

Original Research

Assessment of Bacterial Neonatal Meningitis- A clinical study

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ABSTRACT:

Background: Neonatal infection is one of the major causes of neonatal deaths in India. The present study was conducted to assess bacterial causes of neonatal meningitis. **Materials & Methods:** 64 neonates with neonatal meningitis were recorded. CSF analysis, blood, and CSF cultures were evaluated. All patients with meningitis were assessed by brain sonography. **Results:** Early onset meningitis was seen in 40 and late onset meningitis in 24 cases. The difference was significant ($P < 0.05$). Staphylococcus epidermidis was seen in 17 and 10 in EOM and LOM respectively, streptococcus spp in 6 and 6 in EOM and LOM respectively, Serratia spp in 4 and 3 in EOM and LOM respectively, Klebsiella spp in 3 and 1 in EOM and LOM respectively, gram negative rods in 4 and 1 in EOM and LOM respectively, Pseudomonas aeruginosa in 3 and 2 in EOM and LOM respectively and E. coli in 2 and 1 EOM and LOM respectively. The difference was significant ($P < 0.05$). **Conclusion:** Most common bacterial pathogen associated with neonatal meningitis was staphylococcus epidermidis.

Key words: CSF, Staphylococcus epidermidis, Neonatal meningitis.

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INTRODUCTION

Neonatal infection is one of the major causes of neonatal deaths in India. Bacterial meningitis being a life-threatening condition requires prompt diagnosis and treatment, but diagnosis in newborn is a challenge for clinicians because symptoms and signs are often subtle and non-specific at its early stage.¹ It has been reported that neonatal meningitis can occur in the absence of bacteraemia and no single cerebrospinal fluid (CSF) value can exclude its presence. Several studies from India have reported the spectrum of bacterial pathogens and the existence of antibiotic resistance among the isolates from neonatal sepsis/meningitis cases.² According to the time of diagnosis, it is classified as early onset (EOM) or late onset meningitis (LOM). In EOM, clinical features appear during the first weeks of life. LOM occurs between 8–28 postnatal days. The incidence of neonatal bacterial meningitis ranges from 0.25 to 1 per 1000 live birth and occurs in 25% of neonates with bacteremia.³ In developed countries,

group B streptococci (GBS) are the most common causes of bacterial meningitis, accounting for 50% of all cases. Escherichia Coli (E. Coli) accounts for another 20%. Thus, identification and treatment of maternal genitourinary infections is an important prevention strategy. In developing countries, gram negative bacilli such as Klebsiella and E. Coli may be more common than GBS especially in LOM.⁴ Despite the advancements in neonatal intensive care units (NICU) and increased availability of antibacterial and supportive medications, neonatal meningitis is still a serious disease with high morbidity and mortality rates. Antibiotic resistant nosocomial infections pose significant risk to premature neonates. Infection appearing at 48 to 72 hours of hospitalization that was not present or incubating at the time of admittance of the mother to hospital is defined as nosocomial.⁵ The present study was conducted to assess bacterial causes of neonatal meningitis.

MATERIALS & METHODS

The present study comprised of 64 neonates with neonatal meningitis of both genders. Parents of all neonates were informed regarding the study and their consent was obtained.

Data such as name, age, gender etc. was recorded. Laboratory finding such as CSF analysis, blood, and

CSF cultures were evaluated. All patients with meningitis were assessed by brain sonography. Neonates with an abnormal brain sonography were examined with brain magnetic resonance imaging (MRI). Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 64		
Gender	Boys	Girls
Number	34	30

Table I shows that out of 64 patients, boys were 34 and girls were 30.

Table II Onset of meningitis

Onset	Number	P value
Early onset meningitis (EOM)	40	0.01
Late onset meningitis (LOM)	24	

Table II shows that early onset meningitis was seen in 40 and late onset meningitis in 24 cases. The difference was significant (P< 0.05).

Table III Distribution of bacterial pathogens

Onset	EOM	LOM	P value
Staphylococcus epidermidis	17	10	0.01
Streptococcus spp	6	6	
Serratia spp	4	3	
Klebsiella spp	3	1	
Gram negative rods	4	1	
Pseudomonas auroginosa	3	2	
E. coli	2	1	

Table III, graph I shows that staphylococcus epidermidis was seen in 17 and 10 in EOM and LOM respectively, streptococcus spp in 6 and 6 in EOM and LOM respectively, Serratia spp in 4 and 3 in EOM and LOM respectively, Klebsiella spp in 3 and 1 in EOM and LOM respectively, gram negative rods in 4 and 1 in EOM and LOM respectively, Pseudomonas auroginosa in 3 and 2 in EOM and LOM respectively and E. coli in 2 and 1 EOM and LOM respectively. The difference was significant (P< 0.05).

Graph I Distribution of bacterial pathogens

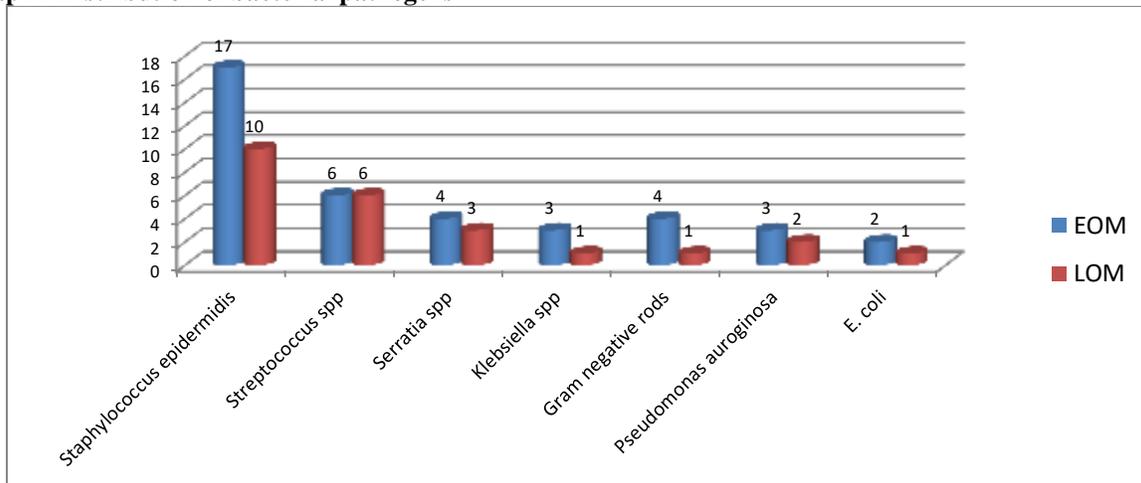


Table IV Sonographic findings

Sonographic findings	Number	P value
Ventricular dilatation	21	0.02
Grade 1 intracranial hemorrhage	14	
Hydrocephalus	10	
Periventricular leukomalacia	8	
Grade 2 intracranial hemorrhage	5	
Grade 3 intracranial hemorrhage	4	
Grade 4 intracranial hemorrhage	2	

Table III shows that sonographic findings were ventricular dilatation in 21, grade 1 intracranial hemorrhage in 14, hydrocephalus in 10, periventricular leukomalacia in 8, grade 2 intracranial hemorrhage in 5, grade 3 intracranial hemorrhage in 4 and grade 4 intracranial hemorrhage in 2 cases. The difference was significant ($P < 0.05$).

DISCUSSION

Neonatal meningitis is the inflammation of the meninges typically occurring within the first 30 days of life. It may be classified as early-onset (EOM) and late-onset meningitis (LOM) according to the time of diagnosis.⁶ Symptoms and clinical findings usually appear during the first week of life in EOM.⁷ Some authors define the disease that begins within the first three days as very early onset meningitis (VEOM). Late-onset meningitis occurs between postnatal 8th and 30th days.⁸ Early-onset bacterial neonatal infection is known to be caused by those pathogens colonizing or infecting the maternal genital tract or in the delivery area. *E. coli*, *GBS*, *Globicatella*, *Sneathia* all known as vaginal colonizers, have been isolated from those who were born through vaginal delivery and had an early onset of symptoms. *A. baumannii*, *C. sakazakii*, *CoNS*, *Pseudomonas* spp., *Roseomonas* and *Bacillus* can be isolated from various environmental sources including the hospital environment. Thus, it is likely that these can colonize the neonate and cause early-onset infection.¹⁰ The present study was conducted to assess bacterial causes of neonatal meningitis.

In present study, out of 64 patients, boys were 34 and girls were 30. Early onset meningitis was seen in 40 and late onset meningitis in 24 cases. Kavuncuoğlu et al¹¹ determined the incidence, etiology, risk factors and outcome of bacterial meningitis in neonates. Demographic features, delivery type, time of onset of meningitis, co-morbidities, clinical features, blood and cerebrospinal fluid (CSF) analysis, cranial sonographic findings, and outcome of patients were recorded. The study comprised 325 meningitis cases identified from 38,023 hospitalised patients in the neonatology unit among 11,8091 live births. Mean gestational age, birth weight, and hospital stay were 36.8 ± 3.7 weeks, 2.480 ± 924 g, and 26 ± 12.4 days, respectively. Almost

half (48%) of the patients were diagnosed in the first seven postnatal days and 52% at 8-30 days after birth. CSF culture findings were positive in 59 (18%) patients (28 in Group 1 and 31 in Group 2). Gram-positive bacteria were the responsible agents in 30 (51%) patients, whereas 26 (44%) patients had Gram-negative bacterial meningitis and 3 (5%) had *Candida* meningitis. Gram-negative bacteria were predominant in Group 1 whereas Gram positive bacteria were predominant in Group 2. Transfontanel ultrasonography revealed pathologic findings in 17.5% of patients. The total mortality rate was 2.5%.

We found that *staphylococcus epidermidis* was seen in 17 and 10 in EOM and LOM respectively, *streptococcus* spp in 6 and 6 in EOM and LOM respectively, *Serratia* spp in 4 and 3 in EOM and LOM respectively, *Klebsiella* spp in 3 and 1 in EOM and LOM respectively, gram negative rods in 4 and 1 in EOM and LOM respectively, *Pseudomonas auroginosa* in 3 and 2 in EOM and LOM respectively and *E. coli* in 2 and 1 EOM and LOM respectively. Devi et al¹² among bacterial isolates detected, Gram-negative bacteria were predominant ($n=32$, 48%) as compared to Gram-positive ($n=26$, 39%). Yeast was isolated on four occasions and five isolates when compared with NCBI database after sequencing of its 16S rRNA gene sequences were comparable with those of uncultured bacterium. The most frequent Gram-negative bacteria detected were *A. baumannii* ($n=12$, 18%), *Klebsiella* ($n=8$, 12%), *Pseudomonas* ($n=6$, 9%). Less frequently detected were *N. meningitidis* ($n=2$, 3%), and one each for *E. coli*, *Sneathia*, *Cronobacter sakazakii*, and *Roseomonas cervicalis*. Among the Gram-positive bacteria, *Enterococcus* spp. ($n=10$, 15%) and *CoNS* ($n=11$, 16%) were most commonly detected. Blood culture was positive in 23 of the 67 neonates whose CSF samples were microbiologically positive. Thus, concordance between CSF positivity and blood culture positivity was seen in 34.3 per cent cases. Twenty one (6.9%) neonates expired of whom three had a positive CSF yield. Multivariate logistic regression analysis for risk factors revealed that two variables, namely, primigravida.

The shortcoming of the study is small sample size.

CONCLUSION

Most common bacterial pathogen associated with neonatal meningitis was staphylococcus epidermidis.

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