

## Acute Encephalitis Syndrome in Children: A Hospital Based Study in Assam, India.

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### Abstract

**Introduction:** Acute Encephalitis syndrome is a serious public health problem in India and a leading cause of mortality and morbidity in children. JE virus is the major cause of AES in India ranging from 5 to 35% . [1] ,[2]. During 2018, total 10485 AES cases and 632 deaths were reported from 17 states to the national vector borne diseases control programme (NVBDCP) in India, with a case fatality rate around 6 percent. [3],[4]. Acute Encephalitis Syndrome is a major health problem in the state of Assam. In the state of Assam, several districts of upper Assam , have been experiencing recurrent episodes of AES with different magnitudes [5] . Under this backdrop, the present study was undertaken to know the clinical profile and outcome of children admitted with AES.

**Methods:** The present study was conducted in the department of Pediatrics , Tezpur Medical College and hospital,Tezpur,Assam over a period of 2 years and 9 months ( from January 2016 to September 2018) . Total 84 cases of AES were included in this study.This was a retrospective study. We collected the bed head tickets (medical record files) of all AES patients from medical record department of the hospital. Relevant data of the AES cases were collected , analyzed and interpreted accordingly.

**Results:** In the present study, total 84 cases of AES were admitted in pediatrics deptt during the study period. Out of 84 AES patients, majority 63% were above 5 years of age. Male were 59.5% and female cases were 40.5%. Most of the cases had come from rural area 58% followed by tea garden area 35.7% . In month wise distribution of AES cases , 78.6% patients were observed in the month of June, July and August suggesting peak incidence in monsoon and post monsoon period. The common presenting clinical manifestations were fever with altered sensorium (100%) followed by seizure 76.1% cases. Laboratory report, CSF analysis revealed 19% cases JE positive and 80.9% JE negative cases. Outcome analysis showed complete recovery in 70.6 % cases and partial recovery with neurological sequelae in 16.1 % cases. The mortality rate of AES was 13.2 % in this study.

**Conclusion:** The present study showed that AES is a leading cause of mortality and morbidity in children. Non JE AES (JE negative) is more common than JE positive encephalitis. J E vaccination to all children is an important measure for prevention and control of the diseases. Further, People should be educated regarding use of mosquito net during sleeping , proper clothing during outdoor games, activity , going to paddy field to prevent mosquito bites. After hospitalization ,adequate supportive care in intensive care unit will reduce the morbidity and mortality. Physiotherapy and family support will improve long term outcome of AES cases with neurological sequelae.

**Keywords:** Acute encephalitis syndrome, fever with altered sensorium, JE positive AES, neurological sequelae, mortality.

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### I. Introduction

Acute Encephalitis syndrome is a serious public health problem in India .It is characterized as acute onset of fever and a change in mental status ( mental confusion, disorientation, delirium or coma) and or new onset of seizures in a person of any age at any time of the year. The disease most commonly affects children and young adults and can lead to considerable morbidity and mortality.[1]. Viruses are the main causative agents in AES cases, although other agents like bacteria, fungus , parasite, spirochetes, toxins and non infectious agents also reported over the past few decades. Japanese encephalitis virus ( JE virus) is the major cause of AES in India (ranging from 5 to 35%). Other Non JE Viruses like Herpes simplex virus, Influenza A virus, west Nile

virus, mumps, measles, enteroviruses, Epstein bar virus and scrub typhus are the other causes of AES in sporadic and outbreak form in India. The etiology in large number of cases still remain unidentified . AES due to JE virus was clinically diagnosed in India for the first time in 1955 in in the state of Tamilnadu [1] ,[2]. During 2018, total 10485 AES cases and 632 deaths were reported from 17 states to the national vector borne diseases control programme (NVBDCP) in India, with a case fatality rate around 6 percent. AES cases were mainly reported from Assam,Bihar,Jharkhand, Karnataka, Tamilnadu , Uttar pradesh , Manipur and Tripura [3]. There is seasonal and geographical variation in the causative organism. The outbreak of JE usually occurs with the monsoon and post monsoon period as the density of mosquitoes increases during this season. On the other hand, encephalitis due to other viruses specially entero-viruses occurs throughout the year as it is a water borne disease. The morbidity and mortality is very high among various viral encephalitis specially in JE or enterovirus encephalitis in various parts of India [4]. JE is the most prevalent mosquito borne viral encephalitis , occurring in Japan, China, Southeast Asia and India.

Acute Encephalitis Syndrome (AES) is a major health problem in the state of Assam as it affects thousands of patient every year. In the state of Assam, particularly several districts of upper Assam , namely Dibrugarh, Jorhat, Tinsukia, Sivasagar, Golaghat and North lakhimpur have been experiencing recurrent episodes of AES ( JE and non JE ) with different magnitudes in the post monsoon period from June to September, leading to many deaths and greater numbers as disabled [5] . But, this disease is now, rapidly spreading into the various districts of middle part of Assam namely Sonitpur,Darrang, Odalguri, and Nagaon with high morbidity and mortality. Many studies were carried out by various workers and agencies to study the epidemiological factor, clinical profile and outcome , mainly in the upper Assam in the past 15 years. But, very little data is available in this respect from the newly affected districts of middle part of Assam. Under this backdrop, the present study was undertaken in this hospital, which is located in middle part of the state of Assam. This hospital mainly caters services to people of these newly affected districts. The objectives of the present study were to know better the clinical profile and outcome of AES patients admitted in the pediatrics department of the hospital.

## II. Methods

The present study was carried out in the Pediatrics department , Tezpur Medical College and hospital, Assam over a period of 2 years and 9 months( from January 2016 to September 2018). This is a tertiary care hospital located in the north bank of the Brahmaputra river in the middle part of the state of Assam. This hospital provides health care services mainly to the people of rural and tea garden areas in the nearby districts namely Sonitpur, Darrang, Odalguri and Nagaon districts. Most of the AES cases from these districts were referred to this hospital for proper care. This was a retrospective study. A total number of 84 AES cases, admitted in pediatrics department over a period of three years (approximately) were included in this study. 38 cases in 2016, 21 cases in 2017 and 25 cases in 2018 up to the month of September2018 . We collected all bed head tickets (medical record files) from medical record department after taking permission from the concern hospital authority. All 84 medical files were evaluated thoroughly and relevant data were recorded accordingly. WHO case definition of AES cases was adopted for selection of cases under this study. Case definition of Acute Encephalitis Syndrome (AES) Clinically, a case of AES is defined as a person of any age, at any time of year with the acute onset of fever and a change in mental status (including symptoms such as confusion, disorientation, coma, or inability to talk) and/or new onset of seizures (excluding simple febrile seizures). Inclusion criteria: All the patients up to age of 12 years of age. Exclusion criteria: Those patients with laboratory findings point to other diagnosis were excluded from the study. Sixteen patients (16) were referred to other hospital for ICU care due to non availability of bed in our ICU , were excluded from the outcome analysis.

## III. Results

Sl. No.	Parameter	Number of patients	Percentage
Age:	0 to 5 years	31	36.9%
	5 to 12 years	53	63 %
Sex	Male	50	59.5 %
	Female	34	40.5 %
Settings	Rural	49	58 %
	Tea garden	30	35.7 %
	Urban	5	5.9%

**Table- 1** shows demographic profile of acute encephalitis syndrome (AES) patients.( n=84 )

In the present study, total 84 cases of AES were admitted in pediatrics deptt over a period of 3 years. Out of 84 AES patients, majority 53 ( 63%) of them were above 5 years of age. Male were 50 (59.5%) and female cases were 34( 40.5%). Most of the cases came from rural area 49 cases (58%)and tea garden area 30 cases (35.7%) suggesting that AES mainly affect rural and tea garden population of Assam .

Year	June,July,August (cases)	Rest of the year (cases)	Total (cases)
2016	31	7	38
2017	16	5	21
2018 Upto sept.	19	6	25
During study period	66 (78.6%)	18 (21.4%)	84 (100%)

**Table :2:** Showing month wise distribution of AES cases.(n=84)

In month wise distribution of AES cases , 66 (78.6%) patients were observed in the month of June, July and August suggesting peak incidence in monsoon and post monsoon period.

Sl. No.	Clinical manifestation	Number of patients	Percentage
1	History of fever	84	100%
2	Headache	47	55.9 %
3	Altered sensorium	84	100%
4	Confusion	63	75 %
5	Coma	20	23.8%
6	Vomiting	45	53.6%
7	Seizure	64	76.1 %
8	Breathlessness	9	10.7%
9	Abdominal pain with loose stool	11	13.1%

**Table : 3::** showing presenting clinical manifestations of acute encephalitis syndrome (AES) patients.( n=84)

In the present study, the common presenting clinical manifestations were fever with altered sensorium (100%) followed by confusion (75%) and seizure ( 76.1%) cases.

A	Abdominal examination	Number of cases	Percentage
1	Hepatomegaly	19	22.6%
2	Splenomegaly	12	14.2%
3	Hepatosplenomegaly	9	10.7%
4	Ascites	1	1.19%
B	Respiratory system		
1	Bronchial breath sound	1	1.19%
2	Crepitation & rhonchi	24	28.6%
3	Respiratory distress	9	10.7%
C	Cardiovascular system		
1	Muffled heart sound	3	3.6%
2	Gallop rhythm	3	3.6%
3	Murmur	8	9.5%
D	Central nervous system		
1	Signs of meningeal irritation	6	7.1%
2	Hemiparesis	11	13.1%
3	Aphasia	24	28.6%
4	Ocular palsy	3	3.6%
5	Facial palsy	3	3.6%

**Table :4:** showing clinical findings of systemic examination of acute encephalitis syndrome patients.(n=84)

On evaluation of Central nervous system examination findings, hemiparesis was noted in 11 cases (13.1%), Aphasia 24 cases (28.6%), ocular palsy 3 cases (3.6%) and facial palsy in 3 cases (3.6%).

Sl. No.	Complications	Number of cases.	Percentage
1	Aspiration pneumonia	11	13.1%
2	Respiratory failure	5	5.9%
3	Peripheral circulatory failure	3	3.6%
4	Upper GI bleeding	1	1.19%
5	Bedsore	5	5.9%
6	Sepsis	2	2.4%

**Table :5:** showing complications developed during hospital stay of acute encephalitis syndrome (AES) cases. ( n=84)

The common complications developed during hospital stay were aspiration pneumonia 11 cases (13.1%) followed by respiratory failure 5 cases (5.9%) and bedsore 5 (5.9%) patients.

Year	Total cases	J E positive cases (%)	J E negative cases(%)
2016	38	5	33
2017	21	3	18
2018	25	8	17
Whole period	84 cases	16 cases (19.04%)	68 cases (80.95%)

**Table:6:** showing distribution of AES cases according to laboratory report. n=84 ( CSF analysis report- JE positive or JE negative)

In the present study, on evaluation of all laboratory investigation report and CSF analysis report ( J E Virus specific Ig M antibody ) , it was found that 16 cases (19.04 %) were JE positive and rest 68 (80.95%) cases were JE negative.

Year	Total case	Dischard/Recovered	Referred to higher Centre	Death
2016	38	26	7	5
2017	21	17	3	1
2018	25	16	6	3
During study Period	84	59	16	9

**Table :7:** showing year wise outcome of acute encephalitis syndrome (AES) cases during the study period.( n=84).

On evaluation of outcome of the AES cases during study period , it was observed that 59 cases were discharged successfully, 16 cases referred to other hospital due to non availability of bed in our Pediatric ICU and 9 cases expired in the hospital.

Sl. No.	Outcome	Number of patients	Percentage
1	Recovered completely	48	70.6%
2	Recovered with neurological sequelae	11	16.1%
3	Death	9	13.2%

**Table:8:** showing the outcome analysis of the AES cases. (n=68). Here, 16 cases were excluded from outcome analysis as these 16 cases were referred to other hospital.

On evaluation of outcome of AES cases, out of these 68 cases, 48 ( 70.6% ) cases recovered completely without neurological sequelae . Partial recovery i.e. with neurological sequelae was seen in 11 (16.1%) cases. Out of 68 cases , 9 (13.2%) cases expired in the hospital during the study period. Hence, the case fatality rate of AES was 13.2% in this study.

#### IV. Discussion

In the present study, total 84 cases of AES were admitted in pediatrics deptt over a period of 3 years. Out of 84 AES patients, majority 63% cases were above 5 years of age. Male patients were 59.5% and female cases were 40.5% . Most of the AES cases were from rural area (58%) followed by tea garden area 35.7% suggesting that AES mainly affect rural and tea garden children and belong to low socioeconomic status. These affected cases were children of poor farmer in rural area and tea garden workers. This observations were similar with other studies done by Kakoti G et al in upper Assam [6] and Kumar R et al in Uttar Pradesh [7]. Children were more affected probably because of lack of cumulative immunity due to natural infection. A male preponderance was seen in our study which was similar with various earlier studies [6,7,9]. It could be explained probably due to boys are exposed more in outdoor activities like playing football and other local games in rural area in comparison to girls who mostly stay indoors. Further, In month wise distribution of AES cases , 78.6% patients were observed in the month of June, July and August suggesting peak incidence in monsoon and post monsoon period. Many workers reported about this peak incidence in their studies [6,7,9]. This may be due to several favorable epidemiological factors like presence of water logged paddy field supporting profuse breeding of vector mosquitoes , birds like herons are common in the paddy fields of rural area during this season and piggeries are more common in Assam and located near house hold campus of the villager. Again, villagers were not using mosquito net regularly at night and at the same time children do not wear proper covered clothing while playing . Hence, they are more prone to have mosquito bites. On evaluation of immunization status , majority of the affected children were not immunized against Japanese encephalitis . Currently, in Assam JE vaccine (live vaccine SA-14-14-2) has been included in routine immunization programme as per national immunization schedule. As there is no specific treatment for Japanese encephalitis , prevention is the only way to control the problem. We have to work for complete coverage of JE vaccination at the community level.

The present study revealed that among the clinical presentation, fever with altered sensorium (100%) followed by seizure 76.1% , headache 55.9% and vomiting 53.6%. Similar observations were made by different researchers in earlier studies like Kakoti G et al [6], Jain P et al [8] and Avabratha KS et al [10]. In our study, after detailed evaluation of all laboratory reports including CSF analysis for JE virus specific Ig M antibody , it was found that the JE positive encephalitis 19.04% and acute Non JE encephalitis was 80.9% . This findings were comparable to many earlier studies done in India. Kumar R et al (2014) reported (29.2%) JE positive and another study done by Kakoti G et al (2013) found 30% JE positive encephalitis [6,13]. This clearly shows that the most common cause of AES was acute viral (Non JE) encephalitis at the community level. Hence, we have to adopt appropriate measure to control these Non J E cases to bring down the morbidity and mortality of AES. This calls for the further studies with large sample size to find out the exact etiological agent , other viruses for the Non JE AES and this will help in planning the future treatment and preventive strategies. On evaluation of outcome of the AES cases , it was observed that out of 68 cases, 70.6% cases recovered completely without neurological sequelae . Partial recovery i.e. with neurological sequelae was seen in 16.1 % cases. This observatioes were similar to other studies conducted in different state of India like Kumar R et al in 2014 [13] and Kakoti G et al in 2013 [6] and Avabratha K S et al in 2012 [10] . The common neurological sequelae were cognitive impairment , hemiparesis and extrapyramidal symptoms. In our study, concurrent seizure and coma at the time of admission were found to be poor prognostic factor and associated with increased mortality. This findings were similar with earlier studies, Y C Wu et al in Taiwan [11] and Ooi MH et al in Malaysia [12] . In the present study,the mortality rate of AES was 13.2%. The mortality rate of AES varies from 10 to 40% observed by various workers in their studies in different state of India.[6, 8,9,13].

## V. Conclusion

The present study showed that AES is a leading cause of mortality and morbidity in children. Non JE AES (JE negative) is more common than JE positive encephalitis. J E vaccination to all children is an important measure for prevention and control of the diseases. Further, People should be educated regarding use of mosquito net during sleeping , proper clothing during outdoor games, activity , going to paddy field to prevent mosquito bites. After hospitalization ,adequate supportive care in intensive care unit will reduce the morbidity and mortality. Physiotherapy and family support will improve long term outcome of AES cases with neurological sequelae.

**Limitation:** The present study was hospital based retrospective study and sample size was small, so the results inferred from the study was not the true reflection of the burden of the community. Further studies with large sample size is needed in Assam to find out the other etiological agents of Non JE AES .

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**Conflict of interest:** None stated.

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