

Cerebrospinal fluid study in children with cerebral malaria at a tertiary care centre of South Rajasthan

Suresh Goyal, Badrilal Meghwal* , Bhupesh Jain and Sanjay Mehta

Department of Pediatrics, Rabindra Nath Tagore (RNT) Medical College, Udaipur, Rajasthan 313001 India

***Correspondence Info:**

Dr. Badrilal Meghwal
Assistant Professor,
Department of Pediatrics,
Rabindra Nath Tagore (RNT) Medical College,
Udaipur, Rajasthan 313001 India
E-mail: drblmeghwal@gmail.com

Abstract

Objective: To study the cerebrospinal fluid (CSF) findings in children with cerebral malaria.

Material and Methods: This study was carried out on 39 cases of cerebral malaria admitted in pediatric department of tertiary care centre of South Rajasthan over a period of one year. Confirmation of diagnosis was done by demonstration of parasites in peripheral blood smear (thick and thin film). CSF pressure was recorded during lumbar puncture. Complete CSF examination (Cytology and Biochemical) was performed.

Results: Out of total 39 patients, 26 (66.6%) were males and 13 (33.4%) females. Maximum numbers of patients (61.6%) were below the age of 6 years. Fever and altered sensorium was present in all cases. Maximum had high grade fever with chills and rigor. Convulsions were present in 66.7% of patients. Majority (27; 69.2%) of patients had increased CSF pressure; 17 (43.6%) patients had pressure between 16-20 cm of H₂O and 10 (25.6%) had pressure more than 20 cm H₂O. The highest pressure observed was 31.0 cm of H₂O. Maximum number of patients (25; 64.1%) had CSF sugar level > 50 mg%. CSF protein between 31-45 mg % was recorded in 24 (61.5%) patients.

Conclusion: Cerebral malaria is one of the common manifestations of severe and complicated malaria in children. This study highlighted that the increased CSF pressure and protein was associated with increased mortality.

Keywords: Cerebral malaria, CSF pressure, protein, mortality

1. Introduction

Malaria is of overwhelming importance in the developing world today, with an estimated 300-500 million cases and more than 1 million deaths each year.[1] India contributes 77% of the total malaria in South-East Asia.[2] Cerebral malaria (CM) is the most common complication of falciparum malaria and occurs in children 3 to 6 years of age.[3] The pathogenesis of childhood cerebral malaria is not well understood. Currently, there are two major hypotheses explaining CM etiology, these are the mechanical and the humoral hypotheses.[4] Activation of microglia and astrocytes in the brain might cause the cerebral symptoms by excitotoxic mechanisms which may be one of the causes of cerebral symptoms.[5] Therefore, we conducted a study on cerebrospinal fluid (CSF) findings in children with cerebral malaria.

below 16 years of age were included. Cerebral malaria was considered when a child presented with unarousable coma or any degree of CNS involvement not attributable to any other cause. Patients' demographic data were recorded. A detailed history taking followed by general physical and systemic examination was done. Confirmation of diagnosis was made by demonstration of parasites in peripheral blood smear (thick and thin film). CSF pressure was recorded in all the patients by simple method of estimating CSF pressure during lumbar puncture (LP). In this method LP was done with 22 gauge needle of one and half inch length. The number of drops was counted in 21 seconds and this was considered as pressure of CSF in cm of water. CSF was also seen microscopically for type of cells. CSF biochemistry was done for protein, sugar and chloride.

2. Material and Method

This study was carried out on 39 cases of cerebral malaria admitted in pediatric department of tertiary care centre of South Rajasthan over a period of one year. Children

3. Results

Out of total 39 patients, 26 (66.6%) were males and 13 (33.4%) females with M: F ratio 2:1. Maximum numbers of patients (24; 61.6%) were below the age of 6 years (Table

1). Out of 39 patients, 27 (69.2%) belonged to Udaipur district and 12 (30.8%) were from other districts.

Fever and altered sensorium was present in all cases. Maximum (28; 71.8%) patients had high grade fever with chills and rigor. Convulsions were present in 39 (66.7%) patients. Other associated findings are described in Table 2.

Majority (27; 69.2%) of patients had increased CSF pressure; 17 (43.6%) patients had pressure between 16-20 cm of H₂O and 10 (25.6%) had pressure more than 20 cm of H₂O (Table 3). Out of these 10 patients 4 expired. This difference was significant as compared to mortality with normal CSF pressure ($p < 0.01$). The highest pressure observed was 31.0 cm of H₂O. The mean CSF pressure in patients who expired was 20.3 ± 7.4 cm of water where as it was 11.8 ± 4.5 cm of water in patients who survived.

CSF protein between 31-45 mg% was recorded in 24 (61.5%) patients. Nine (23.1%) patients had CSF protein level above 45 mg%. Out of these 9 patients, 4 expired. This difference was significant as compared to mortality with normal CSF protein ($p < 0.01$). The mean CSF protein in patients who expired was 70.6 ± 13.9 as compared to 40.0 ± 12.8 in patients who survived. CSF sugar was < 30 mg% in 4 (10.3%) cases and between 30-50 mg% in 10 (25.6%) cases. Maximum number of patients (25; 64.1%) had CSF sugar level > 50 mg%. There were no cells in the CSF in all cases of cerebral malaria.

Table 1: Age and sex distribution of patients

Age (yrs)	Male		Female		Total	
	No. of patients	%	No. of patients	%	No. of patients	%
< 1	2	5.1	-	-	2	5.1
1-3	6	15.4	4	10.3	10	25.6
3-6	8	20.5	4	10.3	12	30.8
6-15	10	25.6	5	12.8	15	38.5
Total	26	66.6	13	33.4	39	100

Table 2: Clinical manifestations of cerebral malaria

Sign/ Symptoms	No. of cases	Percentage
Fever	39	100
Altered sensorium	39	100
Convulsions	26	66.7
Others		
Vomiting	15	38.5
Loose motions	7	17.9
Headache	6	15.4
Abnormal movements of limbs	2	5.1
Pallor	11	28.2
Peripheral circulatory failure	3	7.7
Flaccid paralysis	1	2.6
Lock jaw	1	2.6

Table 3: Cerebrospinal fluid in cerebral malaria

CSF indices	No. of patients (n= 39)	Percentage
Pressure (cm of water)		
< 16	12	30.8
16-20	17	43.6
>20	10	25.6
Protein (mg%)		
15-30	6	15.4
30.1-45	24	61.5
>45	9	23.1
Sugar (mg%)		
<30	4	10.3
30-50	10	25.6
>50	25	64.1
Cells		
Present	-	-
Absent	39	100.0

4. Discussion

In the present study 39 patients were enrolled (66.6% males and 33.4% females). Sixty percent of patients were under the age of 6 years. Fever and altered sensorium was present in all cases. Similar observations were made in other studies [6-8].

In our study we observed increased CSF pressure (> 16 cm of water) in 64% of cases. In a study by Thapa *et al*[6] CSF pressure was increased in 75% of cases. Increased CSF pressure was associated with increased mortality in the present study as reported by other studies also [9-11].

In our study CSF protein was increased (> 45 mg%) in 23.1% of cases. Similar observations were made in other studies also [6,12-15]. Increased CSF protein was associated with increased mortality in the present study. We recorded increased (>50 mg%) CSF sugar levels in 64.1% cases. Jakka *et al* reported low CSF sugar levels in their study. CSF glucose has been found to be lower in patients with fatal cerebral malaria as compared to survivors.[12] None of our patient had CSF pleocytosis. This is similar to other studies [12,15] Few studies[16,17] has reported no changes in CSF in cases of cerebral malaria.

5. Conclusion

Cerebral malaria is one of the common manifestations of severe and complicated malaria in children. This study highlighted that the increased CSF pressure and protein was associated with increased mortality.

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