

Acute Encephalitis Syndrome (AES) Associated with Sociocultural and Environmental Risk Factors in Infants / Children of Bihar, a Hospital Based, Prospective Study

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Abstract

Background: A variety of viruses, bacteria, fungi, parasites, spirochetes, chemicals, and poisons can produce acute encephalitis syndrome, a set of clinical neurologic manifestations. Acute encephalitis syndrome due to an unknown agent is defined by AES guidelines as a suspected case in which no diagnostic testing is done, or testing is done but no aetiological agent is found, or in which the test results are unclear. Children's acute encephalitis syndrome is caused by a confluence of multiple variables.

The study's objective is to assess the environmental and social elements, which are crucial to AES.

Materials and Methods: The research was prospective, hospital-based, and non-interventional in nature. The study was carried out from October 2020 to September 2022 at the P.M.C.H. Paediatric Department in Patna, Bihar. Children and infants hospitalised at PMCH, Patna were part of the study. AES standards were followed in defining all cases, and 148 babies and children were chosen for inclusion. For statistical analysis, the Chi-square test, percentage, and proportion were used.

Results: Out of the 148 babies and kids who were chosen, 130 (87.8%) had the greatest AES in a rural location. The monsoon season had the highest incidence of AES, 72 (48.6%), with a seasonal incidence spanning from March to July. The age range between 1 and 5 years old has the highest frequency of AES. There was a statistically significant correlation between the age of the children and AES. Males were more likely than females to have AES. The inhabitants in kachcha (mud) houses had the highest AES. AES was highest in children of labourers/farmers, at 134 (90.5%). AES was highest, with a mother's illiteracy rate of 133 (89.9%). The highest incidence of AES was found in Hinduism. 134 (90.5%) of the AES cases involved malnourished or undernourished children.

Conclusion: The primary determining risk factors for AES were sociocultural and environmental variables. The most prevalent risk factor among them was malnutrition or under nutrition, which was followed by maternal illiteracy, employment (labour and farming), Hindu religion, age between 1 and 5 years, seasonal variation (March to July, mostly in June), a lower standard of living, a higher prevalence of male children, and the use of formula feeding. Increased prevalence of these contributory factors serves as a reminder to the government and other healthcare professionals to step up their monitoring of AES-related morbidity and mortality and to develop preventative, control, and reduction efforts.

Keywords: Acute Encephalitis Syndrome, Children, Malnutrition, Sociocultural and Environment Risk Factors.

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Background

A variety of viruses, bacteria, fungi, parasites, spirochetes, chemicals, and poisons can produce acute encephalitis syndrome, a set of clinical neurologic manifestations. [1] Acute encephalitis syndrome due to unknown agent is defined as a suspected case in which diagnostic testing is either not done at all or is done but no aetiological agent is

found or the test results are unclear, per AES standards. [2] When discussing aetiology in cases when the disease agent is not well-established, it is common to refer to "risk factors." It has at least two definitions, according to different authors: (a) An attribute or exposure that is strongly linked to the onset of a disease. (b) A variable that can be altered

through action, hence lowering the possibility of occurrence of disease or other specified outcome. [3]

An ecological investigation found a separate correlation between the prevalence of acute encephalitis and the surface proportion of litchi plantations. [4] Following uproar over the growing number of child deaths from AES, Prabhat Kumar Sinha, the head of a six-person team from the Rajendra Memorial Research Institute of Medical Sciences, Patna, gathered samples of litchi from orchards in afflicted areas for a toxicological research. A few scientists linked the illness to litchi in the district of Muzaffarpur. However, Sinha insisted that more research has to be done on the topic. To this day, the disease's causative strain is unknown. [5] AES is a medically based social disease. It's better to think of it as a gauge of social welfare. Numerous non-medical problems are included in the social aspects, such as low life quality, subpar housing, inadequate education, ignorance of the causes of sickness, inadequate diet, and unclean conditions. Each of these interconnected elements plays a role in the development and dissemination of AES. AES is significantly influenced by environmental and societal factors. The current study was conducted in this context to draw attention to the need for the government and other health policy planners to develop strategies and implement the necessary measures to reduce the morbidity and mortality caused by AES in the district of Bihar. The following goals and objectives were therefore included in the design of this study.

Aims and Objectives

The objectives are:

- To identify the sociocultural and environmental risk variables associated with AES;
- To describe the distribution and degree of these risk factors.
- To supply the information needed for the planning, execution, and assessment of programs aimed at preventing, controlling, and lowering AES-related morbidity and mortality as well as for allocating priorities among these programs.

Study Design-

A non-interventional, hospital-based prospective study.

Sample Technique and Sample Size-

All children who fulfilled the AES definition as per the AES guidelines were included and 148 infants/children met the inclusion criteria.

Inclusion Criteria

- Patients admitted in Paediatric Department with fever, headache, confusion, convulsion, vomiting and stiff neck.
- Only defined cases according to AES guidelines were included for study.
- Infant/children (below 12 yrs) of those parents/guardians/attendants who gave the informed consent for study.

Exclusion Criteria

- Confirmed cases of JE virus, TBM or any other pathogens.
- Age more than 12 years.
- Parents/guardians/attendants who did not give informed consent.

Duration of Study- The study was carried out during October 2020 to September 2022.

Data Collection, Technique and Tools- A structured questionnaire was used to gather information about the sociocultural and environmental characteristics of the target population, including the participants' feeding habits, caste, religion, age, sex, and seasonal variation, as well as their nutritional status and mother's education. The consistency and accuracy of the tools were examined. Before the samples were chosen, the pilot testing was completed.

Sources of Information- The study was carried out with the help of faculties of Paediatric Department, paramedical workers, ASHAs, hospital records and interviews of parents/guardians/attendants on a common pro forma.

Statistical Methods- The survey's data were collated, tabulated, and statistically analysed. The Patna Medical College's Department of Paediatrics in Patna handled the centralised data entry and processing. When appropriate, tests of significance were used to determine the relationship between different risk factors. The results have been analysed in order to derive important inferences.

Results

148 children fulfilled the AES criteria. 134 cases (90.5%) were seen in malnourished/undernourished infants/children. Among literacy database, AES was commonest 133 (89.9%) in infants/children of illiterate mother. In children of mothers educated up to primary school, the number of cases of AES was 13 (8.8%) and those having education up to higher secondary and above, the cases of AES was also 2 (1.3%).

Table 1 . AES associated with Undernutrition/ Malnutrition

Nutritional status (n=148)	
Under nutrition / Malnutrition	AES cases with normal weight for age
134 (90.5%)	14 (9.5%)

Table 2. Maternal Literacy and AES

Maternal Literacy	Number of AES cases (n=148)	Percentage
Illiterate	133	89.9
Primary school education	13	8.8
Higher secondary and above education	2	1.3

AES was more common in infants/children of labour/farmer, 134 (90.5%). Among infants/children of businessman, AES case was 12 (8.1%) and two child (1.4%) of clerk developed AES. No AES was seen in infants/children of officer rank families.

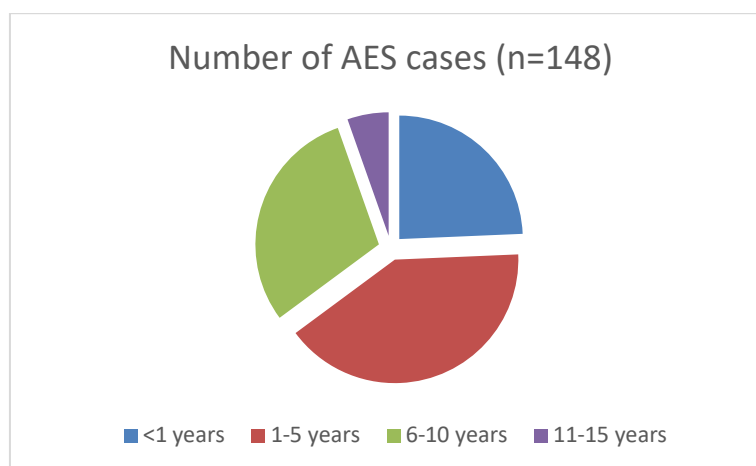
Table 3. AES associated with occupation of the head of the family

Occupation	Number of AES cases (n=148)	Percentage
Labour/ farmer	134	90.5
Business	12	8.1
Govt Service (Clerk)	02	1.4
Govt Service (Officer)	00	0

AES was mostly seen in children aged 1-5 years (60; 40.5%), followed by 6-10 years (44; 29.7%), among 10-12 years (8; 5.4%) and in below one year of age (36; 24.3%). It indicates the more significant statistical association (p 0.263) given in Table 4.

Table 4. Age distribution of AES in Patna

Age group	Number of AES cases (n=148)	Percentage
<1 years	36	24.3
1-5 years	60	40.5
6-10 years	44	29.7
>10yrs-12 years	08	5.4

**Figure 1- Age wise distribution of AES in Patna**

Seasonal variation was seen in incidence of AES. Maximum Incidence of AES was seen in monsoon season (72; 48.6%) for AES, followed by winter (46, 31.1%) and it declined in summer season (30; 20.3%).

Table 5. Seasonal incidence of AES in Patna

Season	Frequency	Percentage
Monsoon	72	48.6
Winter	46	31.1
Summer	30	20.3

Housing standard was the more common contributing factor for AES. AES was mostly seen in dwellers of kachcha house (74; 50.0%), followed by semi-pucca house (60; 40.5%) and in children of dwellers of pucca house, only 14(9.5%) cases of AES were found.

Table 6. Housing standard of Dwellers of AES

Type of house	Number of AES cases(n=148)	Percentage
Kachha	74	50.0
Semi pucca	60	40.5
Pucca	14	9.5

AES was seen more in male infants/children (82; 55.4%) than female (66; 44.6%).

Table 7. Sex wise distribution of AES cases

Total number of AES cases	Male AES cases	Percentage	Female AES cases	Percentage
148	82	55.4	66	44.6

AES was equally seen in formula fed and exclusive breast fed infants/children (37; 25.0%) and it was more in infants of cow's and other animal milk fed infants (74; 50.0%).

Table 8. Feeding practice associated with AES cases

Feeding Practice	Number of AES cases (n=148)	Percentage
Exclusive breast feed	37	25
Formula and mother milk	37	25
Cow's and other animal milk	74	50

Discussion

After analysing the data, it was found that the most prevalent risk factor is malnutrition or undernutrition. This finding is consistent with the findings of John (2013), who, upon invitation from the Bihar government, investigated the mystery of Muzaffarpur and concluded that the cause was acute encephalopathy brought on by a combination of malnutrition and litchi., [6] Six Other risk variables that we have seen include illiteracy among mothers, kachcha houses, and occupations centred around agriculture (labour and farming). G.K. Singh et al. found a substantial ($p<0.05$) correlation between parents' employment status, their reading level, their usage of public transport, and the existence of lychee orchards close to their homes.⁷ The National Centre for Disease Control and the U.S.-based CDC claim that the toxins in litchi were the cause of AES. [8] Based on formula feeding, we have identified the other risk category, which consists of male children aged 1 to 5 years. As per the Health Line study, those with weakened immune systems, elderly folks, and children under 1 year old are at risk for developing encephalitis. [9] According to data, there is a seasonal variation in AES; the disease peaks in occurrence during the monsoon season and becomes epidemic between March and July. According to Jyotsna Singh, the Lychee season (April to June) is when AES becomes prevalent. [10]

Conclusion

Based on our research, we have determined that the primary risk factors for AES were environmental and sociocultural factors. Maternal illiteracy was the

second most common risk factor among them, behind malnutrition or undernutrition. Farmers and labourers in the agriculture industry were more likely to become victims. Children ages 1 to 5 are the most commonly affected by AES. Young boys were more vulnerable. Hindu households' infants and kids were particularly impacted. AES were primarily observed in occupants of lower-class housing (kachcha houses). AES primarily affects newborns and children who are fed formula, cow milk, and other animal products. AES peaks in incidence during the monsoon season and spreads like wildfire from March to July.

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