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Original Article

Frequency Of Meningitis In Neonatal Sepsis

Akber Hussain[1], Qudratullah Malik[2], Muhammad Tariq Nadeem[3], Naem Ullah[4], Farooq Ikram[5], Murtaza Hussain[6]

[1,6] Pediatrics Registrar, CMH Rawalpindi.
[2,3] Professor Pediatrics, CMH Rawalpindi.
[4] BS Pathology
[5] Assistant Professor Paediatrics, CMH Rawalpindi.

Author's Contribution
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[1,2,4] *Experimentation/Study Conduction*
[1,2] *Analysis/Interpretation/Discussion*
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Corresponding Author
Dr. Akber Hussain
Pediatrics Registrar
CMH
Rawalpindi.
Email: akberanjum@yahoo.com

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Abstract

Objective: The aim of the current study was to examine the frequency of meningitis in infants having late-onset sepsis (LOS). Bacterial sepsis and meningitis endure being leading causes of illness and mortality in neonates around the world, predominantly in preterm neonates. They must be discovered and cured as soon as possible to avoid death or disability.

Study Design: The Cross-Sectional method was used to conduct a study.

Duration and Place of Study: The study period was from July to December 2021. Data was collected from Pak Emirates Military Hospital (PEMH) NICU Rawalpindi.

Material and Method: The study comprised a total of 110 individuals, both male and female. All of them were older than 3 days and had been hospitalized and diagnosed with late-onset sepsis. A neonate was diagnosed with meningitis if his or her cerebrospinal fluid (CSF) had > 30 leukocytes/mm3 and any of these two: >200 mg/dl protein or 40 mg/dl glucose.

Results: Out of 110 infants having LOS 38 were diagnosed with meningitis of which 21(55.2%) were male and 17(44.8%) were female. The overall mean weight of neonates was 2.38±1.72. A total of 24(63.1%) had low body weight and 22(57.8%) were premature. Meningitis was found to have a significant association with low body weight and pre-term birth (p value<0.05).

Conclusion: Meningitis was considerably high in neonates with (LOS). Low body weight and pre-term birth had significant associations with meningitis (LOS).

Key Words: Frequency, Meningitis, Late-onset sepsis, Pre-term, Low body weight, Neonates.

Introduction

In spite of all of the advances in perinatology research and discoveries in recent decades, newborn infections continue to cause high rates of morbidity and mortality in developed and developing countries. It is estimated that 60 percent of infant mortality in Brazil occurs during this time, with neonatal sepsis being one of the leading reasons [15]. The enhancement in the public health providing system over the last few years decreased the rate of mortality, particularly in developed countries, however, the percentage of newborns who survived with neurological morbidities ranged from 20% to 50% [19]. However, the mortality rate in developing countries continues to be unacceptably high, inconsistently reported as 0.8-6.1 per 1000 live births and 40 to 58% [6].

Meningitis is the infection and inflammation of the protective membranes that envelop the brain and spinal cord [8]. Meanwhile, the epidemiology of infant meningitis is much like that of neonatal sepsis, neonatal meningitis is also categorized into early and late-onset sepsis. It is based on the timing of contamination and presumed mode of transmission [7]. The cutoff for these categories is varying throughout the literature, normally early onset sepsis occurs ≤72 hours of birth whereas late-onset sepsis occurs between 4 to 8 days of life and as late as 7 weeks after birth and it is attributed to infectious organisms assimilating through interaction with hospitals surroundings or community. The prevalence is high in newborns, especially with low birth weights ≤1500 grams [7,14,16]

Meningitis is reported in 0.3-3% of neonatal sepsis cases, but late-onset sepsis (LOS) has a substantial connection with the presence of meningitis, which is found in 3-30% of cases. Lumbar puncture (LP) is typically performed on all infants with LOS once their clinical state has been alleviated. It was estimated the prevalence of meningitis in LOS to be 16%. Meningitis was observed to be 39.5%t in LOS in another study. Meningitis was found to be present in 61.1 % of LOS patients in another study [17].

Bacterial meningitis is more frequent in the neonatal period than at any other time, with preterm and chronically hospitalized infants having a higher prevalence rate [9]. Furthermore, the epidemiology of bacterial meningitis, the organisms that cause it, the immature immune system's response to infection, and the results are all unique to the neonatal period. Because a cerebral insult caused by meningitis has a stronger influence on the developing brain, younger age at the time of infection is usually associated with a worse outcome [3,4]. As a result, effective diagnosis, evaluation, and aggressive antimicrobial treatment of bacterial meningitis in newborn children are critical for lowering mortality and squeals for the rest of their lives.

The severity of meningitis in neonatal sepsis patients sparked interest in the establishment of this study, with the main objective of assessing the prevalence of meningitis in patients with late neonatal sepsis in reference to Pak Emirates Military Hospital in 2022.

Materials and Methods

A cross-sectional research design was used to conduct the study. Data was collected from Pak Emirates Military Hospital (PEMH) NICU Rawalpindi. The study period was from July to December 2021. The sample size was 110 which include males (n=61) and females (n=49) with ages ranging from 3 to 28 days of life.

Inclusion Criteria: Neonatal older than the age of 3 days both full-term and pre-term with the sign of sepsis presenting circulatory, respiratory, and other signs of sepsis were included in the study.

Exclusion Criteria: Neonates having Spina bifida (meningocoele, myelomeningocoele, and lipomeningocoele), anencephaly, other neural tube defects, or major congenital malformations making lumber puncture almost impossible (meningocele, meningomyelocele) were excluded from the study.

Demographic Information

For the attainment of demographic information, a demographic information sheet was given to parents of neonates having LOS. This information includes gender, age, birth weight, and terms of birth. Parents of neonates were told that all the information will be kept confidential and will be used only for research purposes. The LP and CSF of a patient with a tentative diagnosis of sepsis were referred to the institutional laboratory for cytology and biochemistry. Meningitis was diagnosed in neonates if his/her CSF contained >30 leukocytes/mm, and any of the following two factors: protein > 200mg/dl or sugar < 40mg/dl [18].

Results

Statistical Package for Social Sciences (IBM-SPSS version 22) was used to analyze the data by using

descriptive analysis and the Chi-squared test. Descriptive analysis was used to analyze the tendency of data. For qualitative characteristics like gender and meningitis, frequencies and percentages were used. Age and other quantitative factors were given as Mean±S.D. To account for effect modifiers, data were stratified by age, gender, weight, and gestation. To determine the importance of post-stratification chi-squared test was used to see the significance. P-values≤0.05 was considered significant.

Table 1
CSF Analysis

Characteristics	*Value*
Leukocytes count	21.78±19.21
Glucose level	54.2±21.56
Protein level	112±78.34

Table-1 shows the mean of total leukocytes of neonates was 21.78±19.21. The mean of glucose level in neonates was 54.2±21.56 and the mean of Protein level in neonates was 112±78.34.

Figure 1
Frequency of meningitis in neonatal patients with LOS

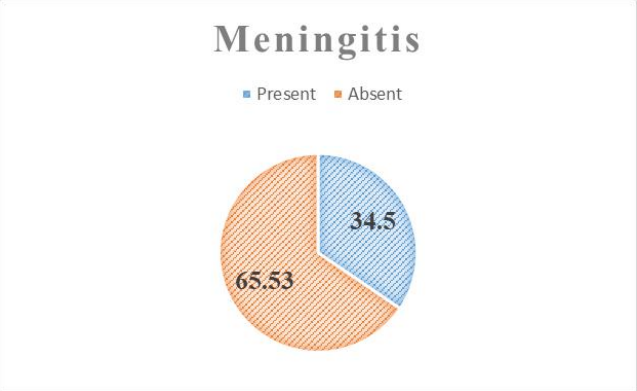

Figure 1 shows that Meningitis was diagnosed in 38 neonates (34.5%) out of 110 while in others i.e. 72 (65.5%). meningitis was absent.

Table-2 Comparison of cases with and without meningitis with regards to study variables

Variables		*Meningitis (n=38)*	*Not-Meningitis (n=72)*	*P-value*
Gender	Male	21(55.2%)	40(55.5%)	0.7192
	Female	17(44.8%)	32(44.5%)	
Age (days)	3-7	13(34.2%)	34(47.2%)	0.652
	8-14	09(23.6%)	27(37.5%)	
	15-21	06(15.7%)	08(11.11%)	
	22-28	10(26.3%	03(4.1%)	
Weight (kg)	<2.5	24(63.1%)	26(36.1%)	0.0281
	>2.5	14(36.9%)	46(63.9%)	
Gestation Age	Pre-Term	22(57.8%)	26(36.2%)	0.0005
	Term	16(42.1%)	46(63.8%)	

Table 2 shows out of 110 neonates having LOS, 61(55%) were male and 49(46%) were female. Overall, the mean age of patients was 9.68±3.42 where mostly neonates were aged 3 to 7 days (42.7%) afterward 8 to 14 days (32.7%), 15 to 21 days (12.7%), 22 to 28 days (11.9%). The finding indicates that male neonates experience meningitis (n=21) more than females (n=17). The mean weight of neonates was 2.38±1.72. Out of 110 total 48 (43.6%) neonates were pre-term. Low body weight and preterm birth were shown to have significant connections (p value< 0.05) with meningitis when compared to neonates without meningitis. There was no significant association between gender and age in neonates with or without meningitis.

Discussion

The aim of conducting the study was to examine the frequency of meningitis in neonatal with late-onset sepsis (LOS). It is one of the common causes of mortality and morbidity. Neonatal meningitis has been linked to a 33-48 % mortality rate in developing countries while these estimates are around 10% in developed countries [6]. According to earlier studies meningitis affects about 0.3-3 percent of neonates with sepsis, while the incidence of meningitis in neonates with LOS is much greater, reaching up to 30 percent [11, 17]. According to Roshi et.al. (2015) the clinical manifestations of septicemia and meningitis overlap, it can be difficult to distinguish a neonate with meningitis from one with septicemia alone [17]. Because meningitis is linked with significantly higher mortality and morbidity, it is always better to treat neonates with septicemia with a high suspicion of meningitis.

Results of our study show that the frequency of meningitis in LOS neonates was 34.5%. Our results are consistent with other international studies. Kaul et.al. (2013) found almost similar findings reporting that 23% of neonates having late onset had meningitis (11). According to the study of Roshi et.al. (2015), the frequency of meningitis in infants with LOS is 18% [17]. Another study reported meningitis was found in 17 to 18% of neonates having LOS in Kenya, Brazil, and other regions of Asia [5,12]. Minor discrepancies in the incidence of meningitis in LOS may be due to variations in epidemiology and geography in community-developed infection in LOS.

Our study shows significant associations ($p < 0.05$) of Low body weight (LBW) and Pre-term birth with meningitis. Results revealed that 63.1% of neonates have low body weight in those who were diagnosed with meningitis. Our results are reliable with another study conducted by Bhagat et.al. (2015) who found meningitis was present in 63% of neonates having Low body weight and 61.7% in neonates with pre-term birth [2]. Another study conducted by Longe et.al. (1984) found a higher incidence of meningitis in infants having low body weight and pre-term birth [13]. Another study conducted in India reported that 73% of neonates were pre-term and 77% had low body weight having LOS with meningitis, findings are consistent with the current study [20].

The majority of the neonates were male in the current study i.e. (55.2%) had meningitis with LOS. Findings are consistent with previous studies that reported that 62.02% of neonates were male with LOS (20). According to a local study conducted in Gangaram Hospital Lahore, 53.7% of babies with LOS were male, which is remarkably close to current findings. According to the study, males had a 2-5-fold higher risk of having septicemia than females, and our findings were consistent with prior findings [1, 10].

The prevalence of meningitis observed in our study, which is consistent with other international studies, indicates an unavoidable and early need for neonatal meningitis recognition, necessitating screening in every case of late-onset sepsis and planning strategies to prevent any lethal losses as a result. In light of our local circumstances, more research is strongly advised in the future.

Conclusion

Meningitis was observed to be considerably higher among babies with LOS in our study. Meningitis is a common occurrence in LOS patients. It is significantly associated with morbidity and mortality, and it requires a long course of antibiotics. The presence of meningitis was observed to be associated with low body weight and preterm birth with LOS. The study also revealed that male neonates are more prone to having meningitis with late-onset sepsis.

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