Research Article

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Clinical and bacteriological profiles of blood culture positive sepsis in newborns

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Abstract

Neonatal infections currently cause about 1.6 million deaths annually in developing countries1. Sepsis and meningitis is responsible for most of these deaths. This study was undertaken to determine the clinical presentations, bacteriological profiles and antibiotic sensitivity patterns of isolates from blood cultures of neonates admitted in a Neonatal Intensive Care Unit, Surat, Gujarat. All blood culture (n=460) were collected from neonates suspected for septicemia and were analyzed and their antibiotic sensitivity patterns were studied. The positive blood culture was 20.87% (96/460). Most (97.1%) of the sepsis was caused by single organism, while polymicrobial aetiology was observed in 2.9% cases. Among these isolates, Gram negative organisms were predominating t (53/96), while Gram positive isolates found in 43 cases (9 cases among which found to be caused by fungi, *C.albicans*). *E.coli* (n=32), and then *S.aureus* (n=25) were the leading cause of neonatal sepsis respectively. Among all maternal and neonatal risk factors preterm delivery, LBW and PROM >24 hrs were found significantly associated with sepsis in newborns included under study. Majority of newborns with neonatal sepsis presented with breathlessness (n=54) and refusal of feed (n=24). Most of the organisms showed sensitivity with amino glycosides (gentamicin and amikacin) but were resist to the nelidixic acid and third generation of cephalosporins. It is concluded *E.coli, Staphylococcus aureus*, and *Klebsiella* species remain the principal organisms causing neonatal sepsis and first line antibiotics like amino glycosides should be first choice of drugs. Prevalence of MDR knocking the emergence of prevention of neonatal sepsis and thereby mortality and keenly checked on the predisposing factors associated with it.

Key-Words: Neonatal sepsis**,** Antibiotic sensitivity patterns, Polymicrobial aetiology, M.D.R.

Introduction

Neonatal sepsis is a significant cause of neonatal morbidity and mortality in the newborn, particularly in preterm, low birth weight infants2, 3. According to World Health Organization (WHO) estimates, neonatal sepsis remains the major cause out of five million neonatal deaths per year4. The spectrum of organisms that causes neonatal sepsis changes over times and varies from region to region. This is due to the changing pattern of antibiotic use and changes in life style. The epidemiological data from other developing countries, however, shows important differences in the incidence, risk factors, pattern and antimicrobial sensitivities of pathogens and mortality from that of developed countries5,6,7.

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Group B streptococcal disease is the most important cause of neonatal sepsis in Europe and North America8 but there is a preponderance of gram-negative organisms in tropical and developing countries9. This study was conducted to determine the clinical presentations, bacteriological profiles and antibiotic sensitivity patterns of isolates from blood cultures of neonates admitted in N.I.C.U., Surat, Gujarat.

Material and Methods

Four hundred sixty blood samples were collected from neonates who were admitted to NICU, Surat, Gujarat and diagnosed clinically for septicemia. They were analyzed for the presence of bacteria during the period of September 2007 to April 2008.

Diagnosis of neonatal sepsis was based upon the antenatal high risk factors and signs and symptoms of sepsis. Neonatal sepsis was suspected in the following conditions:

At birth: All newborns (i) born to mothers with maternal fever, or prolonged rupture of membrane (>18

hours), or foul smelling or meconium stained liquor, or frequent unclean vaginal examination (>3), and/or (ii) having severe prematurity or birth asphyxia necessitating active resuscitation.

After birth: All neonates with lethargy, refusal to feeds, abdominal distention, respiratory distress, temperature instability (hypothermia/fever), jaundice, seizures, vomiting, and autonomic dysfunction etc.

Following procedures: All newborns undergone exchange transfusion.

Blood samples were collected in all cases for culture and sensitivity studies with all aseptic precautions and as per CLSI guidelines.

All suspected cases and their positivity were further divided into early onset sepsis (EOS) and late onset sepsis (LOS), on the basis of time of clinical presentation. Those presented within first 72 hours of life were diagnosed as EOS and after 72 hours of life as LOS.

Results and Conclusion

Among 460 suspected cases, blood culture positivity rate found was 20.87 %, whereas in 79.13% cases there was no growth. Out of 96 cases, 22% (n=21) had LOS and 78% (n=75) had EOS. Majority of newborns were delivered by normal vaginal delivery (n=77) compare to LSCS (n=19). Male to female ratio was 2.5:1. The patients' characteristic is depicted in Table 1.

For the effective management of neonatal sepsis, knowledge about bacteriological profiles and antibiotic sensitivity patterns play a vital role. In our study, we found that EOS was more common than LOS, consistent with other reports.10,11. However our finding is n contrast with the study where LOS was more common than EOS12. This discrepancy could be due to the fact that mortality in early-onset cases is relatively high13. Males have been reported to be 2 to 5 times more than females to develop neonatal sepsis13. The male to female ratio of 2.5:1 in our study is in agreement with the above study, may be due to a gender bias in presentation to hospital for care be unfair to ignore such isolates as contaminants.

In this study, blood culture positivity rate is 20%, whereas in 80% cases there was no growth. This finding is comparable with other reports14, 15. A low blood culture isolation rate could be due to administration of antibiotic before blood collection from the primary centers or the possibility of infection with anaerobes. A negative blood culture does not exclude sepsis and about 26% of all neonatal sepsis could be due to anaerobes16. In this study the predominant isolates was *E.coli* which is in contrast with other reports17,18. The report of the National Neonatal-Perinatal database showed *Klebsiella* as the predominant (29%) pathogen19. The clinical significance of relatively low virulence isolates, such as CONS is difficult to ascertain. These organisms can cause true bacteremia or their isolation may represent simple contamination. It would be unfair to ignore such isolates as contaminants. Most of the organisms are sensitive to aminoglycosides (Amikacin but not gentamicin) and resistant to third generation cephalosporins. In general, the resistance of the gram negative isolates to gentamicin could not supports continued use of this agent in the initial, empiric treatment of neonatal sepsis in hospitals, but combination of drugs such as Cefotaxime + sulbactum is advisable which do not fully supports WHO recommendations that management of young infants up to age 2 months include parenteral use of benzyl penicillin or ampicillin plus an aminoglycoside such as gentamicin20.

Thus, it is concluded that *E.coli*, *Klebsiella spp.* and gram positive *S.aureus* are the leading cause of neonatal sepsis and EOS were found predominantly compare to LOS and combined drugs could be the choice of therapy rather than using single antibiotic at higher/prolonged period.

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Table 1: Patients characteristic with neonatal sepsis

	Total(n=96)	EOS (n=75)	LOS (n=21)
Gender			
Male	**70**	**54**	**16**
Female	**26**	**21**	**04**
Gestation			
Preterm	**49**	**20**	**29**
Term	**37**	**27**	**10**
Post-term	**10**	**06**	**04**
Birth weight (g)			
<1500	**12**	**08**	**04**
1500-2500	**48**	**36**	**12**
>2500	**36**	**15**	**21**
Mode of delivery			
SVD	**77**	**59**	**18**
LSCS	**19**	**08**	**11**

Table 2: Clinical presentations of neonatal sepsis

Symptoms [n=96]	N	EOS (n= 75)	LO (n= 21)
Breathlessness	54	46	05
Not taking feed	25	12	00
Lethargy	18	09	19
Fever	16	08	12
Convulsion	12	04	14
Abdomen distention	12	04	09
Bleeding from any site	10	05	02
Jaundice	10	10	01
Vomiting	07	12	02
Decreased activity	06	02	04
Excessive crying	04	03	01
Diarrhea	02	01	01

Table 3: Organisms isolated from blood culture

Organisms	N	EOS (75)	LOS (21)
E.Coli	32	24	08
S.aureus	25	23	02
Klebsiella Spp	17	12	05
CONS	05	05	00
Streptococcus Spp	04	02	02
Pseudomonas Spp	04	03	01
Candida albicans	09	06	03

Table 4: Antibiotics sensitivity patterns in common isolates

	Name of organisms Isolated					
	E.Coli	***S.aureus***	***Klebsiella spp***	***CONS***	***Pseudomonas Spp***	***Streptococcus Spp***
Names of Antibiotic	**(% Sensitivity)**					
Amikacin	S=84.38 M=12.5 R=3.13	S=88.0 M=4.0 R=2.0	S=94.12 M=0.0 R=5.88	S=100	S=100	S=75.0 M=0 R=25.0
Augmentin	S=28.13 M=6.27 R=65.60	S=72.0 M=8.0 R=20.0	S=29.41 M=5.88 R=64.71	S=100	R=100	S=75.0 M=0 R=25.0
Ceftriaxone	S=59.38 M=15.63 R=24.99	S=40.0 M=0.0 R=60.0	S=35.29 M=0.0 R=64.71	S=80.0 M=0.0 R=20.0	S=0 M=25.0 R=75.0	S=50.0 M=25.0 R=25.0
Cefotaxime	S=56.25 M=28.13 R=15.62	S=36.0 M=0.0 R=64.0	S=35.29 M=0.0 R=64.71	S=80.0 M=0.0 R.20.0	S=0 M=25.0 R=75.0	S=50.0 M=25.0 R=25.0
Ceftazidime	S=68.75 M=6.25 R=25.0	S=44.0 R=52.0 M=4.0	S=52.94 M=5.88 R=41.18	S=80.0 M=0.0 R.20.0	S=50.0 M=0 R=50.0	S=75.0 M=25.0 R=0
Cefazoline	S=25.0 M=15.62 R=59.38	S=16.0 M=0.0 R=84.0	S=17.64 M=5.88 R=76.47	S=80.0 M=0.0 R.20.0	S=25.0 M=0 R=75.0	S=50.0 M=0 R=50.0

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Cefpirome	S=84.38 M=3.12 R=12.50	S=64.0 M=0.0 R=36.0	S=17.64 M=29.42 R=52.94	S=100	S=50.0 M=0 R=50.0	S=50.0 M=25.0 R=25.0
Cefipime	S=78.13 M=3.12 R=18.75	S=60.0 M=4.0 R=36.0	S=35.29 M=40.89 R=23.52	S=100	S=50.0 M=0 R=50.0	S=25.0 M=25.0 R=50.0
Cefotaxime + sulbactum	S=96.88 M=3.12 R=0.0	S=92.0 M=4.0 R=4.0	S=94.12 M=5.88 R=0	S=100	S=100	S=100
Clindamycin	S=98.88 M=0.0 R=3.12	S=36.0 M=12.0 R=52.0	S=41.18 M=29.41 R=29.41	S=20.0 M=0.0 R=80.0	S=75.0 M=25.0 R=0	R=100
Ciprofloxacin	S=46.88 M=6.24 R=46.88	S=40.0 M=4.0 R=56.0	S=70.58 M=17.66 R=11.76	S=20.0 M=0.0 R=80.0	S=50.0 M=0 R=50.0	R=100
Chlor'col	S=68.75 M=3.12 R=28.13	S=88.0 M=0.0 R=12.0	S=88.24 M=0.0 R=11.76	S=100.0	S=0 M=25.0 R=75.0	S=100
Gentamycin	S=53.13 M=3.12 R=43.75	S=60.0 M=12.0 R=28.0	S=29.48 M=17.66 R=52.92	S=100.0	S=50.0 M=0 R=50.0	S=25.0 M=25.0 R=50.0
Imipenum	S=100	S=84.0 M=8.0 R=8.0	S=100	S=100.0	S=75.0 M=0 R=25.0	S=50.0 M=0 R=50.0
Kanamycin	S=46.88 M=6.24 R=46.88	S=28.0 M=0.0 R=72.0	S=76.47 M=0.0 R=23.53	S=20.0 M=20.0 R=60.0	S=25.0 M=25.0 R=50.0	S=50.0 M=0 R=50.0
Meropenum	S=96.88 M=0.0 R=3.12	S=76.00 M=4.0 R=20.0	S=41.17 M=0 R=58.83	S=100.0	S=50.0 M=0 R=50.0	S=50.0 M=0 R=50.0
Nalidixic acid	S=3.12 M=0.0 R=96.88	S=4.0 M=4.0 R=92.0	S=41.18 M=5.88 R=52.94	R=100.0	S=25.0 M=0 R=75.0	R=100
Methicillin	-	S=84.0 M=0.0 R=16	-	S=100.0	-	S=100
Netromycine	S=87.50 M=9.38 R=3.12	S=76.0 M=8.0 R=16.0	S=41.17 M=11.76 R=47.07	S=100.0	S=100	S=75.0 M=0 R=25.0
Peperacilin +Tazobactum	S=96.84 M-0.0 R=3.12	S=80.0 M=8.0 R=12.0	S=47.07 M=5.86 R=47.07	S=100.0	S=75.0 M=0 R=25.0	S=75.0 M=0 R=25.0
Vancomycin	-	S=80.0 M=4.0 R=8.0	-	S=100.0	-	S=75.0 M=0 R=25.0