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Original Research Article

Etiology and Outcome of Children with Acute Febrile Encephalopathy in A Tertiary Care Centre from Eastern India

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Abstract

Background: Acute febrile encephalopathy (AFE) in paediatric patients presents a significant healthcare challenge, with diverse etiologies and variable outcomes. Understanding these factors is critical for effective management. This prospective observational study aimed to examine the etiology, clinical attributes, and outcomes of AFE in children from Eastern India.

Methods: Over an 18-month period, 105 paediatric patients (aged 1 month to 14 years) with acute onset fever and altered consciousness were enrolled. Demographic data, laboratory findings, clinical symptoms, and outcomes were recorded. SPSS 22 was used for statistical analysis.

Results: The majority of AFE cases (63%) occurred in children aged 6 to 14 years, with a slight male predominance (53%). Fever, altered sensorium, and convulsions were prevalent symptoms. Meningoencephalitis was the most common etiology (59%), while approximately half of the cases lacked an identified causative agent. A significant correlation was found between lower Glasgow Coma Scale (GCS) scores (<7) and higher mortality rates (70%). Shock did not correlate significantly with AFE etiology, but higher haemoglobin levels were associated with better outcomes.

Conclusion: This study provides crucial insights into AFE in paediatric patients, emphasizing the need for early recognition, tailored diagnostics, and aggressive management strategies. The challenges in diagnosing AFE, particularly in cases with overlapping symptoms, highlight the complexity of this condition. These findings can guide healthcare practitioners and policymakers in improving outcomes for this vulnerable population.

Recommendation: Further research should focus on larger-scale studies, advanced diagnostic methods, public health initiatives targeting vulnerable communities, and the development of clinical guidelines to enhance AFE management and prevention. Collaboration among healthcare institutions and knowledge sharing should be encouraged to refine diagnostic and treatment approaches.

Keywords: Acute Febrile Encephalopathy, Paediatric Patients, Etiology, Glasgow Coma Scale

Introduction

Acute febrile encephalopathy (AFE) in children is a grave clinical condition indicated by the rapid onset of fever and altered mental status. It presents a substantial healthcare challenge worldwide, particularly in resource-limited settings. Understanding the etiology and predicting outcomes of children with acute febrile encephalopathy is crucial for timely and effective management [1, 2].

Acute febrile encephalopathy is a life-threatening condition, often related with high morbidity and mortality rates [3]. It poses diagnostic dilemmas for healthcare providers due to the diverse range of pathogens and factors that can trigger the condition, such as viral infections, bacterial infections, metabolic disturbances, and immune-mediated mechanisms. Furthermore, the outcomes of children with acute febrile encephalopathy can vary widely, from complete recovery to severe neurological deficits [2], emphasizing the need for a comprehensive understanding of the underlying causes and prognostic factors.

Furthermore, understanding the outcomes of children with acute febrile encephalopathy is essential for healthcare providers, policymakers, and researchers to develop targeted interventions that improve the prognosis and quality of life for affected children. Outcomes may include neurological sequelae, mortality rates, and factors associated with recovery.

This study aims to contribute valuable insights into the etiological factors and outcomes of acute febrile encephalopathy in children in Eastern India, shedding light on the unique challenges and opportunities in this region's healthcare landscape. By analysing the data from a tertiary care centre, we hope to inform evidence-based practices and healthcare policies that can lead to improved outcomes for children suffering from this life-threatening condition.

Methodology

Study Design

This was a prospective observational study aimed at understanding the etiology and outcomes of children with AFE in a tertiary care centre from Eastern India.

Study Setting

The study was conducted at the Paediatric Department of SCB/SVPPGIP, Cuttack, between September 2019 and April 2021.

Study Size

A total of 105 patients, aged between 1 month and 14 years, were recruited over the 18-month study period.

Inclusion Criteria

- Children with sudden-onset (≤14 days) fever (axillary temp >35.5°C or 95.5°F) and altered awareness lasting ≥12 hours and/or convulsion are hospitalized.

Exclusion Criteria

- Illness duration >14 days at presentation.
- Investigation may reveal cerebral space-occupying lesion, endocrinal encephalopathy, febrile seizure, and stroke.
- Children having metabolic encephalopathy and dyselectrolytemia (no CSF abnormalities).

Bias

Efforts were made to minimize bias by ensuring a robust and clear inclusion and exclusion criteria and conducting a comprehensive assessment for all participants.

Data Collection and Analysis

History and Clinical Examination:

Detailed demographic data, clinical history, and symptoms were recorded for each patient. Clinical examination included assessing vital parameters, anthropometry, neurological examination, and other relevant physical assessments.

Investigations:

Routine investigations included CBC, Liver and Kidney Function Tests, Serum Electrolytes, CSF Analysis, and specific viral markers. Imaging studies like Chest X-Ray and CT/MRI of the Brain were conducted as per clinical necessity. Blood and CSF cultures were done to identify causative organisms.

Sample Collection and Storage:

Blood/Serum samples were collected as per standard protocols and transported to the laboratory maintaining appropriate conditions.

Variables

Variables included demographic details, clinical symptoms, laboratory parameters, and outcomes (mortality/discharge).

Statistical Analysis

Data were entered into Microsoft Office Excel Version 2013 and analysed using SPSS version 22. Descriptive statistics were used to summarize the data. Categorical variables were compared using Pearson's Chi-Square test or Fisher's Exact Test, and continuous variables using Mann-Whitney U test or Kruskal Wallis Test. Spearman's Rank Correlation Coefficient was used to capture associations between continuous variables. Significance was considered at $p<0.05$.

Ethical Considerations

The institutional ethical committee approved the study, and all children's guardians gave informed consent. Research followed ethical guidelines and the Helsinki Declaration.

Results

Table 1 presents the distribution of acute febrile encephalopathy (AFE) cases among different paediatric age groups in your study. It shows that the majority of AFE cases (63%) were in the 6-14 years age group. Children aged 1-5 years accounted for 32% of the cases, while infants under one year old represented the smallest group at 5%. This distribution suggests that AFE is more prevalent in older children, particularly those between 6 and 14 years, in the population studied.

Table 1: Distribution (%) of AFE cases in pediatric age groups (n=100)

AGE	Frequency	Percent
<1 year*	5	5.0
1-5 years	32	32.0
6-14 years	63	63.0
Total	**100**	**100.0**

*<1 year= 1 M-12 MONTHS

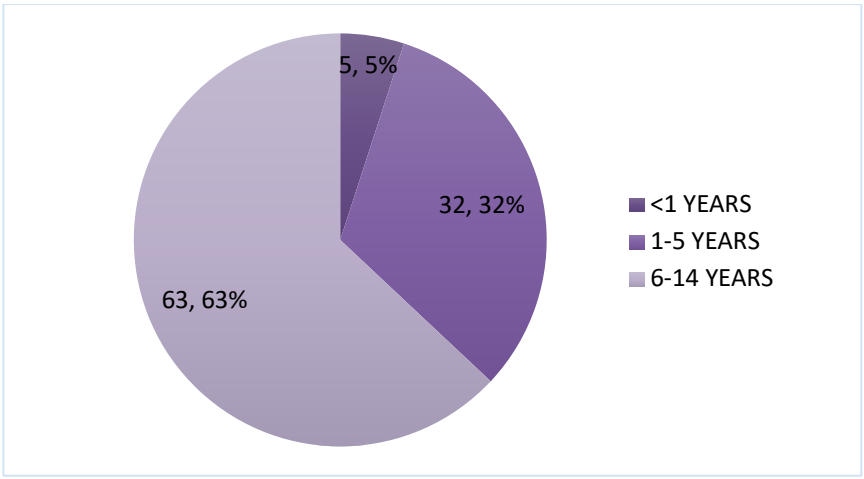

Fig 1: This is the pie chart showing percentage of cases in different paediatric age group related to AFE

Table 2 shows the distribution of AFE cases by age and sex. In the youngest group (<1 year), there are slightly more female cases (3) than male (2). In the 1-5 years age group, there are more males (19) than females (13). However, in the 6-14 years group, the distribution is almost even, with 31 females and 32 males. Overall, out of the total 100 cases, males are slightly more affected (53%) compared to females (47%). This data suggests a relatively balanced distribution of AFE across sexes, with a slight male predominance.

Table 2: Distribution of AFE cases with Age and Sex.

Age Groups	Female	Males	Grand Total
<1 year*	3	2	5
1-5 years	13	19	32
6-14 years	31	32	63
Total	**47**	**53**	**100**

*<1 year= 1 M-12 MONTHS

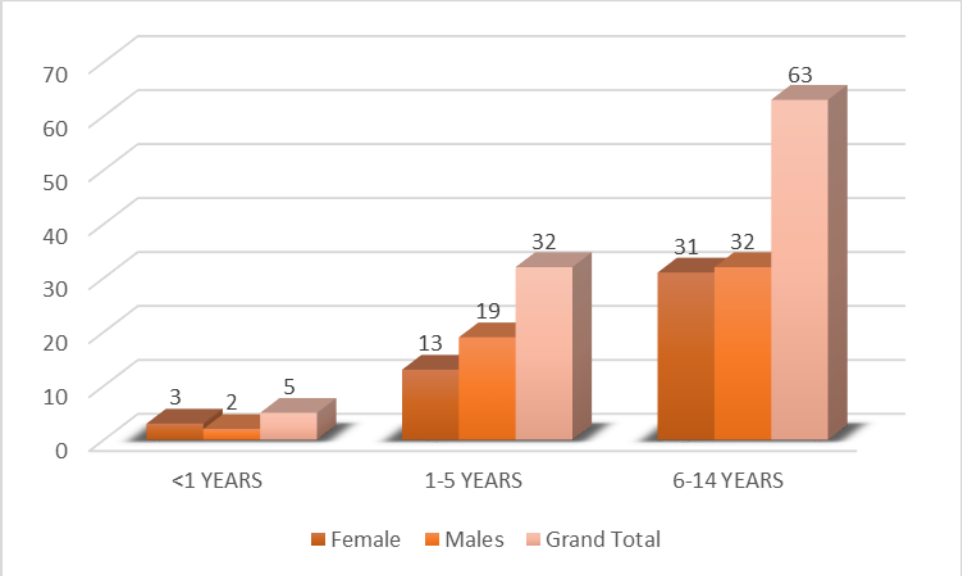

Fig 2: Bar Chart Showing No. of AFE Cases with Age and Sex Distribution.

Table 3 illustrates the prevalence of various clinical symptoms in patients with AFE. Fever was present in all cases (100%). Convulsion and altered sensorium were also very common, affecting 91% and 99% of cases, respectively. Headache or lethargy was reported in 68% of cases and vomiting in 58%. Loose stool was the least common symptom, observed in only 20% of the cases. This distribution highlights fever, altered sensorium, and convulsions as the most prevalent symptoms in AFE cases.

Table 3: Clinical Symptoms in AFE cases (n=100)

S.no	Symptom	Percentage of Cases
1	Fever	100
2	Headache/ Lethargy	68
3	Vomiting	58
4	Convulsion	91
5	Altered Sensorium	99
6	Loose Stool	20

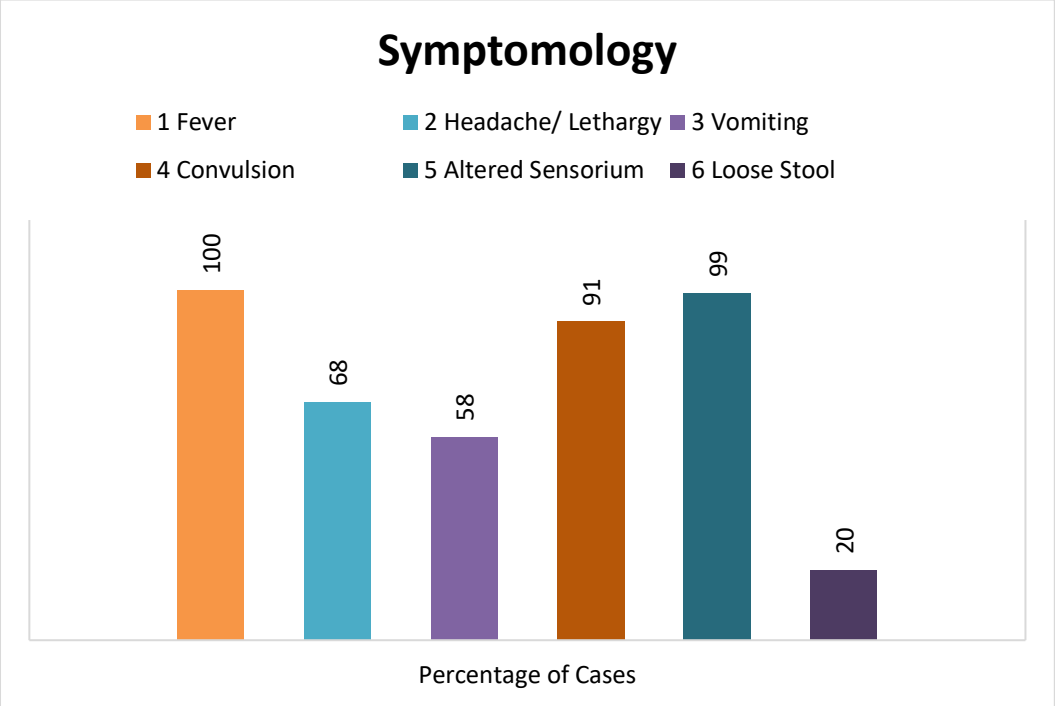

Fig 3: Bar Chart representing frequency of symptoms in a case of AFE.

Table 4 details the etiology of AFE in the study. Meningoencephalitis is the most common cause, accounting for 59% of cases. Pyogenic Meningitis and Tubercular Meningitis are also notable causes, representing 14% and 12% of cases respectively. Scrub Encephalitis is identified in 8% of cases. Less common causes include ADEM (Acute Disseminated Encephalomyelitis) and Autoimmune Encephalitis, each accounting for 4% and 3% of cases respectively. This data indicates that Meningoencephalitis is the predominant etiological factor in AFE among the studied population.

Table 4: Etiology of AFE

DIAGNOSIS	Frequency	Percent
ADEM	4	4.0
Autoimmune encephalitis	3	3.0
Meningoencephalitis	59	59.0
Pyogenic Meningitis	14	14.0
Scrub Encephalitis	8	8.0
Tubercular Meningitis	12	12.0
Total	**100**	**100.0**

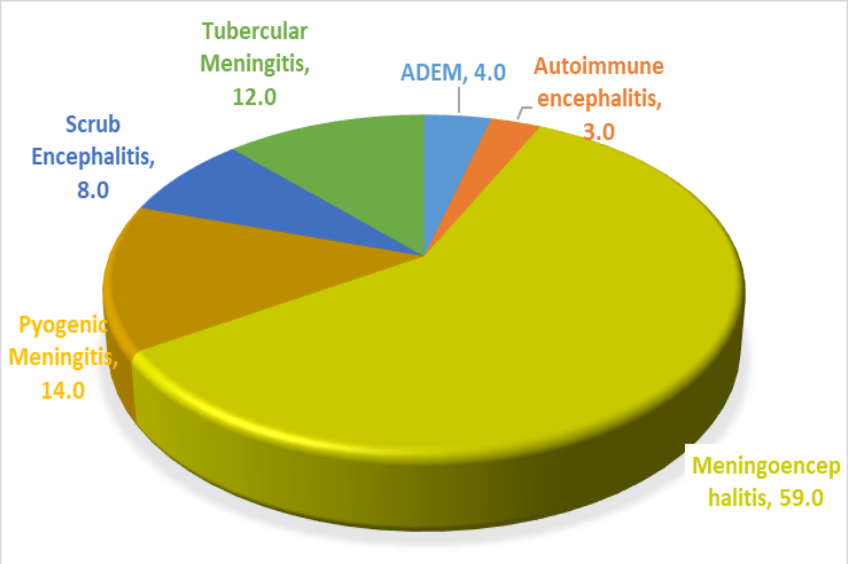

Fig 4: Pie Chart representing the various etiology of AFE found in the study with their frequency.

Table 5 compares the presence of shock at admission with different etiologies of AFE. Shock was present in 26% of cases and absent in 74%. Shock prevalence varied with etiology: none in ADEM, 33.33% in Autoimmune Encephalitis, 28.81% in Meningoencephalitis, 7.14% in Pyogenic Meningitis, 50% in Scrub Encephalitis, and 25% in Tubercular Meningitis. The p-value of 0.218 indicates no significant relationship between the presence of shock and the etiology of AFE, suggesting that shock is not a determining factor for the etiology of AFE in this study.

Table 5: Comparison of presence of Shock at admission with Etiology in AFE cases

		DIAGNOSIS						Total n (%)	p Value	Significance
		ADEM n (%)	Autoimmune encephalitis n (%)	Meningo Encephalitis n (%)	Pyogenic Meningitis n (%)	Scrub Encephalitis n (%)	Tubercular Meningitis n (%)			
VITALS-SHOCK	ABSENT	4 (100)	2(66.67)	42(71.19)	13(92.86)	4(50)	9(75)	74(74)	0.218	Not Significant
	PRESENT	0(0)	1(33.33)	17(28.81)	1(7.14)	4(50)	3(25)	26(26)		
Total		4 (100)	3(100)	59(100)	14(100)	8(100)	12(100)	100(100)		

()- No. indicated in the parenthesis indicates % of cases w.r.t. etiology of disease

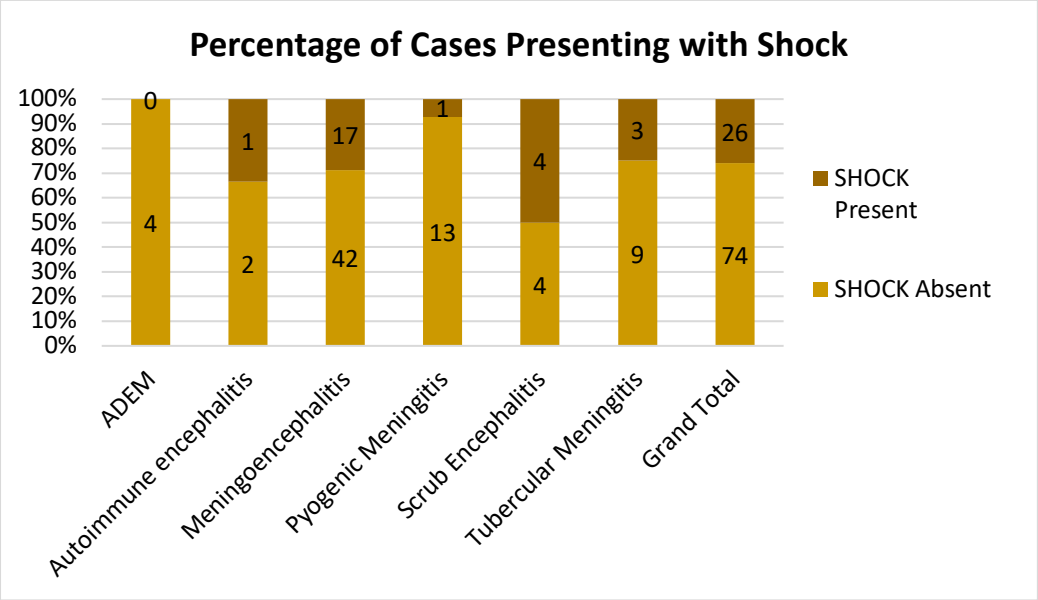

Fig 5: In the above chart, presence of Shock was tabulated across the various diagnosis of AFE.

Table 6 shows the correlation between the Glasgow Coma Scale (GCS) severity and the outcome of the disease. Patients with a GCS score of less than 7 had a higher mortality rate (70%) compared to those with higher scores. Those with a GCS score between 7 and 11 had a lower mortality rate (10%), and the mortality rate for patients with a GCS score above 11 was 20%. The p-value of less than 0.001 signifies that this correlation is statistically relevant, suggesting that lower GCS scores are associated with higher mortality in AFE cases.

Table 6: Co-Relation between GCS Severity with Outcome of disease

		OUTCOME		Total n (%)	p Value	Significance
		DISCHARGED n (%)	Died n (%)			
GCS STATS	<7	16(17.78)	7(70)	23(23)	<0.001	Significant
	7-11	61(67.78)	1(10)	62(62)		
	>11	13(14.44)	2(20)	15(15)		
Total		90(100)	10(100)	100(100)		

()- No. indicated in the parenthesis indicates % of cases w.r.t. outcome of disease

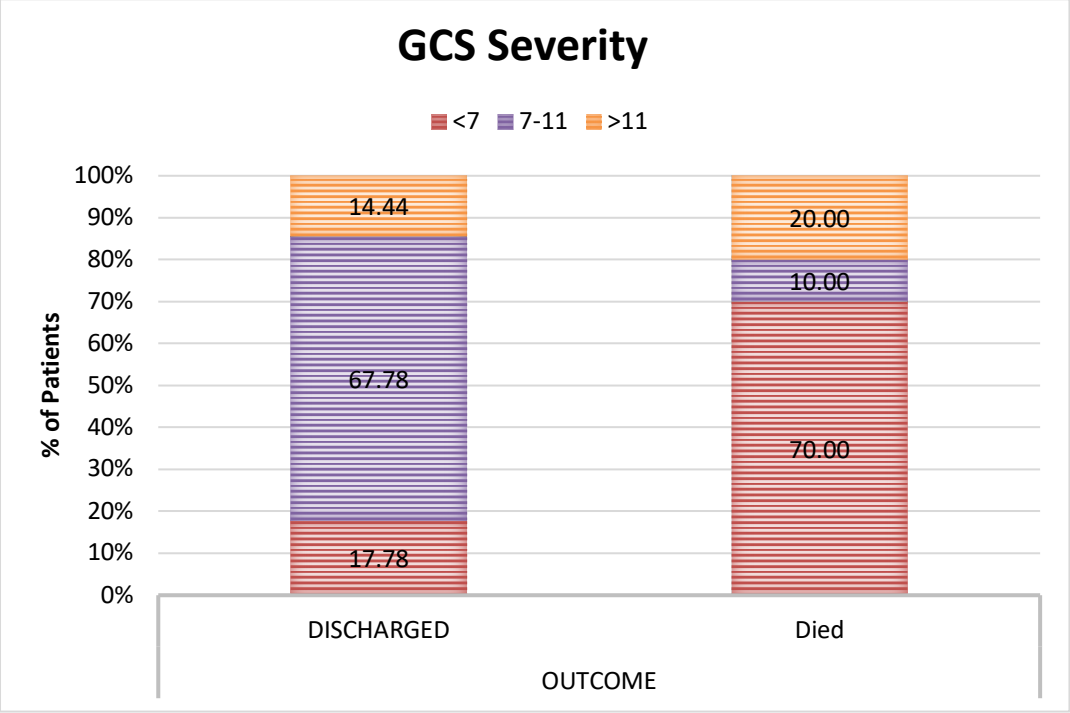

Fig 6: Bar Chart between GCS Severity with Outcome of disease

Discussion

The data provided in this study on AFE in paediatric patients offers valuable insights into various aspects of this challenging condition. The study population consisted of 100 AFE cases, with the median age of patients being 7 years. It is noteworthy that the highest incidence of AFE occurred among children aged 6 to 14 years, comprising 63% of the total cases. This age group's vulnerability to AFE raises questions about potential environmental or behavioural factors contributing to their susceptibility. This finding aligns with similar studies that have observed higher AFE prevalence in older children [4]. Additionally, the study reported a slight male predominance in AFE cases, except in infancy. This male predominance aligns with existing literature suggesting a higher male predisposition to infectious diseases [5, 6, 7].

The study also addressed socioeconomic status, revealing that 72% of cases were from a low socioeconomic background. This observation aligns with earlier research emphasizing the role of socioeconomic factors such as poor hygiene, overcrowding, inadequate nutrition, and limited access to vaccination in the incidence of AFE [8]. Understanding these factors is critical for tailoring preventive measures and healthcare interventions.

The clinical presentation of AFE in this study demonstrated that fever was a universal symptom, accompanied by altered sensorium, convulsions,

headache, and vomiting in varying proportions. These findings align with prior studies that have highlighted the common clinical features of AFE, making early recognition and management challenging due to symptom overlap with other diseases [9, 10]. The complexity of pinpointing an accurate diagnosis in cases with overlapping symptoms underscores the need for comprehensive diagnostic approaches.

The study identified various specific infectious etiologies for AFE, with meningoencephalitis being the most common, followed by pyogenic and tubercular meningitis. However, it is crucial to note that approximately half of the cases did not have an identified etiological agent. This could be attributed to factors such as over-the-counter antibiotic use, unidentified viral causes, or aseptic meningitis. This finding highlights the complexity of diagnosing AFE and the limitations in identifying causative agents in some cases. These challenges are not unique to this study, as similar observations have been reported in studies from other regions [11, 12].

The study revealed a significant association between lower Glasgow Coma Scale (GCS) scores at presentation and higher mortality rates. Patients with GCS scores below 7 had a significantly lower chance of survival. This underscores the importance of early recognition and aggressive management in cases with low GCS scores, as supported by previous studies [13].

Surprisingly, the study did not find a significant correlation between the presence of shock and the etiology of AFE, challenging the reliability of shock as a diagnostic marker for this condition. However, it did note that most recovered patients had haemoglobin levels above 7g/dL, emphasizing the importance of adequate haemoglobin levels in AFE patients' outcomes.

Conclusion

In conclusion, this study provides valuable data on the clinical characteristics, etiology, and outcomes of AFE in paediatric patients. It highlights the challenges in diagnosing and managing AFE, particularly in cases with overlapping symptoms and unidentified causative agents. The findings underscore the importance of early recognition, tailored diagnostic protocols, and aggressive management strategies to improve outcomes in this vulnerable paediatric population.

Limitations: The study's limitation is its small sample size (100 cases), potentially insufficient for a comprehensive understanding of AFE in Eastern India. The study lacks longitudinal data, hindering insights into long-term recovery and sequelae in AFE patients. Identifying AFE causes in nearly half of cases presents diagnostic limitations, affecting treatment and prevention strategies.

Recommendations: Large-scale multicentre studies with longitudinal data are needed to investigate AFE in Eastern India. Improve AFE etiology diagnosis and treatment with precise diagnostic technologies, including molecular ones. For AFE prevention, promote hygiene, clean water, nutrition, and vaccination in low-income populations. Distribute early AFE recognition recommendations stressing Glasgow Coma Scale (GCS) scores and aggressive response in low GCS instances. Regularly check AFE patients' haemoglobin levels to guide transfusions and supportive therapy. Encourage healthcare organizations and academics to collaborate and share AFE diagnostic and treatment discoveries to improve patient outcomes.

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List of abbreviations:

AFE- Acute febrile encephalopathy

CBC- Complete Blood Count

ADEM- Acute Disseminated Encephalomyelitis

GCS- Glasgow Coma Scale

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