

Frequency of Meningitis in Neonatal Late Onset Sepsis in Gangaram Hospital, Lahore

Salma Saleem, Naveed Akbar, Asma Anwar, Rashid Mehmood

ABSTRACT

Objective: Bacterial sepsis and meningitis are still major causes of morbidity and mortality in newborns all over the world, especially in premature infants. They must be recognized and treated quickly to prevent death or disability.

Study Design: This prospective cross-sectional study. **Period and Place of study:** 6 months period in Pediatrics Department of Sir Gangaram Hospital Lahore. **Materials and Methods:** A total of 190 neonates fulfilling the inclusion criteria (> 7 days with positive septic screen) were included and subjected to detailed history, clinical examination followed by investigations. All babies with positive septic

screen underwent lumbar puncture (LP) and cerebral spinal fluid (CSF) was sent to laboratory for cytology and biochemistry.

Results: Mean age of patients was 15.6 ± 6 days with a male to female ratio of 1.6:1. Frequency of Meningitis in babies with late-onset sepsis was 39.5% (75 patients out of 190).

Conclusion: Meningitis is commonly associated with late onset sepsis hence LP should be done as standard protocol in such neonates and the outcome is directly proportional to the diagnosis at initial presentation. **Key words:** Meningitis, Late-onset Sepsis, Neonates, Frequency, Lumbar puncture, Lahore.

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INTRODUCTION

Despite high hygienic standards, deliveries at hospitals, access to antimicrobial agents for prophylaxis, treatment, and facilities for advanced intensive care, neonatal infections are important cause of mortality and morbidity in newborn infants all over the world. Most studies of incidence and etiology of neonatal sepsis and meningitis come from industrialized countries since there is a lack of data from the developing countries where the mortality and morbidity are probably immense.¹

Sepsis is responsible for about 30-50% of the total neonatal deaths in developing countries including India and Pakistan.² Various community and

hospital based studies have reported sepsis as a cause of neonatal death in 20-50% of cases.^{3,4} Culture proven sepsis may occur in up to 20% of NICU admissions.⁵ The incidence of neonatal sepsis according to the data from National neonatal perinatal database is 30 per 1000 live births. The database comprising 18 tertiary care neonatal units across India found sepsis to be one of the commonest causes of neonatal mortality contributing to 19% of all neonatal deaths.^{6,7} Septicemia was the most common clinical category with incidence of 23/1000 live births while the incidence of meningitis was reported to be 3/1000 live births.⁶

Neonatal sepsis is a clinical syndrome characterized by signs and symptoms of infection with or without accompanying bacteremia in the first month of life. It can encompass various systemic infections of the newborn such as meningitis, pneumonia, arthritis, osteomyelitis and urinary tract infections.^{5,7} There is no consensus on how to classify neonatal sepsis and meningitis

Corresponding Author:

Dr. Naveed Akbar Hotiana
Assistant Professor, Pediatrics
GangaRam Hospital, Lahore
Tel. +92 345-4026158
E-mail: naveedakbar70@gmail.com

in periods after birth. Early and late onset sepsis has been reported as occurring before or after 48 hours of age, 72 hours of age, or 96 hours of age.^{8,9} The first week of life is often reported as early onset sepsis with a subgroup of infections that develop during the first 24 hours of life called very early onset infections.¹⁰ Late onset infections occur during the second to fourth weeks of life while infections from day 28-30 to day 120-180 are called very late onset infections.

Any newborn with bacterial sepsis is also at risk of meningitis. As such the incidence of meningitis in neonatal sepsis has varied from 0.3-3% in various studies,

but late onset septicemia has been reported to be fairly associated with meningitis; with percentage ranging from 3 to 30%.¹⁰ In cases of LOS, lumbar puncture (LP) should be done in all infants prior to starting antibiotics. LP could be postponed in a critically sick neonate but should be performed once the clinical condition stabilizes.⁷ The rationale of this study was to evaluate the importance of obtaining lumbar puncture (LP) in neonates with LOS. This study was undertaken with the objective to estimate the incidence of meningitis in late onset sepsis so as to reduce mortality and morbidity.

MATERIALS & METHODS

This prospective cross-sectional study over 6 months period was conducted in the Neonatal unit at Pediatrics Department of Sir Gangaram Hospital, Lahore. The study was carried out on the neonates admitted in the department of pediatrics, from 1st November, 2013 to 30st April 2014.

Inclusion Criteria

- Neonates older than 7 days both full term and preterm with clinical features of sepsis i.e. based on history and physical examination demonstrating either circulatory, respiratory, CNS dysfunction or other features of sepsis.

Exclusion Criteria

- Neonates with gross congenital anomalies making lumbar puncture practically impossible e.g spina bifida, meningocele, meningomyelocele.

▪ Neonates having deranged coagulation profile
A total of 190 babies fulfilling the inclusion and exclusion criteria admitted in neonatal unit were

enrolled in this study. An informed consent was taken from parents of babies before the study. In each neonate with clinical features of sepsis, a detailed history and examination was done. All babies with provisional diagnosis of sepsis were undergone lumbar puncture and CSF was sent to laboratory for cytology and biochemistry. The presenting clinical features of babies, values of CSF total leukocytes count, sugar, protein levels and blood total leukocytes count, CRP level, platelets count was collected. Meningitis was labeled in a neonate if his/her Cerebrospinal fluid contains > 30 leukocytes/mm³, and any one of these two:

- protein > 200mg/dl
- sugar < 40mg/dl

Frequency of Meningitis was calculated by total number of cases of meningitis among all the 190 babies of study sample during this period of 6 months.

Statistical analysis

The descriptive statistical analysis included examinations of means, standard deviations, frequencies, ranges, and percentages and pie-charts. The statistical packages SPSS (Version 20) and MS Excel (MS Office 2010) were used.

RESULTS

Demographic Profile

This study comprised of a total of 190 cases and included those neonates who satisfied the inclusion criteria. Frequency of meningitis was calculated in them. Results showed that the mean age of patients was 15.6 ± 6.1 days (with a range of 8-28 days). There were 102 (53.7%) male and 88 (46.3%) female patients. The male to female ratio in this study was 1.6:1 indicating greater incidence of sepsis in male babies.

Table 1: Demographic profile of patients included in this study

Characteristics	Value
Male (% cases)	102 (53.7)
Female (% cases)	88 (46.3)
Male to Female ratio	1.6:1
Mean age ± SD (range)	15.6±6.1 days (8-28)

(n=190)

Blood Analysis

The mean total leukocytes count of patients was 25589.27 ± 33674.35 (with range of 2400-38900). The mean platelet count of patients was 135922.71 ± 192311.07 (with a range of 10700-517000). The mean total CRP level of patients was 5.43 ± 1.49 (with a range of 2-8).

Table 2: Data regarding blood analysis

Characteristics	Value
Total leukocyte count (range)	25589 ± 33674 (2400-38900)
Platelets count (range)	135922 ± 192311 (10700 - 517000)
CRP (range)	5.43 ± 1.49 (2-8)

(n=190)

CSF Analysis

The mean total leukocytes count of patients was 24.36 ± 22.27 (with range of 2-115). The mean sugar level of patients was 67.60 ± 29.28 (with range of 18-153). The mean protein level of patients was 127.14 ± 77.35 (with range of 11-360).

Table 3: Data regarding CSF analysis

Characteristics	Value
Total leukocyte count (range)	24.36 ± 22.27 (2-115)
Sugar level (range)	67.6 ± 29.3 (18-153)
Protein level (range)	127 ± 77 (11-360)

(n=190)

Meningitis

According to the definition mentioned in previous section, Meningitis was present in 75 babies out of a total of 198 patients (39.47%) while in rest of the patients i.e. 115 (60.53%), Meningitis was absent.

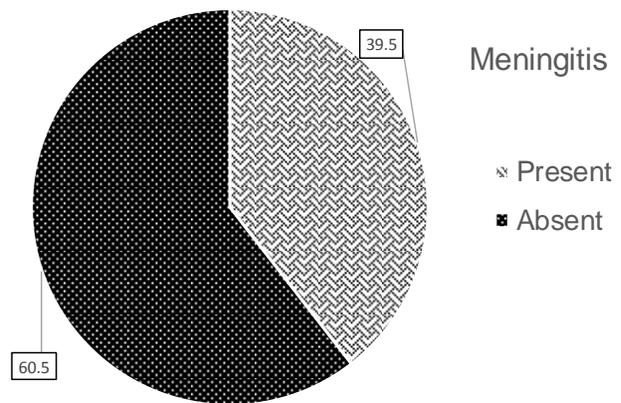


Figure 1: Frequency of Meningitis in neonatal patients with late-onset sepsis

DISCUSSION

Neonatal sepsis is one of the commonest causes of neonatal morbidity and mortality. According to previous studies, near about 0.3-3% of neonates with sepsis do have meningitis but in case of LOS, the incidence of meningitis is higher, even upto 30%.^{9,10} The overlapping clinical manifestations of septicemia and meningitis make it very difficult to differentiate a neonate with meningitis from the one with septicemia alone as meningitis is associated with much more mortality and morbidity, it is always better to have a high suspicion for meningitis while treating neonates with septicemia.¹⁰ The frequency of meningitis in LOS in our study was 39.5%. Our results are in agreement with many international studies.^{14,15} For example, almost similar findings were reported by Kaul et al.⁹ where 23% septic neonates with LOS had meningitis. More recently, Roshi et al.¹⁰ has reported prevalence of meningitis in neonates with late onset sepsis as almost 18%.¹⁴ The low body weight (LBW) neonates with sepsis accounted for 49.2% and preterms with sepsis accounted for 36.4%.⁹ However meningitis was observed in 63.3 % of LBW neonates and 61.7% of preterm neonates.¹⁰ This high incidence of meningitis in LBW and especially preterm has also been reported by Laving et al. and Anjos da Silva. Jiang et al.¹¹ observed that LOS was significantly more common in very low birth weight (VLBW) and preterm neonates. Male to female ratio in sepsis was 1.6:1 in our study, similar to observations made by Jiang et al.¹¹ and Gheibi et al.¹²

Late onset meningitis is associated with a variety of organisms, though they are predominantly Gram negative. There is a higher incidence of viral and fungal (commonly *Candida albicans*) organisms than in early onset infection. Episodes of group B streptococcal infection can present late and are more likely to be associated with meningitis.⁹ All studies excluded diphtheroids and *Staphylococcus epidermidis* as being contaminants, unless they were grown in multiple cultures and there was a clinical indication of infection.^{9,10}

The frequency of meningitis observed through our study, which is equally compatible with other international studies shows an inevitable and early need for recognition of neonatal meningitis, making it necessary to be screened in every case of late onset sepsis and devising strategies to prevent any fatal losses due to this. More studies in future are highly recommended for this purpose considering our local settings.

CONCLUSION

In our study meningitis is found to be significantly high among newborns with LOS. Meningitis is a major association with LOS cases. It is associated with significant morbidity and mortality and entails a prolonged antibiotic course. Incidence as high as 39.5% of meningitis in neonates with LOS in our study, endorses the need of doing a lumbar puncture in all the neonates with LOS, before starting antibiotics.

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AUTHORS

- **Dr. Salma Saleem**
Senior Registrar, Pediatrics,
Ganga Ram Hospital, Fatima Jinnah
Medical University Lahore
- **Dr. Naveed Akbar Hotiana**
Assistant Professor, Pediatrics,
Ganga Ram Hospital, Fatima Jinnah
Medical University Lahore
- **Dr. Asma Anwar**
Assistant Professor, Pediatrics,
Ganga Ram Hospital, Fatima Jinnah
Medical University Lahore

- **Prof. Dr. Rashid Mehmood**
Professor of Pediatrics,
Ganga Ram Hospital, Fatima Jinnah
Medical University Lahore

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Name of Author	Contribution to the paper	Author's Signatures
Dr. Salma Saleem	1 st Author	
Dr. Naveed Akbar Hotiana	2 nd Author	
Dr. Asma Anwar	3 rd Author	
Prof. Dr. Rashid Mehmood	4 th Author	