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BACTERIAL MENINGITIS IN LATEONSET NEONATAL SEPSIS

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ABSTRACT: Background: Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of infection with or without accompanying bacteraemia in the first month of life. Any newborn with bacterial sepsis is at risk of meningitis, but late onset sepsis(LOS) has been fairly associated with meningitis from 3% to 30%.Most common organisms causing neonatal meningitis in developing countries are Gram negative bacteria (GNB) like *Klebsiella pneumoniae* and Escherichia coli. **Objective:** To detect microbiological profile of CSF and blood culture and its Antibiotic sensitivity test (AST) in LOS. **Methodology:** All the Positive sepsis screen patients with clinical suspicion of LOS, CSF and Blood sample were taken for culture and AST and CSF analysis. **Result:** During the study period 150 neonates 49 (32.6%) were diagnosed with meningitis. 42 were positive for Gram staining of CSF. From 42, CSF culture was positive in 38(25.33%) Neonatal meningitis were more common in male (61.2%) in preterm (73.4%) and in low birth weight (<2500gms) babies (87.7%). 61(40.66%) shows blood culture positive. *Klebsiella pneumoniae* was the predominant pathogen causing septicemia & meningitis. In the GNB highest sensitive drug is Meropenem (70.9%). **Conclusion:** Meningitis is found in approximately one third of cases of LOS. Our study highlights the diagnostic utility of routine lumbar puncture in neonates with clinical features of sepsis.

INTRODUCTION: Neonatal sepsis is divided into early onset sepsis (EOS) and late onset sepsis (LOS). EOS refers to sepsis presenting in the first 72 hrs of life and LOS refers to sepsis presenting after 72 hrs to 28 days of life [1].

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EOS reflects trans-placental or ascending infection from maternal genital tract, where as LOS is associated with nosocomial, or community acquired infection.

Meningitis is a significant cause of morbidity and mortality in pediatric population [2, 3]. Bacterial meningitis is the most common form of supportive CNS infection. According to Indian records 0.5 to 2.6% of hospital admissions are of bacterial meningitis. In developed countries the case fatality rate is 10% while in India and other developing countries it is 16-30% [4].

The pattern of organisms causing infections varies from place to place and can change in the same place over a period. This is due to the changing pattern of antibiotic use and changes in lifestyle. Also, the emergence of resistance of these organisms to antimicrobial agents has become a major threat. Early treatment and appropriate use of antibiotics would minimize the risk of severe morbidity and mortality due to infections, reducing the emergence of multi-drug resistant organisms.

MATERIAL & METHOD: A total of 150 patient of late onset neonatal sepsis (Age > 72 hrs to 28 days) with any one parameter from positive sepsis screen (TLC <5000/cumm or >20000/cumm, ANC <1800/mm, CRP >1 mg/dl, Micro ESR >15mm, IT ratio >0.2) admitted in NICU of Department of Pediatrics at SSG hospital, Vadodara were included in this study. The Ethical Committee of the Institute approved the study protocol. IEC approval no. is IECHR-PGR/115-19. With all aseptic precautions 1-3 ml blood was collected in Pediatric glucose broth bottles & immediately transported to the laboratory within one hour of collection. The culture bottles were loaded in Bact Alert. CSF was collected through lumbar puncture in sterile container & it was transported to the laboratory within one hour. Gram staining and culture was done. Blood and CSF culture was done on MacConkey agar, Blood agar, Brain heart infusion agar and Chocolate agar. Any growth observed in culture, identification and antibiotic sensitivity was being done. All the Antibiotic sensitivity results were recorded and interpreted using CLSI guidelines. Meningitis was labeled in a neonate whose CSF findings satisfied all the following criteria: (1) CSF glucose less than the plasma glucose (sample to be taken before lumbar puncture) by ≥50%; (2) CSF white cell count >10/cu mm; (3) CSF protein >80 mg/dl, and (4) with/without CSF culture positive.

RESULTS: This present study was carried out at S.S.G hospital microbiology department, medical college Baroda for a period of 14 months. During the study period 150 neonates of clinically suspected and sepsis screen positive were taken. Out of these 49 (32.66%) neonates had diagnosed with meningitis, 42(25%) were positive for Gram staining of CSF. And from 42, CSF culture was found positive in 38 (25.33%) neonates.

TABLE 1: DEMOGRAPHIC DETAILS OF NEONATES WITH MENINGITIS (N=49)

Characteristic		No. of Neonates (%)
Gender	Male	30(61.2%)
	Female	19(38.7%)
Gestational age	Full term	13(26.5%)
	Preterm	36(73.4%)
Birth weight	<2500 gm	43(87.7%)
	>2500 gm	6(12.2%)

TABLE 2: CULTURE POSITIVE ISOLATES FROM CLINICALLY DIAGNOSED CASE

	Positive	Negative
CSF culture positive	38 (25.33%)	112 (74.66%)
Abnormal CSF finding	49 (32.66%)	101 ((67.33%)
Blood culture positive	61 (40.66%)	89 (59.33%)

TABLE 3: ORGANISM ISOLATES FROM BLOOD AND CSF CULTURE

Organism	Blood Culture Positive Cases	CSF Culture Positive Cases
Klebsiella pneumonia	30	21
Escherichia coli	13	10
Acinetobacter baumannii	10	6
Pseudomonas Species	2	1
Staphylococcus aureus	4	0
Enterococcus faecalis	2	0
	Total- 61	Total-38

TABLE 4: ANTIMICROBIAL SENSITIVE PATTERN OF GRAM-NEGATIVE ISOLATES FROM NEONATAL SEPTICEMIA (BLOOD CULTURE)

Antibiotics	*Klebsiella pneumoniae* (n=30)	*Escherichia coli* (n=13)	*Acinetobacter baumannii* (n=10)	*Pseudomonas* species (n=2)	Total no of isolates (n=55)

Amikacin	10(33.3%)	5(38.4%)	NT	NT	15 (27.2%)
Meropenem	28 (93.3%)	8 (61.5%)	1(10%)	2(100%)	39(70.9%)
Cefotaxime	3 (10%)	3(10%)	1(10%)	2(100%)	9(16.3%)
Cefepime	4 (13%)	3(10%)	2(20%)	2(100%)	11(20%)
Piperacillin and Tazobactam	14 (46.6%)	4(13.3%)	3(30%)	2(100%)	23 (41.8%)
Ampicillin	0	2(6.6%)	2(20%)	1(50%)	5(9%)
Gentamicin	NT	NT	3(30%)	1(50%)	4(7.2%)

TABLE 5: ANTIMICROBIAL SENSITIVE PATTERN OF GRAM-POSITIVE ISOLATES FROM NEONATAL SEPTICEMIA (BLOOD CULTURE)

Antibiotics	Staphylococcus aureus (n=4)	Enterococcus faecalis (n=2)	Total no of isolates (n=6)
Penicillin	0	0	0
Vancomycin	4 (100%)	2 (100%)	6 (100%)
Linezolid	4 (100%)	2 (100%)	6 (100%)
Cefoxitin	0	NT	0
Erythromycin	1 (25%)	0	1(16.6)
Clindamycin	3 (75%)	NT	3 (50%)
Cotrimoxazole	4 (100%)	NT	4 (66.6%)
Amoxyclav	0	NT	0
Gentamycin	4 (100%)	2 (100%)	6(100%)
Levofloxacin	NT	2 (100%)	2 (33.3%)
Ampicillin	NT	0	0

TABLE 6: ANTIMICROBIAL SENSITIVE PATTERN OF ISOLATES FROM NEONATAL MENINGITIS (CSF CULTURE)

Antibiotics	*Klebsiella pneumoniae* (n=21)	*Escherichia coli* (n=10)	*Acinetobacter baumannii* (n=6)	*Pseudomonas species* (n=1)	Total no of isolates (n=38)
Amikacin	6 (28.5%)	2(20%)	NT	NT	8 (21%)
Meropenem	20 (95.2%)	5 (50%)	0	1(100%)	26 (68.4%)
Cefotaxime	3 (14.2%)	0	0	1(100%)	4 (10.5%)
Cefepime	4 (19%)	0	1(16.6%)	1(100%)	6(15.7%)
Piperacillin and Tazobactam	11 (52.3%)	1(10%)	1(16.6%)	1(100%)	14 (36.8%)
Ampicillin	0	0	0	0	0
Gentamicin	NT	NT	0	0	0

NT- Not Tested.

DISCUSSION: This study revealed incidence of neonatal meningitis in LOS was 32.6% which was almost similar to other observational studies like Kumar *et al.*[5] (32.8%) & Singh *et al* [6] (20.56%), Rabbani *et al* [8] (34.02%). The minor difference in the incidence can be attributed to the various epidemiological and geographical factors in community-acquired infection.

In our study the incidence of meningitis is more in male. The male female ratio is 1.07:1, which was almost similar with other studies like Noviyani *et al* [7] (1.5:1) Ismaili *et al* [9] (1.25:1) Shrestha Anup *et al* [10] (1.2:1). Incidence of neonatal meningitis in preterm and LBW neonates was 73.4 % and 87.7%in our study respectively which was similar with other studies like Noviyani *et al* [7] was shown 66.7% and 63% respectively. In the study Ismaili *et al* [9] 77.78% in LBW neonates. In our study blood culture positive rate is 40.66% which was 47.22% in Rabbani *et al* [8] 22.4% in Shrestha Anup *et al* [10]. In our study commonest isolates in blood culture was *Klebsiella pneumonia* followed by *Escherichia coli, Acinetobacter baumanii, Staphylococcus aureus, Enterococcus faecalis* and *Pseudomonas* species which was similar with other studies like Shrestha Anup *et al* [10] Noviyani *et al* [7] Kamble *et al* [15].

CSF culture positive rate in our study was 25.3% which was almost similar with other studies like Kumar *et al.* [5] (23.33%). Boskabadi H *et al* [11] (36.5%). In our study commonest isolates in CSF culture was *Klebsiella pneumonia* followed by *Escherichia coli, Acinetobacter baumenii* and *Pseudomonas* species which was similar with other studies like *Barik kanailal et al* [13], Boskabadi H *et al* [11], Shah Mubashir Hassan [12]. In our study **Table**

6 of result showing isolated organism from CSF culture were highly sensitive to Meropenem (68.4%), Piperacillin and Tazobactam (36.8%), Amikacin (21%). Which was similar with the study Barik kanailal *et al* [13]. High degree of resistance was noted for cephalosporin, 15.7% for Cefepime and 10.5% for Cefotaxime.Which was similar in the study like Shah Mubashir Hassan [12], Biset S *et al* [14].

CONCLUSION: The study carried out at S.S.G hospital microbiology department, medical college Baroda for a period of 14 months shows meningitis is found in approximately one third cases of late onset sepsis. Meningitis was common in male compared to female. Meningitis was common in preterm low birth weight compared to term with normal birth weight. Gram negative bacteria were common isolates in CSF and Blood cultures. *Klebsiella pneumoniae* was most common isolate in CSF and Blood cultures. Meropenem was the most sensitive drug among gram negative isolates.

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