION: Neonatal septicemia is an important cause of morbidity & mortality among neonates in India, with an estimated incidence of approximately 4% in intramural live births[1]. Septicemia in neonates refers to generalized bacterial infection documented by a positive blood culture in the first 4 week of life & is one of the four leading causes of neonatal mortality in India[2]. Prior to antibiotic era, the mortality from septicemia was 90%, but it declining to 24-58% after antibiotics came in use[3].

Hence, the present study was undertaken to study the bacteriological profile of neonatal septicemia cases and their antibiotic sensitivity pattern for planning strategy for the management of these cases.

MATERIALS AND METHODS: Blood specimens for culture were drawn from 303 newborns admitted in NICU, Sir T Hospital, Bhavnagar during Jan-2006 to August-2008 with sepsis. Two blood samples from each neonates approximately one or two milliliter of blood was collected using proper aseptic precautions & inoculated immediately into 5 ml of brain heart infusion broth with 0.025% sodium polyanethol sulfonate as anticoagulant. Bottles were incubated at 37^0C for 7 days. Four subcultures were made, first after 24 hr., then at 48 hr., at 72 hr. and on the 7th day on blood agar, MacConkey agar & chocolate agar[4]. Any growth was identified by colonial characteristics & standard biochemical tests[5]. Antibiotic sensitivity testing was performed by Modified Kirby-Bauer disc diffusion method as per CLSI recommendations[6].

RESULTS: Out of 303 cases studied, growth of bacteria was obtained in 140 (46.20%) blood samples. The incidence of Gram negative &

Gram positive organisms was 67.85% & 28.57% respectively. Candida also isolated in 3.57% of cases. Klebsiellae spp. & Staphylococcus aureus were the most common Gram negative & Gram positive organisms together accounting for 47.14% & 25% of the isolates respectively. Other common Gram-negative isolates were Escherichia coli (10.71%), Pseudomonas spp. (4.28%), Proteus spp. (3.57%) and other less frequent isolates. (Table – 1).

Table 2 and 3 show the antibiotic sensitivity patterns of organisms isolated. In most cases S.aureus was resistant to the commonly used antibiotics, including penicillin, cloxacillin & cefelexin. None of the Gram-positive isolates were resistant to vancomycin. Of the two aminoglycosides studied, amikacin scored over gentamicin in terms of sensitivity for S.aureus. Most of the Gram-negative organisms also were resistant to commonly used antibiotics. Ciprofloxacin were sensitive in about 50-60% of cases isolated. Newer combinations of antibiotics like piperacillin/tazobactum & cefoperazone/sulbactum were sensitive in more than 95% of cases.

Table 1. Number of microbial isolates from culture positive neonates. (n=140)

Isolates	Frequency of isolates (%)
Klebsiella spp.	66 (47.14)
Staphylococci aureus	35 (25)
Escherichia coli	15 (10.71)
Pseudomonas spp.	06 (4.28)
Proteus spp.	05 (3.57)
Acinetobacter spp.	03 (2.14)
CONS	05 (3.57)
Candida	05 (3.57)

Table 2. Antibiotic sensitivity patterns of Gram-positive isolates

Antibiotics	Resistant percentages of isolates	
	Organisms	
	Staphylococcus aureus	Coagulase negative staphylococci (CONS)
Amoxicillin	85.56	80.43
Erythromycin	49.12	53.50
Cephalexin	34.30	29.65
Gentamicin	45.00	48.25
Vancomycin	0.00	0.00
Ciprofloxacin	42.41	40.29
Amikacin	15.23	4.26

DISCUSSION: For the effective management of neonatal septicemia cases, study of the bacteriological profile with their antibiotic

pattern plays a significant role. In this study, blood culture positivity rate in neonatal septicemia cases was 46.20%, similar results found by Kumhar GD et al[7] and also by I roy et al[8].

In the present study Gram-negative organisms constituted the major group of isolates (67.85%) from neonatal septicemia cases, which correlates with the findings (59.8%) of Kumhar GD et al[7]. Among this group Kleibsella spp. has been found to be the prominent pathogen (47.14%), which correlates with the findings (47.1%) of Madhu Sharma et al[9].

Table 3. Resistance patterns of Gram-negative isolates.

Antibiotics	**Resistant percentages of isolates**			
	Organisms			
	Kleibsella spp.	Escherichia coli	Proteus spp.	Pseudomonas spp.
Amoxicillin	100	96	95	100
Co-trimoxazole	83.51	76.5	56.2	96.6
Gentamicin	76.3	83.4	77.2	69.2
Piperacillin/Tazobactum	2.1	1.42	2.71	2.3
Cefoperazone/Sulbactum	3.45	3.12	2.87	3.76
Cefotaxime	40.4	45	39.5	48.2
Ciprofloxacin	68.4	76,4	65	74.7
Ceftriaxone	28.7	32.5	23.4	20.3

A total 28.57% of Gram-positive organisms have been observed in our study, similar kind of results also find in I Roy et al8. Amongst the Gram-positive organisms Staphylococci aureus was the predominant pathogens (25%).

The results of antibiotic sensitivity pattern revealed that majority of Gram-negative organisms were resistant to commonly used antibiotics like amoxicillin. It has been shown that piperacillin/tazobactum & cefoperazone/ sulbactum were the two most effective antibiotics against Gram-negative organisms.

Majority of S.aureus was resistant to amoxicillin. Vancomycin still remains the most sensitive drug for S.aureus, not a single case of resistant was found against vancomycin, which

is a correlate with the findings of I Roy et al[8]. Resistant to amikacin is less in compared with gentamicin.

We did not distinguish between community & hospital acquired infections. Being a retrospective study of microbiological records, correlation with neonatal morbidity and mortality & other markers of sepsis was also not possible.

Neonatal septicemia is a life threatening emergency, and rapid treatment with antibiotics is essential for a favorable outcome. Classical empirical treatment of neonatal sepsis consists of amoxicillin & an aminoglycoside. In present study, S.aureus & Gram-negative isolates were frequently found to be resistant to amoxicillin & an aminoglycoside also, thus indicating that the use of these drugs might be ineffective. Therefore great caution is required in selection of antibiotic therapy. In the view of above the strategy of antibiotic usage in the hospital must be reviewed.

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