

## FREQUENCY OF FEVER AND CEREBROSPINAL FLUID PLEOCYTOSIS IN ACUTE ENCEPHALITIS IN CHILDREN

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### ABSTRACT

**Objective:** To determine the frequency of fever and cerebrospinal fluid pleocytosis in acute encephalitis in children.

**Study Design:** Cross-sectional study.

**Place and Duration of Study:** This study was conducted on admitted patients from Outpatient Department and Emergency in Children's Hospital PIMS, Islamabad, from May 2009 to Mar 2010.

**Methodology:** Fifty six patients with acute encephalitis were included in the study, meeting the criteria as per International classification of diseases 9 and 10. All children (both genders) between the ages of 4 months to 12 years with acute encephalitis were included. Cerebrospinal fluid routine examination was done in all patients and the findings of pleocytosis (WBC count  $>5u/l$ ), protein and sugar were noted in proforma.

**Results:** Out of 56 patients 38 (68%) were males and 18 (32%) were females. The ages ranged from 4 months to 12 years, with the mean age of  $4.6 \pm 3.2$  years. Amongst the 56 enrolled patients all presented with fever. Cerebrospinal fluid examination showed Pleocytosis in 30 (54%) and normal cell count in 26 (46%). Cerebrospinal fluid protein content was normal in 45 (80%) and increased in 11 (20%).

**Conclusion:** Fever was present in all cases of acute encephalitis in children admitted to Children's Hospital PIMS, Islamabad with high frequency of cerebrospinal fluid pleocytosis.

**Keywords:** Acute Encephalitis, Cerebrospinal Fluid Pleocytosis, Fever, Frequency.

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### INTRODUCTION

Acute viral encephalitis refers to an acute inflammation of brain parenchyma due to a direct viral invasion. It is often an unusual manifestation of common viral infections and most commonly affects young children and young adults. The disease is associated with high mortality and morbidity<sup>1-6</sup>.

The clinical presentation of viral encephalitis is nonspecific and includes fever, varying degrees of alteration in sensorium with or without focal neurological deficit and/or seizures<sup>7,8</sup>. These symptoms may be due to a variety of other infective or non-infective causes therefore Malaria, bacterial and fungal meningitis and non-infectious causes of encephalopathy must be excluded. Herpes Simplex virus, is the most common cause of acute viral encephalitis<sup>10-12</sup>.

There continues to be difficulties with rapid

diagnosis of Acute Encephalitis and the admitting clinician needs to have a high index of suspicion. Fever, has been found to be the most common symptom. Cerebrospinal Fluid examination should be done in all such patients, Cerebrospinal Fluid Pleocytosis has also been found to be a common finding. Routine cerebral imaging within first 2-4 days of onset of neurological symptoms may be unremarkable and Cerebrospinal Fluid PCR for viral DNA may also delay treatment<sup>6,7</sup>.

Any patient presenting with fever and mental status change should be started on Aciclovir, which is the single most important factor in reducing mortality from 70% to between 6-19%<sup>8,10,12</sup>. Acute Encephalitis is a very serious disease and has dreadful complications. This study was planned to determine the frequency of fever and cerebrospinal fluid pleocytosis in acute encephalitis in children.

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## METHODOLOGY

This was a cross sectional descriptive study, which was conducted on patients admitted, from Outpatient Department and Emergency, suspected with acute encephalitis, in Children Hospital PIMS, Islamabad, from May 2009 to March 2010. Sample size was calculated by using WHO sample size calculator taking confidence level 95%, anticipated population proportion 17.7%, with a required precision 10%. Fifty six patients with acute encephalitis meeting the criteria as defined above, were included in the study. All children (both genders) between the ages of 4 months to 12 years with Acute Encephalitis were included, using non-probability purposive sampling. Patients with Cerebral palsy and degenerative disease, Cerebral Malaria and meningitis were excluded. Parents / guardians refusing consent were also excluded. Informed written consent was taken from parents / guardians.

Age and gender of patients were entered in the predesigned proforma. History regarding fever was taken and also entered in the proforma. Cerebrospinal Fluid routine examination was done in all patients (after taking written consent) under aseptic condition using sterile technique with vitals monitoring. Cerebrospinal fluid was sent to the lab immediately for analysis, the findings of cerebrospinal fluid pleocytosis (cerebrospinal fluid WBC count  $>5u/l$ ), Cerebrospinal Fluid protein and Blood sugar random (normal values between 15-45 mg/dl) and Cerebrospinal Fluid sugar (normal value 50-80 mg/dl, approx. 60% of serum glucose) were recorded in predesigned proforma. Blood sugar levels were also checked at the time of cerebrospinal fluid examination and values of blood sugar and cerebrospinal fluid sugar were compared ( $<60\%$  of blood sugar was taken as low cerebrospinal fluid sugar).

Data was entered in SPSS version 17 for analysis. Mean  $\pm$  standard deviation was calculated for age of patient. Frequency and percentages were calculated for gender, fever, Cerebrospinal Fluid WBC count, Cerebrospinal Fluid protein and sugar.

## RESULTS

Out of 56 patients, 38 (68%) were males and 18 (32%) were females. The ages ranged from 4 months to 12 years, with the mean age of  $4.6 \pm 3.2$  years. Amongst the 56 patients enrolled all (100%) presented with fever. Cerebrospinal fluid examination which was done in all patients showed normal cell count in 26 (46%) and Pleocytosis in 30 (54%) (fig-1). Cerebrospinal fluid protein content was normal in 45 (80%) and increased in 11 (20%) (fig-2). Cerebrospinal fluid sugar was

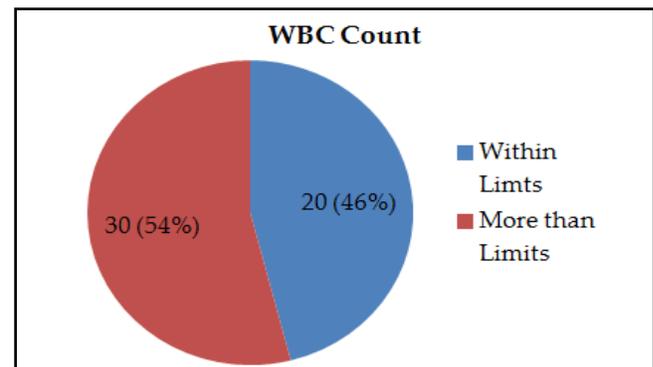


Figure-1: Findings of cerebrospinal fluid WBC count.

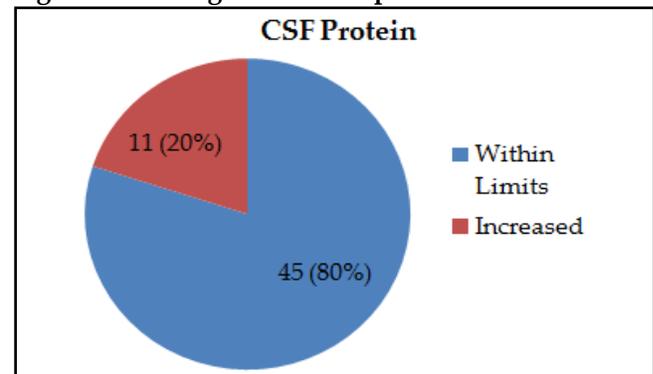


Figure-2: Findings of cerebrospinal fluid protein.

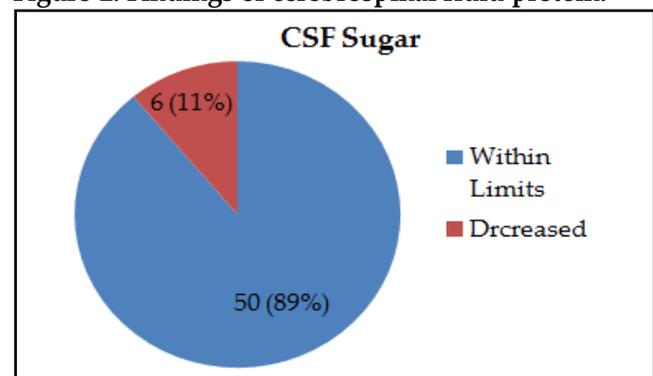


Figure-3: Findings of cerebrospinal fluid sugar.

within limits in 50 (89%) and low in 6 (11%), (fig-3).

## DISCUSSION

Acute encephalitis is a serious brain infection associated with high mortality and morbidity<sup>1-3</sup>. It has a wide spectrum of presentation, from focal to generalized cerebral dysfunction and consequences ranging from complete recovery to death<sup>1,3-5</sup>.

Even with the advances in lab techniques and development of new tests, there is difficulty in diagnosing and unless the physician has a high index of suspicion, it can be missed<sup>6-8</sup>. A wide variety of etiological agents exist, with Herpes simplex virus responsible for the most serious illness with significant risks of morbidity and death, despite advances in anti-viral therapy<sup>9-12</sup>. Though a number of organisms have been described to cause Acute Encephalitis, the etiology in most patients remains unknown<sup>12,13</sup>.

In our study children with the ages between 4 months to 12 years with Acute Encephalitis were included with the mean age of 4.6 years. Kamble also documents 1-5 years as the most common age of presentation<sup>13</sup>. In a study done by Tan *et al*, the mean age of children with Acute Encephalitis was 4.5 years<sup>14</sup>. Hsieh *et al* also documents in his study that three fifth of the children with encephalitis were younger than 6 years<sup>16</sup>. Acute Encephalitis is mostly seen in children and young adults, with herpes simplex virus having bimodal age distribution: first peak in those younger than 20 and a second peak in older than 50 years<sup>1-3</sup>. Males were in majority (68%) in our study. Kamble<sup>13</sup> and Hsieh *et al*<sup>16</sup> also report that males were dominant in their study, the male-female ratio was 1.9. While most other report that Acute Encephalitis does not have any sex predilection with the exception of Mumps Encephalitis, which usually affects men<sup>1,2,6</sup>.

In our study, all patients with Acute Encephalitis had fever (100%). Fever has been reported to be the most frequent symptom by Hsieh *et al*<sup>16</sup>, reported as 75%. In another study by Mekan, *et al*<sup>17</sup> fever was again reported as 78%, the most

common symptom. Ladapo<sup>15</sup> in his study also documents fever as 90%. In adults personality/behavior changes and headache have been reported to be the most common symptoms, which are less frequent in children<sup>18</sup>.

In our study Cerebrospinal Fluid pleocytosis was 54%. Cerebrospinal Fluid pleocytosis has been documented by Mekan *et al*<sup>17</sup>, in their studies. Hsieh *et al*<sup>16</sup> reported Cerebrospinal Fluid WBC count 0-630 u/L, with a mean count of 29.4 /uL. Gondim *et al*<sup>18</sup> also reports pleocytosis in most of his patients.

Cerebrospinal fluid protein content was normal in 80% and increased in 20% in our study, while Jameel *et al*<sup>18</sup>, Mekan *et al*<sup>17</sup> and Hsieh *et al*<sup>16</sup> report protein to be mostly raised. Elevated cerebrospinal fluid protein has been labeled as a predictor of poor outcome by Jameel *et al*<sup>18</sup>. Protein content was normal in majority in our study, which is consistent with the study of Ladapo<sup>13</sup> (this difference of cerebrospinal fluid protein content could be because of small sample size of our study). Cerebrospinal fluid sugar was within limit in 89% and low in 11% which is consistent with the studies done by Hsieh *et al*<sup>16</sup>, Mekan *et al*<sup>17</sup> & Jameel *et al*<sup>18</sup>. Though there were no specific findings in Cerebrospinal Fluid examination and the diagnosis was mainly clinical, but cerebrospinal fluid examination helped to rule out bacterial brain infection, for which the treatment is different.

## CONCLUSION

All patients were found to have fever in our study. Cerebrospinal fluid pleocytosis was seen in majority of the patients; cerebrospinal fluid protein content was normal in most patients; while cerebrospinal fluid sugar was normal in majority of the patients. acute encephalitis is a diagnostic challenge, with no specific findings in cerebrospinal fluid. However cerebrospinal fluid examination is mandatory to distinguish it from other forms of brain infections. Early starting of antiviral (aciclovir) has dramatically reduced mortality, so the clinician should have a high index of suspicion and treatment should be commenced early.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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