

## Original Articles

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# Clinical and Epidemiological Profile of Paediatric Encephalitis Patients in a Tertiary Care Hospital

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### Abstract:

**Introduction:** Acute encephalitis is potentially harmful central nervous system (CNS) inflammation usually caused by infections. The diagnosis is difficult to establish and the etiology often remain unclear. It is endemic throughout the year with occasional epidemics in various localities in our country. So this study was carried out to see the clinical and epidemiological background of hospitalized children with encephalitis.

**Methodology:** A retrospective, observational study, conducted in the department of Paediatrics, Chittagong Medical College Hospital (CMCH). The study period was from January 2009 to December 2010. Children with all ages and sex with clinical case definition of encephalitis characterized by new onset of fever (temperature  $\geq 38^{\circ}\text{C}$ ) or history of fever during present illness along with altered mental status (confusion, disorientation, coma) and/or neurological deficit (focal or diffuse neurological dysfunction or new onset of seizure) were included.

**Results:** A total of 666 cases were analyzed during the study period. The mean age of the children was 3.77 years ( $SD \pm 2.9$  years), most of the cases (48.5%) were between 12 months to 60 months age group. Urban cases were 144 (25%) & rural cases were 421 (75%). Year wise admissions in 2009 & 2010 were 312 & 354; deaths were 46% & 56%. Prominent clinical features of admitted encephalitis patients were fever (89%), convulsion (84%) and altered consciousness (75%). The trend of admission was high in the months of January, April and October. Significant number of death were observed under 5 year's age group ( $P$  value  $< 0.02\%$ ).

**Conclusion:** It was observed from this study that clinical profiles among children with encephalitis can help to understand the course and epidemiological pattern of the disease. The spectrum of encephalitis can differ from rural to urban area and the months of January, April and October were the peak seasons for encephalitis in south-east region of Bangladesh; probably due to viral surge.

**Key words:** Acute encephalitis, epidemiology, South-east region, Bangladesh.

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### Introduction:

Encephalitis is one of the challenging clinical entities in hospital setting causing high morbidity and mortality.<sup>1</sup> Many viruses are reported to cause encephalitis and there are considerable geographical and seasonal variation regarding predominate pathogens.<sup>2</sup> In addition new viruses are constantly emerging and spreading, largely as a result of changes in the distribution of their vectors<sup>2</sup>. Classically encephalitic children present with a brief 'flu like' prodrome followed by severe headache, nausea,

vomiting and altered consciousness and also may present with meningism, seizures and focal neurological signs.<sup>2</sup>

Worldwide data report an annual incidence of acute encephalitis ranging from 3.5 to 7.4/100000 rising to 16/100000 in children.<sup>3</sup> Globally, the most common viral causes of sporadic encephalitis in adults and children is Herpes simplex (HSV),<sup>2</sup> followed by Varicella Zoster virus (VZV), Cytomegalovirus (CMV), Epstein Bar virus (EBV), measles, mumps and enterovirus.<sup>4,5</sup> In Europe tick-borne encephalitis, in the USA, West Nile viruses are the most common causes of encephalitis<sup>6</sup>. Whereas in Asia, Japanese encephalitis virus (JEV) is the leading cause of viral encephalitis with an estimated 35,000–50,000 cases and 15,000 deaths reported annually.<sup>7</sup> It is a seasonal disease, with most cases occurring in temperate areas from June to September.<sup>2</sup> Distinct etiologies of encephalitis in Bangladesh remain yet unknown. Two years hospital based surveillance in Bangladesh was found 4% JEV infection.<sup>8</sup>

Encephalitis is a serious infection in children with usually no specific treatment and the mortality rate is also high.<sup>9</sup> It is endemic throughout the year with occasional epidemics in various localities in our country. There were four epidemics of Nipha virus infection reported in our country during the period of 2001-2011.<sup>10</sup>

There are 14 Upazillas and 16 Thanas (Chittagong city corporation area) under Chittagong district which is located in the Southern region of Bangladesh. In the department of Paediatrics, Chittagong Medical College Hospital (CMCH) the admission and death of encephalitic patients are gradually increasing. Considering the morbidity and mortality burden, the retrospective study was conducted to get a baseline data of encephalitis in children admitted in this hospital.

#### **Materials and methods:**

A retrospective, observational study was conducted at inpatient department of Paediatrics, CMCH. The case selection approach was non-probability sampling clinically those who fulfill the selection (clinical case definition) criteria. The study period was from January 2009 to December 2010. The total sample size was comprised 666 patients of both sexes from 2 month to 12 years.

The clinical case definition of acute encephalitis include new onset of fever (temperature  $\geq 38^{\circ}\text{C}$ ) or history of fever during the present illness along with altered mental status (confusion, disorientation, coma) and/ or neurological deficit (focal or diffuse neurological dysfunction or new onset of seizure- either focal or generalized)<sup>8</sup>. Pyogenic meningitis was excluded by Cerebro-spinal fluid (CSF) study, culture, latex agglutination test and severe malarial cases were excluded by RDT (Rapid Diagnostic Test) for malaria positive or Blood slide examination (BSE) positive cases.

The level of consciousness were assessed for each patient by Glasgow Coma Scale (GCS) or modified GCS or AVPU scale (**A**lert, **V**ocal stimulation response, **P**ainful stimulation response, **U**nresponsiveness) which was applicable. The patient was leveled as unconscious when GCS  $\leq 8$  or not response to painful stimuli. Blood sugar, serum calcium, blood urea and complete blood count were done during the resuscitation. Bloods were collected by medical technologist and send it to CMCH clinical pathology department. BSE for malarial parasite and or RDT for malaria were done to all patients in malaria research group laboratory in CMCH. Within 24 hours after admission lumbar puncture (LP) was done and CSF analysis was performed. Specific viral and other etiological isolation and sophisticated investigation like Magnetic Resonant and Imaging (MRI) were not done due to lack of facilities. The admitted child was managed as per treatment protocol with blanket coverage - antibiotics, antiviral & in highly suspicious cases with anti malarial drugs before doing RDT for malaria or BSE.

Data were collected from admission file of the patient by using data entry proforma, which was prepared by the researchers themselves to make the process of data collection easier and systematic. After collection of relevant information the data was checked, verified, edited manually for consistency and to reduce error.

#### **Results:**

A total of 666 cases were analyzed during the study period. The mean age of the children was 3.77 years ( $\text{SD} \pm 2.9$  years), most of the cases (48.5%) within 13 month to 60 months age group. Among 666 patient, 144(25%) were from urban and 421 (75%) from rural

areas of Chittagong districts (Table-I). Number of admission was 312 & 354 and neurological deficit were 5% & 5.3% and death were 52% and 36% in 2009 and 2010, respectively (Table - II). In Fig-1 Upazilla wise distribution of patient is shown and in Fig-2 urban patients coming from different areas of Chittagong city is shown. Most of the rural patient came from Banskhalia 76 (18%), Satkania 60 (14%), Lohagara 46 (11%), Anowara 40 (10%) and most of the urban patient came from Bakolia 25(17%), Baizid 21(15%), Agrabad 13(9%), and Bandar 16 (11%). Fever (89%), convulsion (84%), altered consciousness (75%), severe weakness (48%), respiratory prodromal features (34%), planter extensor (9.9%), were the main clinical features (Table-III). Vast majority of the patients were admitted with the features of encephalitis in the months of January, April and October (Fig.-3). Neurological deficits were found in 35 cases during the study period. Among them focal weakness were found in 12 (34%), paralysis 9(26%), cognitive impairment 09(24%) & visual impairment 05(13%) cases (Table-IV). Significant number 344 (52%) of

patient died and vast majority of these from rural area 221(52%) (Table-V).

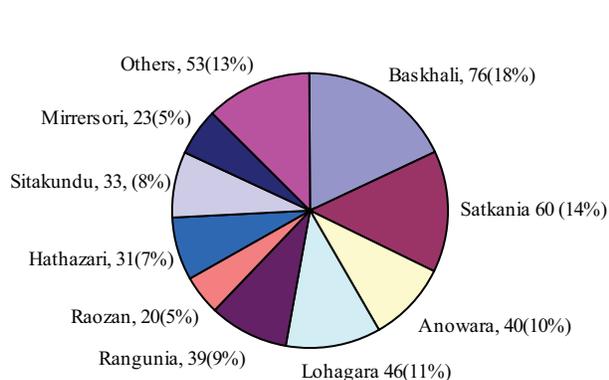
**Table-I**  
*Distribution of patients by demographic characteristics*

Demographic characteristics	No. of patients (n=666)	Percentage (%)
Age group in months		
2-6 mo	88	13%
7- 12 mo	104	15.5%
13-60 mo	322	48.5%
>60 mo	152	23%
Sex		
Male	407	61%
Female	259	39%
Location		
Urban	144	25%
Rural	421	75%
Other district	101	16.66%

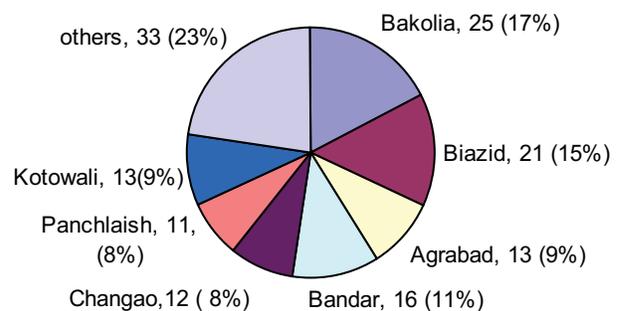
Mean age 3.77years, sd ±2.9 years

**Table-II**  
*Year wise admission of cases and their outcome*

Year	Admission	Outcome n (%)		
		Cured	Death	Recovery with neurological deficit
	Total n=666	287(43%)	344 (52%)	35 (5 %)
2009	312 (47%)	153 (52%)	144 (46%)	15 (5%)
2010	354 (53%)	134 (36%)	200 (56%)	20 (5.3%)



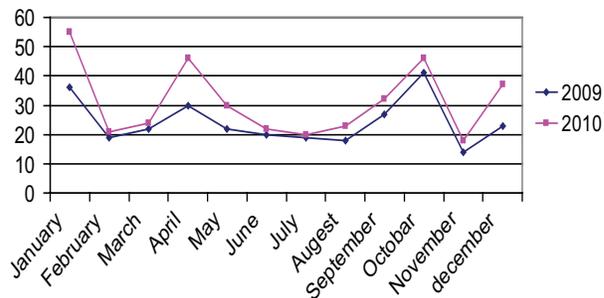
**Fig.-1:** *Distribution of patients by different Upazilla of Chittagong district (n=421)*



**Fig.-2:** *Distribution of encephalitis patients in different Urban area of Chittagong district (n=144)*

**Table-III**  
*Clinical manifestations of enrolled patients*

Symptoms	Number	Percentage (%)
Fever	590	89
Altered consciousness	502	75
Convulsion	564	84
Headache	85	13
Severe weakness or lethargy	320	48
Nausea, vomiting	189	28
Diarrhea	100	15
Muscle pain	75	11
Limb weakness	65	9
Respiratory symptoms	225	34
<b>Signs</b>		
Temp >38 <sup>0</sup> c	590	89
Neck rigidity	115	17
Positive Kernig's sign	95	14
Babinski's sign (Planter extensor)	66	9.9
Abnormal pupillary reflex's	79	11
Tremor /rigidity/ myoclonus	54	8



**Fig 3:** Month and year wise distribution of encephalitis patients

**Table-IV**  
*Pattern of neurological deficit among the survivors (n=35)*

	Number	Percentage (%)
Focal weakness	12	34
Paralysis	09	26
Cognitive impairment	09	24
Visual problem	05	13

**Table-V**  
*Patients outcome in relation to Geographical location*

	Admitted case	Improved	Recovery with neurological deficit	Death
Chittagong district (Rural)	421 (63%)	180 (43%)	20 (5%)	221 (52%)
Chittagong district (Urban)	144 (22%)	67 (46%)	8 (5%)	69 (48%)
Other than Chittagong districts	101 (15%)	40 (40%)	7 (7%)	54 (53%)
Total	666	287 (43%)	35 (5%)	344 (52%)

**Discussion:**

Encephalitis means inflammation of the brain parenchyma and it causes severe neurological syndrome commonly associated with significant morbidity and mortality.<sup>1</sup> In this study mean age was 3.77 ± 2.9 years and 61% admitted patients were male. Most of the patients came from rural locality (75%). Two surveys conducted in USA found the mean age of acute encephalitis was 4 years which is close to our study.<sup>11, 12</sup> One study in Rangpur Medical College (RMC) found mean age of children was 4 ± 2.4 years which is almost similar to our study.<sup>13</sup> In 2001, there was an outbreak of acute encephalitis in

Meherpur district of Bangladesh and another similar type of outbreak occurred in Naogon district in 2004. Epidemiological investigation in these two outbreak revealed evidence of Nipha virus infection and the mean age of the victims in those outbreak was 12 years.<sup>10,14</sup> Acute encephalitis is a severe and potentially life threatening disease, and the fatality rate of encephalitis was found as 24-42% and was highest in children aged 5-9 year age group in developed country with their Intensive care unit (ICU) facility.<sup>15</sup> The death rate was 52% in this study may be due to late referral to this tertiary hospital and lack of treatment facilities including ICU support in the hospital. In

Malaysia and Singapore in the period of outbreak in 1998-99 due to Nipha virus infection, out of 265 infected cases, the death rate was 40%.<sup>16,17</sup> Death rate of encephalitis in RMC in 2005 was 51%.<sup>13</sup> The higher death rate of this study may be due to lack of case management facilities and delayed arrival and lack of ICU facility.

Significant numbers of patients were from Banshkhali 76 (18%), Satkania 60 (14%), Lohagara 46(11%) and Anowara 40 (10%) that constitutes 53% of total admitted cases. These four upazillas are located in the coastal region of Chittagong district. People living in these upazillas are in close proximity to rice irrigated areas which may create suspicion of Japanese encephalitis Virus (JEV) pathogen. JEV is mainly transmitted by the mosquito *Culex tritaeniorhynchus*, and lay eggs in irrigated rice paddies and other open water sources.<sup>18,19,20</sup>

Though virus isolation was not possible in our study, the main presenting symptoms and signs were respiratory prodromal features (34%), fever (89%), convulsion (84%), and altered consciousness (75%), severe weakness (48%), diarrhea (15%), headache (13%), nausea & vomiting (28%), neck rigidity (17%), kernigs sign (+) ve (14%), Planter extensor (9.9%). In one study conducted in Sweden on childhood encephalitis had shown encephalopathy (80%), fever (81%), neurological findings (44%), and seizures (40%)<sup>21</sup> as prominent features. In another study in Assam on JE patients were shown fever (100%), altered sensorium (83.58%), seizure (82.08%), headache (41.79%) and vomiting (29.85%), signs of meningeal irritation were (55.22%) the main clinical findings. They found GCS d" 8 among 40.29% patients.<sup>22</sup> These variations of presentation may be related to different viral etiology.

In our study we found most of the patients were admitted in the months of January 89 (13%), April 76 (11%), and October 87 (13%), that reflects pre-monsoon and post-monsoon peak. It may be associated with mosquito breeding increases during these periods, which is the suspected carrier of virus.

Neurological sequela are common observation in encephalitis patient and is directly related to age of the patient and to the severity of disease.<sup>15</sup> In our study 5 % patient had neurological sequelae at the time of discharge, out of them focal weakness was 12 (34%), paralysis 9(26%), cognitive impairment 9 (24%) and visual impairment 5(13%). Similar

neurological sequelae were also noted in other different studies.<sup>15, 23, 24</sup> The predominant long term sequelae were personality changes, cognitive problems and epilepsy.<sup>23</sup> But the long term sequelae were not evaluated in this retrospective study. In our study significant number of death occurs under 5 years age groups, and there was no association of sex in relation to outcome. Similar findings were also noted in earlier study done in RMC.<sup>13</sup>

### Conclusion:

Lots of diversity of clinical and epidemiological characteristics of encephalitis was demonstrated in this study which makes the diagnosis and management of encephalitis difficult to clinicians. So this report can help the clinicians in identifying the disease pattern, selecting the treatment strategy, and anticipating the course of illness among children with encephalitis. The spectrum of encephalitis can differ from rural to urban area and the months of January, April and October were the peak seasons for encephalitis in south-east region of Bangladesh; probably due to viral surge.

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