OPEN ACCESS

IJABR

International Journal of Advanced Biotechnology and Research

ISSN 0976-2612, Online ISSN 2278–599X,

17, (3), 2026, 96-102

Research Article

Study of Clinico-Epidemiological Profile of Children Admitted With Acute Encephalitis Syndrome in a Tertiary Care Hospital

Dr. Vinay Kumar[1], Dr. Debjyoti Roy[2] and Dr. Sk Anisul Alam[3]

Article Info

[1]Senior Resident, Department of Pediatric Medicine, Prafulla Chandra Sen Government Medical College and Hospital, Arambagh, Hooghly, West Bengal, India

[2]Senior Resident, Department of Pediatrics, Prafulla Chandra Sen Government Medical College and Hospital, Arambagh, West Bengal, India

[3]PGT (3rd Year), Department of General Medicine, Midnapore Medical College and Hospital, Midnapore, West Bengal, India

---

Corresponding Author:
Dr. Vinay Kumar,
Senior Resident, Department of Pediatric Medicine, Prafulla Chandra Sen Government Medical College and Hospital, Arambagh, Hooghly, West Bengal, India.
vinnay374@gmail.com

Received: 21/07/2026
Accepted: 29/08/2026
Published: 06/09/2026

DOI: 10.5281/zenodo.22526354

Publisher's Note: IJABR Press stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Abstract

Background: Acute encephalitis syndrome (AES) is a WHO surveillance case definition denoting acute fever with altered mental status and/or new-onset seizures, and is a major cause of childhood morbidity in India. The present study aimed to investigate the etiological profile, clinical presentation, and outcome of children admitted with provisional AES at a tertiary care hospital in eastern India.

Methods: This cross-sectional study was conducted in the Department of Paediatrics, with CSF/serum testing supported by the Department of Microbiology, at a tertiary care hospital in West Bengal. Children aged 1 month to 12 years with provisional AES were consecutively enrolled, and demographic, clinical, laboratory, neuroimaging, treatment, and outcome data were analysed using SPSS.

Results: A total of 180 children were enrolled (mean age 5.2 ± 3.3 years; 58.9% male). AES was confirmed as the final diagnosis in 60.9%, with meningitis (20.1%) and meningoencephalitis (7.8%) accounting for most remaining diagnoses. Altered mental status was present in 45.8% and seizures in 67.0%. CSF and serum JE IgM were positive in 10.6% and 7.8% of samples, respectively. Hyponatraemia and dysglycaemia were recorded in 20.6% and 14.4%, and neuroimaging was abnormal in 6.1% of those imaged. Mechanical ventilation was required in 19.4%. Outcome was recovery in 87.6%, LAMA in 8.4%, and death in 3.9%.

Conclusion: Nearly three-fifths of children with suspected AES had confirmed AES, reflecting overlap with other CNS infections, particularly meningitis. JE accounted for a modest share of confirmed cases. Seizures and altered sensorium predominated, and metabolic derangements were common, supporting vigilant care alongside aetiological workup beyond JE serology.

Keywords: Acute encephalitis syndrome; Japanese encephalitis; meningitis; clinico-epidemiological profile.

Introduction

Acute encephalitis syndrome (AES) is a surveillance case definition adopted by India's National Vector Borne Disease Control Programme, denoting a person of any age, at any time of year, presenting with acute onset of fever together with a change in mental status and/or new onset of seizures, excluding simple febrile seizures [1]. The International Encephalitis Consortium has separately proposed consensus diagnostic criteria and priorities for the aetiological work-up of suspected encephalitis, distinguishing infectious from autoimmune and other non-infectious causes [2]. Despite these efforts at standardisation, encephalitis and AES remain difficult to characterise epidemiologically: a large analysis of hospitalisation data from the United States found that the causative agent was unknown or unrecorded in the majority of encephalitis-associated admissions [3].

Internationally, population-based surveillance has shown that AES and encephalitis encompass a heterogeneous group of infectious and immune-mediated conditions rather than a single disease entity, with the relative contribution of individual causes varying substantially by setting and by the intensity of diagnostic testing applied [4]. In India specifically, the epidemiology of AES has been described as undergoing a changing paradigm, with Japanese encephalitis (JE) accounting for a diminishing share of confirmed cases in several states even as the overall burden of AES persists, and with a substantial proportion of cases in most series remaining aetiologically unexplained on routine testing [5,6].

Regional studies from eastern India have reported viral confirmation in only a minority of AES cases, with herpes simplex virus emerging as an important, though not exclusive, contributor in this part of the country [7]. Within West Bengal specifically, JE IgM positivity among AES cases has been reported to vary considerably between years and localities, underscoring the importance of local, hospital-based data alongside national surveillance figures [8]. Elsewhere in India, non-JE pathogens including Orientia tsutsugamushi (the causative agent of scrub typhus) have been increasingly recognised as important, potentially treatable causes of AES, particularly in Bihar and adjoining regions [9], while large public health outbreaks such as that investigated in Gorakhpur, Uttar Pradesh, have highlighted the continuing diagnostic and public health challenge posed by AES clusters in children [10].

The present study was undertaken to describe the demographic, clinical, laboratory, and outcome profile of children admitted with a provisional diagnosis of AES at a tertiary care hospital in eastern India, and to characterise the proportion in whom AES was confirmed as the final diagnosis as against alternative CNS infections.

Materials and Methods

This cross-sectional observational study was conducted in the Department of Paediatrics and Department of Microbiology, Burdwan Medical College and Hospital, West Bengal, with cerebrospinal fluid (CSF) and serum testing for Japanese encephalitis (JE) IgM performed with support from the Department of Microbiology. Ethical clearance was obtained from the Institutional Ethics Committee, and the study was conducted in accordance with the Declaration of Helsinki.

All infants and children aged 1 month to 12 years admitted with a provisional diagnosis of AES, defined as acute onset of fever with (i) a change in mental status (confusion, disorientation, coma, or inability to talk) and/or (ii) new onset of seizures (excluding simple febrile seizures), were consecutively enrolled. Children with simple febrile seizures, a known pre-existing seizure disorder, traumatic encephalopathy, or metabolic encephalopathy were excluded.

A structured, pre-tested proforma was used to record demographic details, clinical presentation, and relevant investigations through direct interview of parents/caregivers,

review of medical records, and CSF reports from the Department of Microbiology. Investigations included CSF examination, CSF and serum JE IgM ELISA, serum electrolytes, blood glucose, and neuroimaging where clinically indicated. Hyponatraemia and dysglycaemia were recorded as per standard laboratory reference ranges. Outcome at the end of hospitalisation was classified as recovered and discharged, discharged against medical advice (LAMA), or death.

Data were entered into Microsoft Excel and analysed using SPSS (version 27.0; IBM Corp., Armonk, NY, USA). Categorical variables were summarised as frequencies and percentages; continuous variables were summarised as mean ± standard deviation. Denominators vary slightly across variables because of missing data for individual fields and are reported alongside each result.

Results

A total of 180 children admitted with a provisional diagnosis of AES were enrolled. The mean age was 5.2 ± 3.3 years (range 0.08–12.0 years). Of these, 106 (58.9%) were male and 74 (41.1%) were female. By religion, 126 of 179 patients with data recorded (70.4%) were Hindu and 53 (29.6%) were Muslim.

Final diagnosis at admission

Of 179 patients with a recorded admission diagnosis, 109 (60.9%) had a final diagnosis of AES. The remainder had a range of alternative diagnoses, most commonly meningitis (36, 20.1%) and meningoencephalitis (14, 7.8%), reflecting substantial clinical overlap between the AES case definition and other acute CNS infections (Table 1).

Table 1. Admission/final diagnosis of children enrolled with provisional AES

Diagnosis	n	%
AES	109	60.9%
Meningitis	36	20.1%
Meningoencephalitis	14	7.8%
Sepsis with meningitis	8	4.5%
Febrile seizure	3	1.7%
Fever (unspecified)	2	1.1%
Seizure disorder	2	1.1%
Viral meningoencephalitis	2	1.1%
AMES	1	0.6%
Enteric meningoencephalitis	1	0.6%
Simple febrile seizure + meningitis	1	0.6%

Clinical presentation

Altered mental status was present in 81 of 177 patients with data recorded (45.8%), and seizures were present in 120 of 179 patients (67.0%) (Table 2).

Table 2. Clinical presentation

Feature	n	%
Altered mental status	81	45.8%
Seizures	120	67.0%

Laboratory and etiological findings

CSF was collected in 177 of 180 patients (98.3%) and serum in 104 of 180 patients (57.8%). Among samples tested, CSF JE IgM was positive in 19 of 179 (10.6%) and serum JE IgM was positive in 8 of 102 (7.8%); the two JE IgM result tables carry slightly different denominators (179 and 102) than the corresponding CSF- and serum-collection counts (177 and 104) because they derive from separate laboratory data exports in the source records, a discrepancy that could not be reconciled from the material available and should be checked against the original laboratory registers (Figure 1).

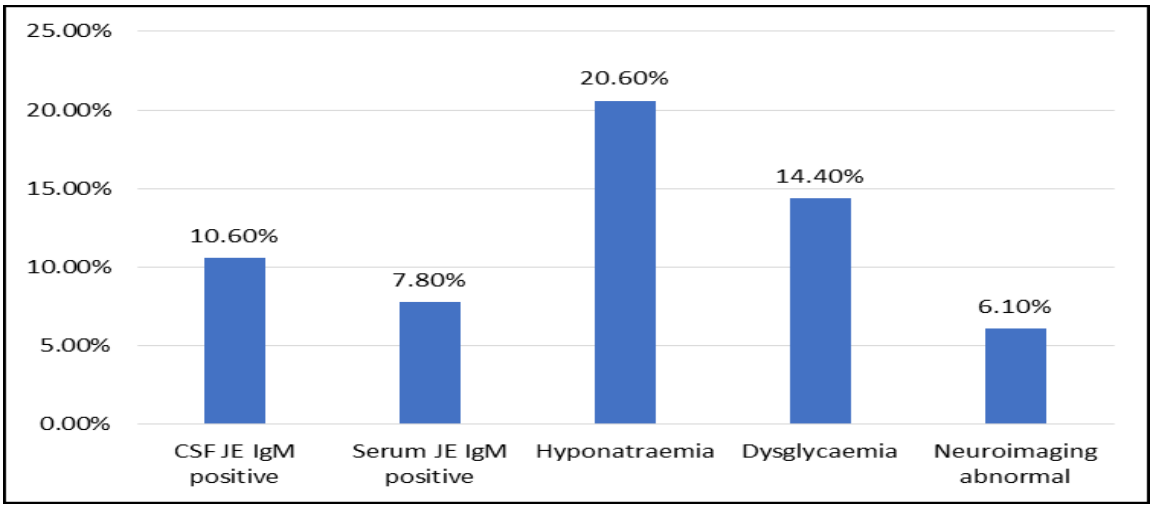

Figure 1. Investigation findings

Treatment and supportive care

Mechanical ventilation was required in 35 of 180 patients (19.4%). Empirical antibiotic data were available for a subset of 114 patients, of whom 96 (84.2%) received ceftriaxone and 25 (21.9%) received azithromycin; the reason for the smaller denominator for antibiotic-usage data was not specified in the source records and should be clarified by the author (Table 3).

Table 3. Supportive care and empirical antimicrobial therapy

Parameter	n	%
Required mechanical ventilation	35	19.4%
Received ceftriaxone	96	84.2%
Received azithromycin	25	21.9%

Outcome

Among the patients, 87.6% recovered and were discharged, 8.4% were discharged against medical advice (LAMA), and 3.9% died (Figure 2).

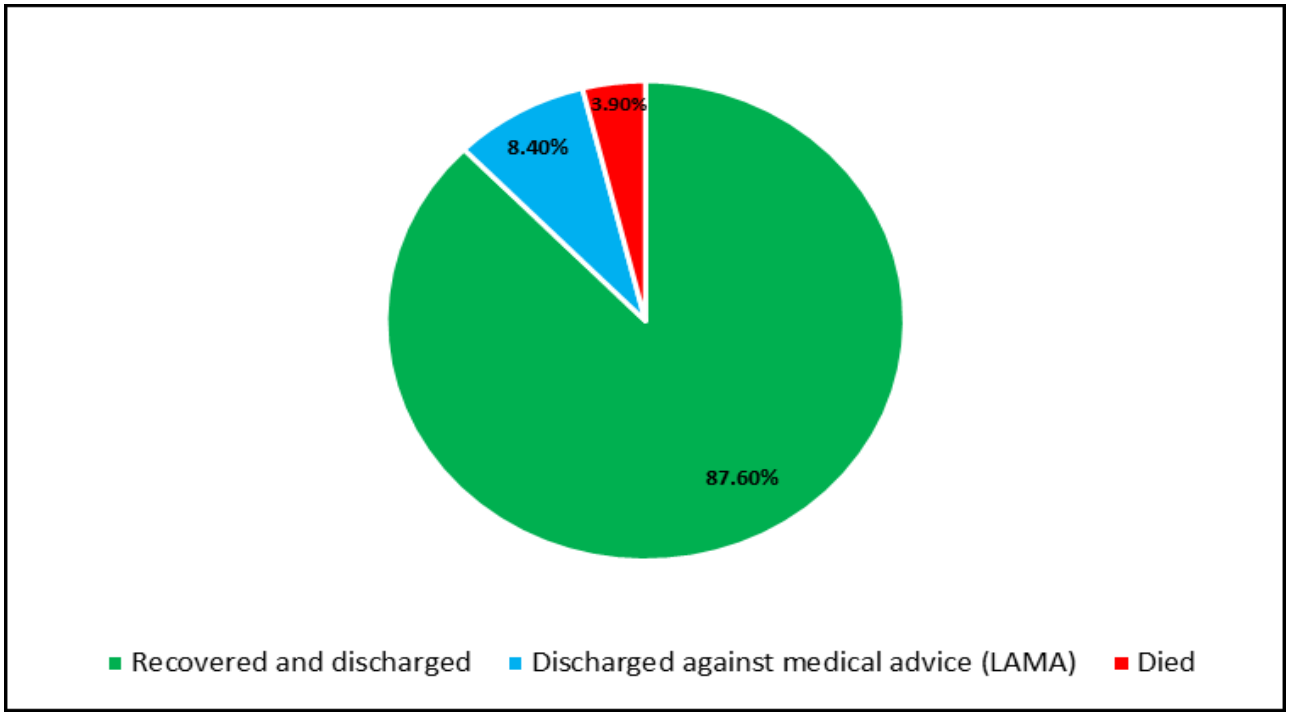

Figure 2. Outcome of hospitalisation

Discussion

In this cohort of 180 children admitted with a provisional diagnosis of AES at a tertiary care hospital in eastern India, only 60.9% were ultimately confirmed to have AES as the final diagnosis, with meningitis and meningoencephalitis accounting for most of the remainder. This finding illustrates the point made by John et al., who cautioned against treating AES as a single disease entity given that the surveillance case definition captures a heterogeneous group of encephalitis, encephalopathy, and meningitis presentations that require separate diagnostic consideration and management [11]. The substantial proportion of children ultimately diagnosed with meningitis rather than encephalitis in the present cohort reinforces the importance of CSF evaluation, which was performed in 98.3% of patients here, in distinguishing between these overlapping presentations.

The mean age of 5.2 years and male predominance (58.9%) observed in this study are broadly consistent with the demographic pattern described in other Indian and regional AES cohorts, in which school-age children and boys are disproportionately affected [12,13]. Seizures (67.0%) and altered mental status (45.8%) were the dominant presenting features in this cohort, in keeping with the case definition itself and with the clinical profile described by Tripathy et al. in their comparison of viral and nonviral AES in children from Eastern India, in which altered sensorium and seizures were similarly prominent presenting features [12].

The proportion of CSF JE IgM positivity in this cohort (10.6%) was lower than the JE positivity reported in some historical AES series from northeastern India, where JE has traditionally accounted for a larger share of confirmed cases [14], but is broadly in keeping with the wider literature suggesting that JE now accounts for only a modest proportion of AES in many parts of India as other aetiologies, and non-JE viral and bacterial causes, are increasingly recognised [12,15]. Direct comparison of aetiological yield across these studies is limited by differences in the panel of pathogens tested; the present study's aetiological workup was largely restricted to JE serology, and pathogens known to contribute meaningfully to paediatric AES elsewhere in India, such as herpes simplex virus, dengue virus, and scrub typhus, were not systematically evaluated [12,15].

Metabolic derangements were relatively common in this cohort, with hyponatraemia in 20.6% and dysglycaemia in 14.4% of patients, and mechanical ventilation was required in 19.4%. These findings are consistent with previous reports identifying hyponatraemia and the need for ventilatory support as markers of disease severity and, in some cohorts, as predictors of poor outcome in AES [13,16]. Neuroimaging was abnormal in only 5.0% of the total cohort (9 of 147 patients in whom it was performed), a lower yield than reported in some paediatric encephalitis series using MRI, where abnormal imaging has been associated with greater disease severity and worse functional outcome; the lower yield here may in part reflect the predominant use of CT rather than MRI, since MRI has been shown to be more sensitive than CT for detecting parenchymal abnormalities in pediatric encephalitis [17,18].

The overall mortality in this cohort (3.9%) was lower than the case fatality rates reported specifically for JE-associated AES in other Indian series, such as the 14.7% mortality among JE-positive children reported by Kakoti et al. in Assam, and lower than the 31% “bad outcome” (death or neurological sequelae) reported among children with suspected viral AES in Nepal by Rayamajhi et al. [13,14]. This comparatively favourable outcome is plausibly explained by the composition of the present cohort, in which a substantial proportion of children ultimately had bacterial meningitis or other diagnoses that, with prompt antimicrobial therapy, generally carry a better prognosis than confirmed viral or JE encephalitis; unlike several of the comparator studies, however, the present analysis did not stratify outcome by

final diagnosis or confirmed aetiology, and this comparison should therefore be interpreted with caution.

This study has some limitations. First, it was a single-center study conducted at a tertiary care hospital in one district of West Bengal. Second, the relatively small sample size restricted the assessment of long-term outcomes and temporal relationships between clinical, laboratory, and radiological parameters. A larger multicentric longitudinal study would provide more robust evidence regarding disease progression and treatment outcomes.

Conclusion

In this cohort of children admitted with a provisional diagnosis of AES at a tertiary care hospital in eastern India, only about three in five were ultimately confirmed to have AES, with bacterial meningitis and meningoencephalitis accounting for most of the remaining diagnoses. Seizures and altered sensorium were the dominant presenting features, JE accounted for a modest proportion of confirmed cases, and hyponatraemia, dysglycaemia, and ventilatory requirement were recorded in a substantial minority of patients. These findings support continued vigilance for metabolic derangement and respiratory compromise in the acute management of suspected AES, and highlight the need for aetiological workup that extends beyond JE serology alone, given the broad differential diagnosis captured by the AES case definition.

Declarations

Ethics Approval

Ethical clearance was obtained from the Institutional Ethics Committee of Burdwan Medical College and Hospital, West Bengal. The study was conducted in accordance with the principles of the Declaration of Helsinki.

Consent to Participate

Informed consent was obtained from the parents or legal guardians of the participating children, as applicable, in accordance with the requirements of the Institutional Ethics Committee.

Availability of Data and Materials

The data generated and/or analysed during the present study are available from the corresponding author on reasonable request, subject to institutional and ethical restrictions.

Competing Interests

The authors declare that they have no competing interests.

Funding

No specific funding was received for this study.

Use of Artificial Intelligence

AI tools were not used to generate or fabricate research data, analyse the study results, or make scientific conclusions. The authors take full responsibility for the accuracy, originality, and integrity of the content of the manuscript.

References

1. Government of India, National Vector Borne Disease Control Programme (NVBDCP). Guidelines for Surveillance of Acute Encephalitis Syndrome (with special reference to Japanese Encephalitis). New Delhi: Ministry of Health and Family Welfare; 2006.
2. Venkatesan A, Tunkel AR, Bloch KC, Lauring AS, Sejvar J, Bitnun A, et al. Case definitions, diagnostic algorithms, and priorities in encephalitis: consensus statement of the International Encephalitis Consortium. Clin Infect Dis. 2013;57(8):1114-1128.
3. Khetsuriani N, Holman RC, Anderson LJ. Burden of encephalitis-associated hospitalizations in the United States, 1988-1997. Clin Infect Dis. 2002;35(2):175-182.
4. Granerod J, Ambrose HE, Davies NW, Clewley JP, Walsh AL, Morgan D, et al. Causes of encephalitis and differences in their clinical presentations in England: a multicentre, population-based prospective

study. Lancet Infect Dis. 2010;10(12):835-844.
5. Sen PK, Dhariwal AC, Jaiswal RK, Lal S, Raina VK, Rastogi A. Epidemiology of acute encephalitis syndrome in India: changing paradigm and implication for control. J Commun Dis. 2014;46(1):4-11.
6. Beig FK, Malik A, Rizvi M, Acharya D, Khare S. Etiology and clinico-epidemiological profile of acute viral encephalitis in children of western Uttar Pradesh, India. Int J Infect Dis. 2010;14(2):e141-e146.
7. Rathore SK, Dwibedi B, Kar SK, Dixit S, Sabat J, Panda M. Viral aetiology and clinico-epidemiological features of acute encephalitis syndrome in eastern India. Epidemiol Infect. 2014;142(12):2514-2521.
8. Bandyopadhyay B, Bhattacharyya I, Adhikary S, Mondal S, Konar J, Dawar N, Biswas A, Bhattacharya N. Incidence of Japanese encephalitis among acute encephalitis syndrome cases in West Bengal, India. Biomed Res Int. 2013;2013:896749.
9. Jain P, Prakash S, Tripathi PK, Chauhan A, Gupta S, Sharma U, Jaiswal AK, Sharma D, Jain A. Emergence of Orientia tsutsugamushi as an important cause of acute encephalitis syndrome in India. PLoS Negl Trop Dis. 2018;12(3):e0006346.
10. Mittal M, Bondre V, Murhekar M, Deval H, Rose W, Verghese VP, et al. Acute encephalitis syndrome in Gorakhpur, Uttar Pradesh, 2016: clinical and laboratory findings. Pediatr Infect Dis J. 2018;37(11):1101-1106.
11. John TJ, Verghese VP, Arunkumar G, Gupta N, Swaminathan S. The syndrome of acute encephalitis in children in India: need for new thinking. Indian J Med Res. 2017;146(2):158-161.
12. Tripathy SK, Mishra P, Dwibedi B, Priyadarshini L, Das RR. Clinico-epidemiological study of viral acute encephalitis syndrome cases and comparison to nonviral cases in children from Eastern India. J Glob Infect Dis. 2019;11(1):7-12.
13. Rayamajhi A, Ansari I, Ledger E, Bista KP, Impoinvil DE, Nightingale S, et al. Clinical and prognostic features among children with acute encephalitis syndrome in Nepal; a retrospective study. BMC Infect Dis. 2011;11:294.
14. Kakoti G, Dutta P, Ram Das B, Borah J, Mahanta J. Clinical profile and outcome of Japanese encephalitis in children admitted with acute encephalitis syndrome. Biomed Res Int. 2013;2013:152656.
15. Jain P, Jain A, Kumar A, Prakash S, Khan DN, Singh KP, et al. Epidemiology and etiology of acute encephalitis syndrome in North India. Jpn J Infect Dis. 2014;67(3):197-203.
16. Kalita J, Misra UK, Pandey S, Dhole TN. A comparison of clinical and radiological findings in adults and children with Japanese encephalitis. Arch Neurol. 2003;60(12):1760-1764.
17. Bykowski J, Kruk P, Gold JJ, Glaser CA, Sheriff H, Crawford JR. Acute pediatric encephalitis neuroimaging: single-institution series as part of the California encephalitis project. Pediatr Neurol. 2015;52(6):606-614.
18. Rao S, Elkon B, Flett KB, Moss AF, Bernard TJ, Stroud B, Wilson KM. Long-term outcomes and risk factors associated with acute encephalitis in children. J Pediatric Infect Dis Soc. 2017;6(1):20-27.