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ORIGINAL ARTICLE

Importance of Lumbar Puncture in Late Onset Sepsis

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ABSTRACT

Neonatal sepsis is the significant reason of neonatal mortality and morbidity and mostly results in extended hospitalization of infants in the neonatal intensive care unit. The sepsis was confirmed by a positive blood culture and a condition is considered clinical sepsis when the blood culture is negative. It is practically not possible to clinically differentiate sepsis from neonatal meningitis. However, a positive CSF for pathogenic bacteria indicates meningitis.

Aim: The purpose of this study was to evaluate the frequency of late-onset sepsis in neonates with meningitis and to determine whether CSF analysis and lumbar puncture is mandatory in all cases of late-onset sepsis.

Methods: This study was conducted in the Paediatrics department of CMH Abbottabad, and Sharif Medical City Hospital Lahore, and Pathology department of Women Medical and Dental College, Abbottabad for the duration from January 2022 to June 2022 among neonates with late neonatal sepsis. All neonates underwent clinical examination, history, routine tests (blood culture, C-reactive protein, complete blood count) and analysis and culture of cerebrospinal fluid for clinical evaluation of sepsis.

Results: All 80 neonates tested positive for clinical sepsis: hematological sepsis was seen in 59 patients and 21 were CSF culture positive for sepsis; 8 (38.9%) of the 21 have positive CSF culture and 13 cases have negative blood culture. The most common clinical symptom was poor suction 70(87.5%), followed by weak moor 61(76.3%), and lethargy 46(57.5%). The Klebsiella spp was common organism seen in 15 children in the blood culture and the most communal organism in the cerebrospinal fluid culture was Staphylococcus aureus in 6 cases.

Conclusions: The incidence of neonatal meningitis is high in new-borns with late-onset sepsis. Meningitis in neonates often transpires in the absence of bacteraemia. Therefore, the CSF examination and lumbar puncture are compulsory in all children with late onset sepsis.

Keywords: Lumbar puncture, Meningitis, Neonatal sepsis

INTRODUCTION

Neonatal sepsis is the significant reason of neonatal mortality and morbidity and mostly results in extended hospitalization of infants in the neonatal intensive care unit[1-2]. Neonatal sepsis can be classified as late-onset or early-onset contingent on whether symptoms occur later (> 72hrs) or earlier (< 72hrs)[3-4]. The organisms of late-onset sepsis found in the external environment of the hospital or home. Late-onset neonatal sepsis occurs in ~ 0.1% of all new-borns and up to 25% of very low birth weight (birth weight <1500 g)[5-6]. Previously, acute phase C-reactive protein (CRP) and white blood cell counts were used to detect neonatal sepsis[7]. In the early neonatal sepsis stages; CRP is less sensitive but more specific[8-9]. The sepsis was confirmed by positive blood culture and a condition is considered clinical sepsis when the blood culture is negative. It is practically not possible to clinically differentiate sepsis from neonatal meningitis[10]. However, a positive CSF for pathogenic bacteria indicates meningitis. A total of 15-55% of patients with meningitis (positive CSF culture) have negative blood culture[11-12] The purpose of this study was to evaluate the frequency of late-onset sepsis in neonates with meningitis and to determine whether CSF analysis and lumbar puncture is mandatory in all cases of late-onset sepsis.

METHODS

This study was conducted in the Paediatrics department of CMH Abbottabad, and Sharif Medical City Hospital Lahore, and Pathology department of Women Medical and Dental College, Abbottabad for the duration from January 2022 to June 2022 among neonates with late neonatal sepsis. A total of 80 neonates were included in this study.

Inclusion criteria: Neonates with symptoms of sepsis 72 hours after birth: (1) tachypnea, apnea, cyanosis, respiratory failure. (2) Tachycardia, Bradycardia. (3) Convulsions, Hypotonia. (4) Poor perfusion and poor skin color. (5) Lethargy, poor intake and Irritability. (6) Hepatomegaly, abdominal distension and splenomegaly. (7) Hypothermia, hyperthermia.

Exclusion Criteria: Infants with the following symptoms: (1) Congenital infection. (2) Early neonatal sepsis. (3) Perinatal asphyxia. (4) Congenital abnormalities. (5) Intracranial bleeding. (6) Drug use by mother.

In our study, following information was taken from the attendants of the neonates: (1) Natal, prenatal and family medical histories with an emphasis on gender, postnatal age, gestational age and mode of delivery. (2) comprehensive clinical examination of gestational age, temperature, oral feeding tolerance, abdominal distension, residual gastric aspirate, cyanosis and others based on the sepsis score described by a modified clinical sepsis score. (3) The laboratory tests performed are as follows: (a) Complete blood picture with differential cell count to evaluate the results of haematological sepsis score. b) PCR. c) Blood culture. (d) Lumbar puncture and CSF analysis.

A peripheral blood sample was collected by veni-puncture. Blood was collected using a sterile technique. This requires cleaning patients with alcohol wipes containing 2% chlorhexidine and 70% isopropyl alcohol prior to collection. The samples were centrifuged for 10 minutes at 3000 rpm, and then the samples of serum were stored till the analysis: (1) Complete blood count (2) Blood culture (anaerobic and aerobic). The lumbar puncture was performed under complete aseptic conditions.

The lumbar puncture was executed by inserting a needle between the 4th and 5th lumbar vertebrae (L4-L5). Routine CSF testing includes color, clarity, glucose, protein, differential white blood cell counts, red blood cell counts, Gram staining, and bacterial culture. Depending on the results of the initial tests and possible diagnosis, further tests may be required.

RESULTS

All 80 neonates tested positive for clinical sepsis: hematological sepsis was seen in 59 patients and 21 were CSF culture positive for sepsis; 8 (38.9%) of the 21 have positive CSF culture and 13 cases have negative blood culture.

Table-1: shows the Clinical sepsis score

Clinical Sepsis Score	No
1	0 (0)
2	1 (1.3)
3	28 (35)

4	17 (21.3)
5	24 (30)
6	10 (12.5)
7	0 (0)

The most common clinical symptom was poor suction 70(87.5%), followed by weak moor 61(76.3%), and lethargy 46(57.5%).

Table-2: shows Blood culture results of children

Organisms	n (%)
Citrobacter spp.	4 (5)
Coagulase-negative Staphylococcus spp.	3 (3.8)
Klebsiella spp.	15 (18.8)
MRSA	3 (3.8)
No growth	37 (46.3)
Pseudomonas spp.	4 (5)
S. aureus	6 (7.5)
Staphylococcus spp. pathogens	8 (10)

The Klebsiella spp was common organism seen in 15 children in the blood culture and the most communal organism in the cerebrospinal fluid culture was Staphylococcus aureus in 6 cases.

Table-3: shows CSF culture results of children

Organisms	n (%)
Enterobacter spp.	5 (6.3)
Streptococcus spp.	4 (5)
Klebsiella spp.	4 (5)
No growth	59 (73.8)
Pseudomonas spp.	3 (3.8)
S. aureus	6 (7.5)

Table-4: Correlation between the clinical score and the haematological score

Clinical score	Pearson's correlation	P value	Significance
Haematological score	0.597	0.001	High

DISCUSSION

Neonatal sepsis is definite as a syndrome of clinical bacteraemia with signs of infection in the initial fourth weeks of life[13]. The clinical manifestations of sepsis are not specific to new-borns and a high rate of doubt is essential for the on-time analysis of sepsis[14-15]. Although the gold standard investigation for the sepsis diagnosis is blood culture, though culture reports were not obtainable until 48 to 72 hours. In this study, we found that sepsis was more common in full-term babies (73.3%) than in premature babies (26.7%).

Taking into account age at the time of admission, our study included infants ranging in age from 7 to 27 days, with a mean age ± SD of 14.23 ± 64.2 months. In this study, patients were assessed according to the estimated neonatal sepsis score. Since all our cases were clinically septic, their scores ranged from 3 to 6. A total of 28 cases (35%) scored 3 points, 17 cases (21.3%) scored 4 points, 24 cases (30%) scored 5 points and 10 cases (12.5%) scored 6, but none of them scored seven and the most common clinical symptoms in sepsis patients were was poor suction 70(87.5%), followed by weak moor 61(76.3%), and lethargy 46(57.5%). These results are comparable by Ottolini et al[16-17]. In our study, CRP ranged from 6 to 192 mg / dL (mean ± SD = 104.3 ± 63.01), while approximately 10% of our cases were CRP negative and 3.3% had positive blood cultures. These results are in agreement with Gendrel et al[18]. In our study, Klebsiella spp was the communal organism causing sepsis. In this study, all new-borns (80 cases) underwent lumbar puncture and CSF analysis for cytology, chemistry (glucose and protein), and cerebrospinal fluid culture. The results showed that 59 cases (73.8%) had normal CSF, less than 5 cells / mm3, normal glucose and protein levels, and culture showed no growth. However, in 21 cases (26.2%), CSF analysis showed cells ranging from 80 to 26,000 cells / mm3. It should be noted that the interpretation of CSF results in new-borns is more difficult than in older babies, especially in premature babies whose more permeable blood-brain barrier leads to higher levels of glucose and protein[19-20]. As for the culture of the cerebrospinal fluid, there was no growth in 59 (73.8%) of the 80 cases in our study. The remaining 26.2% had positive cerebrospinal fluid cultures. The most common organism is S. aureus (7.5%). In our study, high cerebrospinal fluid white blood cell counts, high protein levels, and low glucose levels were found in 4/80 (5%) of cases with negative CSF culture; these results contradicted the results obtained by Garges et al, but were in agreement with Smith et al[21-22].

CONCLUSION

We concluded that clinical parameters such as irritability, lethargy, and poor appearance are better indicators of meningitis. Neonates with late sepsis have a high frequency of neonatal meningitis. Meningitis in new-borns often transpires in the absenteeism of bacteraemia. Therefore, the CSF analysis and lumbar puncture are compulsory in all late sepsis patients.

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