The Professional Medical Journal
www.theprofesional.com

https://doi.org/10.29309/TPMJ/2020.27.11.4600

ORIGINAL PROF-0-4600

Frequency of meningitis in neonates having late onset sepsis.

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Article received on:
28/02/2020
Accepted for publication:
24/04/2020

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ABSTRACT… Objectives: The current study was aimed to determine the frequency of meningitis in children having late-onset sepsis (LOS). **Study Design:** Descriptive Case Series study. **Setting:** Department of Pediatrics Medicine, Nishter Medical University Multan and DHQ Teaching Hospital, Dera Ghazi Khan. **Period:** From July to December 2019. **Material & Methods:** A total of 206 neonates of both gender, older than 72 hours, admitted and diagnosed with sepsis were enrolled. Meningitis was labeled in a neonate if his/her cerebrospinal fluid (CSF) contains > 30 leukocytes/mm^3, and any one of these two: protein >200mg/dl or sugar <40mg/dl. **Results:** Out of a total of 206 neonates having LOS, majority, 111 (53.9%) were male and 73 (35.4%) were aged 3 to 7 days. Overall, mean weight was found to be 2.68+0.51 kg. A total of 84 (40.8%) neonates were preterm. Frequency of meningitis was found in 44 (21.4%) neonates. Neonates having low body weight and being preterm were noted to have significant associations (p value < 0.05) with meningitis. **Conclusion:** Frequency of meningitis in neonates with LOS was high. Low body weight and preterm neonates having LOS were found to have significant association with the presence of meningitis.

Key words: Late-Onset Sepsis, Low Body Weight, Meningitis, Preterm.

Article Citation: Ahmad S, Hussain N, Rafique T, Saleem R. Meningitis in neonates having late onset sepsis. Professional Med J 2020; 27(11):2363-2367. https://doi.org/10.29309/TPMJ/2020.27.11.4600

INTRODUCTION

Despite better hygienic standards and access to healthcare facilities in the recent decades, neonatal infections are still known be a major cause of morbidity as well as mortality among newborns around the globe.[1] Majority of the researchers reporting incidence and etiology surrounding neonatal sepsis along with meningitis are from developed countries while limited work is noticed from developing countries where overall burden of these disease are immense.[2] Incidence of neonatal meningitis from developed countries have been reported around 0.3/1000 live births while these figures soar up to 0.08-6.1 per 1000 live births in developing countries, while mortality ranges between 40-58%.[3]

Sepsis is labeled as early-onset sepsis (EOS) or LOS. LOS is described as systemic infection occurring beyond 1st 72 hours following birth.[4] Any newborn with bacterial sepsis is also at risk of meningitis.[5] Meningitis is frequently found in LOS cases in comparison to EOS while it is also found that LOS linked meningitis is usually presenting with symptoms.[4]

Reported incidence of meningitis among neonatal sepsis ranges between 0.3-3% while LOS is noted to have a significant association with the presence of meningitis, found in 3-30% of the cases.[6] In all neonates having LOS, lumber puncture (LP) is commonly performed when the clinical status of the individual stabilizes.[7]

Prevalence of meningitis in LOS was seen as 16% by Roshi B et al from India.[6] In another study, it was reported that, meningitis in LOS was 39.5%.[8] In another study, meningitis in LOS was 61.1%.[9] Researches done to look for frequency of meningitis in LOS have been found to have variability while very limited work is seen at local level in this regard. The findings of this study were thought to help us in better understanding the burden of meningitis among LOS in our

population while it will also open doors for newer research protocols looking at priorities for the management of affected patients. The current study was aimed to determine the frequency of meningitis in children having LOS.

MATERIAL & METHODS

The descriptive case series study was conducted at the Department of Pediatrics Medicine, Nishter Medical University Multan and DHQ Teaching Hospital, Dera Ghazi Khan from July to December 2019. Ethical and research committee of the respective institutes approved the study. Informed consent was sought from the parents/ guardians of all study participants.

The sample size of 206 is estimated by using 95% confidence level, 5% margin of error with an expected percentage of Meningitis i.e. 16% in patients with LOS.[6]

Adopting non-probability consecutive sampling technique, a total of 206 neonates (103 from each center) of both gender, older than 72 hours, admitted and diagnosed with sepsis were enrolled. Sepsis screening included (TLC <5000/ mm^3 or > 20000/mm^3, absolute Leucocyte count <1800/mm^3, CRP >1mg/dl, micro ESR >15mm, IT ratio >0.2, platelet count pf < 15000/mm^3), while presence of any 2 of these 6 parameters was considered as the presence of sepsis.[10]

Neonates with spina bifida (e.g. meningocoele, myelomeningocoele, lipomeningocoele), anencephaly, other neural tube defects, or with gross congenital anomalies making lumber puncture practically impossible (meningocele, meningomyelocele) were excluded.

Demographic information of all study participants like age and gender were noted. Cases having provisional diagnosis of sepsis underwent LP and CSF were sent to institutional laboratory for cytology and biochemistry. Meningitis was labeled in a neonate if his/her CSF contains > 30 leukocytes/mm^3 and any one of these two: protein >200mg/dl or sugar <40mg/dl.[8]

All the data was collected through a pre-designed proforma and analyzed using SPSS version 23.0. Frequencies and percentages were expressed for qualitative variables like gender and meningitis. Quantitative variables like age were expressed by Mean±S.D. Data was stratified for age, gender, weight and gestation to deal with effect modifiers. For post stratification, chi-square test was applied to see the significance. P-value≤0.05 was considered significant.

RESULTS

Out of a total of 206 neonates having LOS, 111 (53.9%) were male and 95 (46.1%) female. Overall, mean age was noted to be 11.28+5.4 days whereas majority of the neonates, 73 (35.4%) were aged 3 to 7 days, followed by 13 to 17 days 44 (21.4%) and 39 (18.9%) 8 to 12 days. Overall, mean weight was found to be 2.68+0.51 kg. A total of 84 (40.8%) neonates were preterm.

Figure-1 shows that meningitis was found in 44 (21.4%) neonates. When neonates having meningitis were compared with those having no meningitis, low body weight and preterms were noted to have significant associations (p value < 0.05) with meningitis while gender and age were not found to have any significant association as shown in Table-I.

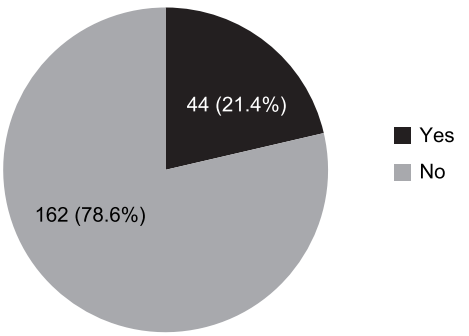

Figure-1. Frequency of meningitis in neonatal with late-onset sepsis.

DISCUSSION

LOS is usually presented after 72 hours of age and commonly along with septicemia, pneumonia or meningitis. In developing countries, neonatal meningitis has been noted to impact 33-48% mortality rates while among developed countries, these figures are around 10%.[11]

Study Variables		Meningitis (n=44)	No Meningitis (n=162)	P-Value
Gender	Male	23 (52.3%)	88 (54.3%)	0.8090
	Female	21 (47.7%)	74 (45.7%)	
Age of Presentation (days)	3-7	18 (40.9%)	55 (34.0%)	0.5963
	8-12	6 (13.6%)	33 (20.4%)	
	13-17	7 (15.9%)	37 (22.8%)	
	18-22	8 (18.2%)	24 (14.8%)	
	23-27	5 (11.4%)	13 (8.0%)	
Weight (kg)	<1.5	3 (6.8%)	19 (11.7%)	0.0005
	1.5-2.5	26 (59.1%)	45 (27.8%)	
	>2.5	15 (34.1%)	98 (60.5%)	
Gestational Age	Pre-Term	24 (54.5%)	60 (37.0%)	0.0361
	Term	20 (45.5%)	102 (63.0%)	

Table-I. Comparison of LOS cases with and without meningitis with regards to study variables.

In the present study, it was noted that majority, 53.9% of the neonates were male. A recent study from Mumbai India[12] noted 62.01% neonates with LOS to be male. A local study from Gangaram Hospital, Lahore[8], noted 53.7% of the neonates having LOS to be male which is very similar to current observation. It has been observed that males have 2-5 fold more chances of developing septicemia in comparison to females while our result were in accordance to various other findings.[13-15]

Overall, mean age was noted to be 11.28+5.4 days whereas majority of the neonates, 73 (35.4%) were aged 3 to 7 days, followed by 13 to 17 days 44 (21.4%) and 39 (18.9%) between 8 to 12 days. Our findings with regards to age of the neonates were very similar to Jha AK et al from India[13] where majority, 46% of the neonates with LOS were between 3 to 7 days of age. Bhagat R and Colleagues[16] also witnessed 46.1% of the neonates with LOS to be between 3 to 7 days of age.

We noted meningitis was found in 44 (21.4%) neonates having LOS in the current work. In a prospective trial spanning 1 year, Kaul V from India[5] found 23% of the cases with LOS to have meningitis which is quite close to those figures which we found in the present study. A local study from Gangaram Hospital, Lahore[8] noted nearly 40% of the neonates with LOS to have meningitis which is a bit higher which we found in this study. Researchers from Kenya[17], Brazil[18] and other parts of Asia[19] have found frequency of meningitis ranging between 17-18% which is close to which we found. Minor differences regarding the presence of meningitis in LOS could be because of difference in factors related to epidemiology and geography in community acquired infection in LOS.

In the present study, low body weight and preterm newborns were noted to have significant associations (p value < 0.05) with meningitis. It has been found earlier as well that meningitis was present in 63% of the low body weight neonates having LOS and 62% of the preterm neonates were also having meningitis which again emphasizes which was found in the present work.[16] Higher frequency of meningitis among low birth weight and preterm neonates have also been described by other researches as well.[20,21] Umait S et al from India[12] also noted among neonates having LOS with meningitis, 73% and 77% were preterm and had low body weight which is in accordance to current findings.

Frequency of meningitis found in the present research is somewhat similar to the findings of the other researcher. Early recognition of meningitis should be made while all cases of LOS should be screened thoroughly for the presence of meningitis which could enable us to devise strategies and approaches to reduce the burden of LOS.

Involvement of multiple centers as well as confirmed cases of LOS are some of the strengths of this study. Our study also has some limitations. We did not evaluate breastfeeding trends among study participants. We could not note etiological factors or aspects related to management and outcome in this research which would have further given us valuable insights about the current practices at our settings.

CONCLUSION

Frequency of meningitis in neonates with LOS was high. Low body weight and preterm neonates having LOS were found to have significant association with the presence of meningitis.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Shakeel Ahmad	Study idea, Design, Supervision.	
2	Nusrat Hussain	Data collection, Literature review, Proof reading.	
3	Tayyaba Rafique	Data analysis, Discussion, Drafting.	
4	Rabia Saleem	Data collection, Data interpretation.	