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Original Research Article

Profile of Japanese Encephalitis Patients amongst Acute Encephalitis Syndrome Cases Attending a Tertiary Care Hospital in Assam

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Abstract:

Introduction: Japanese Encephalitis (JE) is an endemic disease in Assam, India. It presents as Acute Encephalitis Syndrome (AES), usually characterized by sudden-onset fever, headache, and altered consciousness. Despite the introduction of JE vaccine in the National Immunization Schedule and adult immunization, JE virus infection continues. Gaps exist concerning its profile, presentation, and etiology in tertiary care centers in India. The profile of AES patients in tertiary centers is different, possibly due to delayed care-seeking, empirical therapy, and disease progression.

Aim and Objective: To assess the profile of Japanese Encephalitis patients amongst Acute Encephalitis Syndrome cases attending a tertiary care Hospital in Assam

Materials and Methods: A record-based study was conducted in a tertiary care hospital in Assam from Jan 2023 to Aug 2024, where all AES cases admitted to the hospital during the study period were included. Along with socio-demographic variables, blood and CSF (cerebro-spinal fluid) reports were also collected and analyzed.

Results: During the study period, 1177 AES cases were reported, of which 313 (26.59%) were positive for JEV. Both CSF and serum were positive for 196 (16.65%) samples; only CSF positive was 59 (5.01%), and only serum positive was for 58 (4.93%) samples. Males (57%) were affected more than females (43%). Majority of males belong to the age group of 10-19 years. Most AES cases reported were from the Dibrugarh district (34%), out of which JE cases were positive for 7%, followed by the Tinsukia district (AES – 18%, JE- 6%). An increasing trend was seen from June (15.33%), taking a peak during July (49.52%), followed by August (15.97%).

Conclusion: Focusing on male teenagers may be decisive in JE transmission and vulnerability. A seasonal trend is also observed. Evidence-based interventions like immunization, personal protection against mosquito bites, integrated vector management, early diagnosis, and prompt treatment at peripheral hospitals must be promoted. Also, a complete investigation to exclude other causes of AES should be prioritized.

Keywords: JE, AES, CSF.

Introduction

Acute encephalitis syndrome (AES) is a serious public health concern characterized by the sudden onset of fever with neurological symptoms such as delirium, coma, disorientation, or mental confusion.[1][2] Viruses are the major cause of AES in India; however, bacteria, fungi, parasites, spirochetes, chemicals, and toxins have also been documented in recent times.[2] Japanese encephalitis virus (JEV), a primary cause of viral encephalitis in Asia, mostly affects children and has caused outbreaks in India since 1955.[3] JEV, a flavivirus spread by mosquitoes, is in the same genus as the West Nile, dengue, Zika, and yellow fever viruses. The virus is endemic in 24 countries in the WHO South-East Asia and Western Pacific Regions, which puts over 3 billion people at higher risk of contracting JEV. The disease has no definite cure. Relieving severe clinical symptoms and assisting the patient in overcoming the infection are the main goals of treatment.[4] Humans contract JEV from mosquito bites from infected Culex species mosquitoes, primarily Culex tritaeniorhynchus. Once infected, humans do not acquire enough viremia to spread the infection to feeding mosquitoes. The

virus spreads through an enzootic cycle involving mosquitoes, pigs, and/or aquatic fowl. The majority of cases of JE occur in rural and peri-urban areas, where people reside closer to these vertebrate hosts, especially domestic pigs.[5] During the post-monsoon period from July to October, the state of Assam, and specifically several districts in upper Assam, including Dibrugarh, Jorhat, Tinsukia, Sivasagar, Golaghat, and North Lakhimpur, have been experiencing recurrent episodes of AES (JE and non-JE) of varying magnitudes, resulting in numerous fatalities and a higher number of disabled people.[7] With high morbidity and mortality, this illness is rapidly expanding into several lower Assam districts, including Barpeta, Nalbari, Bongaigaon, Baska, Chirang, Kokrajhar, and Kamrup (rural).[6] Gaps exist concerning its profile, presentation, and etiology in tertiary care centers in India. The profile of AES patients in tertiary centers is different, possibly due to delayed care-seeking, empirical therapy, and disease progression. [1]

Aim and Objective: To assess the profile of Japanese Encephalitis patients amongst Acute Encephalitis Syndrome cases attending a tertiary care Hospital in Assam

Materials and Methods

A record-based study was conducted in a tertiary care hospital in Assam from Jan 2023 to Aug 2024, where all AES cases admitted to the hospital during the study period were included. Along with socio-demographic variables, blood and CSF reports were also collected and analyzed. Data was collected using standardized integrated disease surveillance program (IDSP) formats.

Ethical consideration: Permission was obtained from the Institutional Ethics Committee (H). Due permission was taken from IDSP before commencing data collection. Data confidentiality was maintained throughout the study.

Results

During the study period, 1177 AES cases were reported, of which 313(26.59%) were positive for JEV [Fig 1]. Both CSF and serum were positive for 196 (16.65%) samples; only CSF positive was 59 (5.01%) [Table 1a], and only serum positive was for 58 (4.93%) samples [Table 1b].

Males (57%) were affected more than females (43%). Majority of males belong to the age group of 10-19 years, followed by 60-69 years and 1-9 years, while most females belong to the age group of 1-9, followed by 60-69 and 10-19 [Fig 2]. The majority were Hindu (96%) by religion [Fig. 3].

Most AES cases reported were from the Dibrugarh district (34%), out of which JE cases were positive for 7%, followed by the Tinsukia district (AES – 18%, JE- 6%). Out of reported AES cases (10%) in Sibsagar district, 9% of AES came out to be JE positive [fig 4]. An increasing trend was seen from June (15.33%), taking a peak during July (49.52%), followed by August (15.97%) [fig 5].

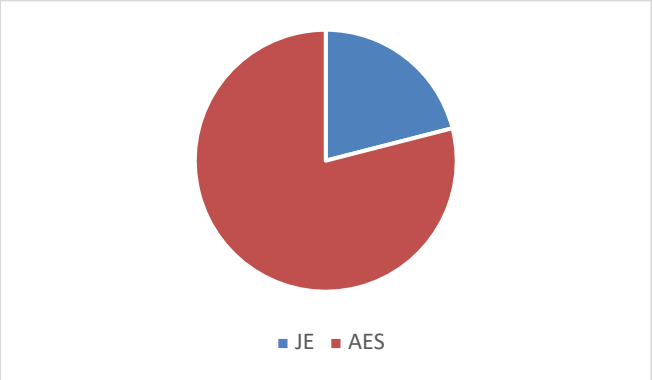

Figure 1: Total JE cases out of AES:

Table 1(a): CSF results:

CSF	Numbers (%)
Positive	59 (5.01%)
Negative	740 (62.87%)
Equivocal	45 (3.82%)

Table 1(b): Serum results:

Serum	Numbers (%)
Positive	58 (4.93%)
Negative	114 (9.68%)
Equivocal	51(4.33%)

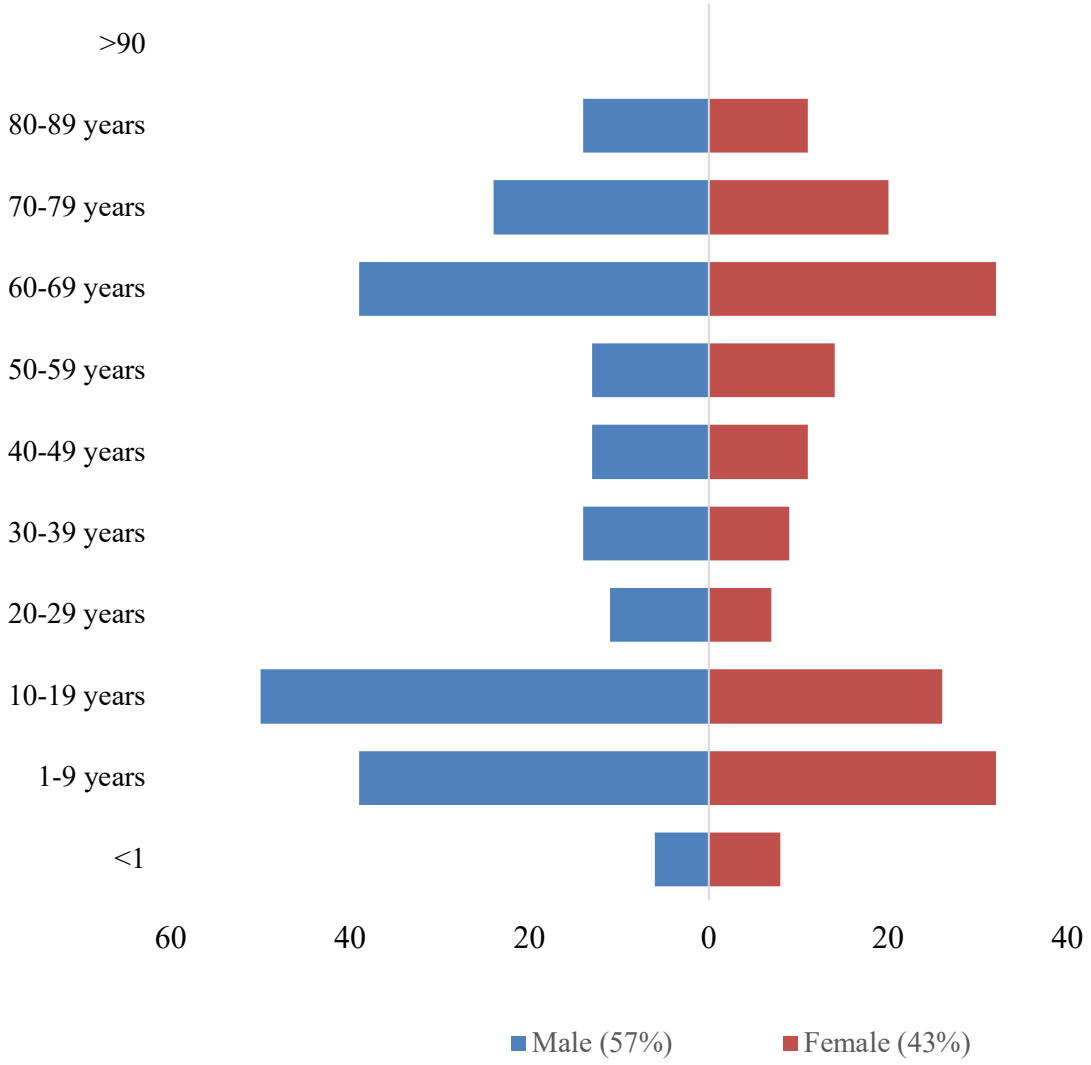

Figure 2: Age & Gender distribution:

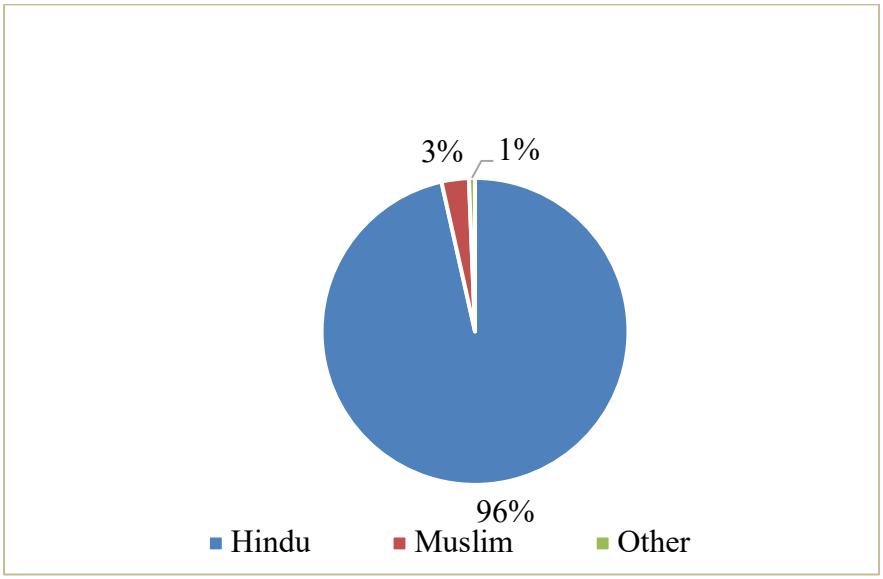

Figure 3: Distribution by religion:

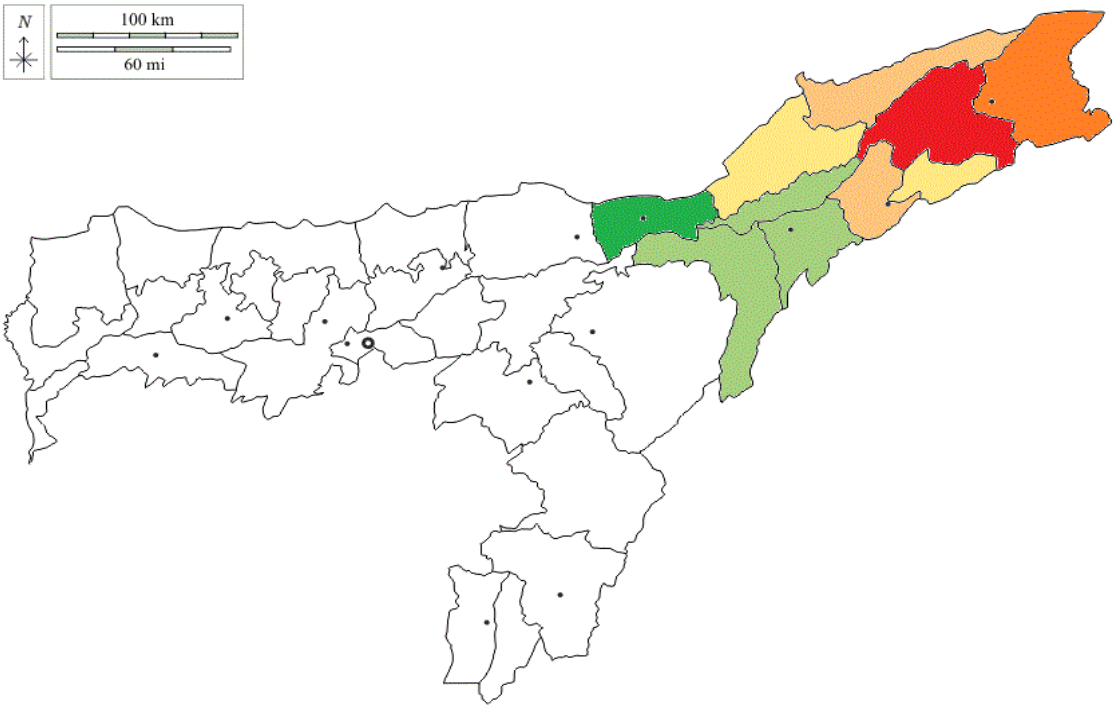

Figure 4: Distribution by districts of Assam:

District	AES	JE
Dibrugarh	34%	7%
Tinsukia	18%	6%
Dhemaji	10%	3%
Sivasagar	10%	9%
Charaideo	8%	2%
Lakhimpur	8%	2%
Majuli	1%	1%
Golaghat	1%	1%
Jorhat	1%	1%

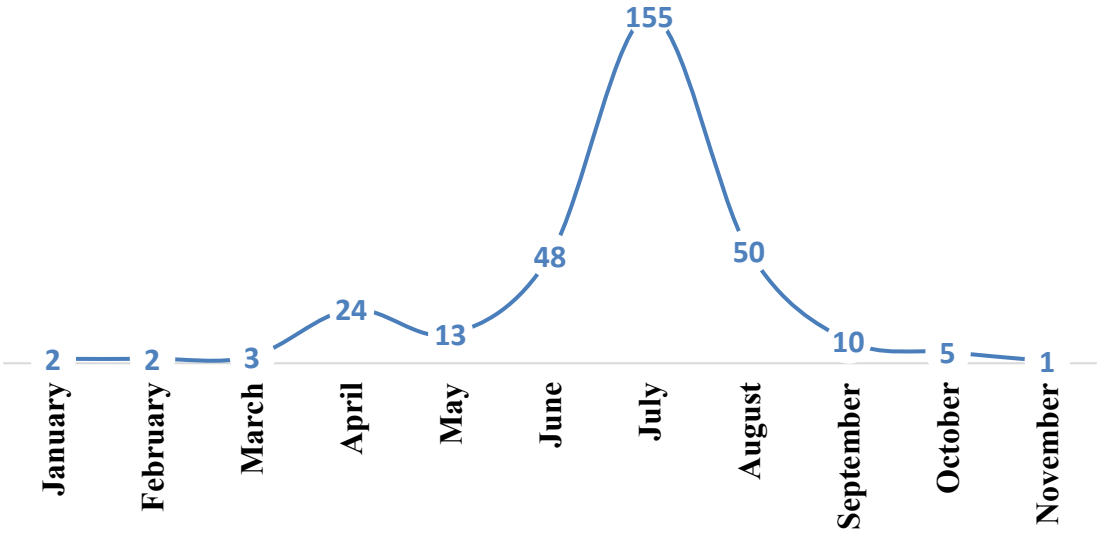

Figure 5: Seasonal variation:

Discussion

JE positivity was 26.59%. This indicates non-JE AES is also prevalent, which needs evaluation to identify the causative agents. A study by Kumar et al. found that 11.84% were positive for JEV, which is the most predominant causative agent among AES suspects.[3] A study by Ahmed et al. found that out of the overall 1081 AES cases, JE was positive for 588 (54.39%) cases.[6] Another study done by Sonowal et al. found that out of the 3173 CSF samples, 461 (14.5%) were positive for JE. [7] In a study by Medhi et al., of the 1707 patients admitted, 696 (40.77 %) were diagnosed as JE.[8] And a study by Baruah et al. found that out of 48 AES cases reported from different areas in the Dhemaji district of Assam, 28.13% were found to be JE IgM positive.[9] A study by Kumar et al. found that AES positivity was established in 1480 cases (28.82%) among the 5136 suspected cases.[10] Testing for JEV in AES cases has increased over time, leading to a higher detection rate. Despite the availability of vaccines and anti-mosquito measures, JE remains a major cause of AES in Assam.

In our study, males and younger age groups were affected more, indicating more exposure of males to mosquito bites and lower immunity amongst the younger age group. A study by Dutta et al., found that 55.56% of males and 44.44% of females were positive for JEV.[10] In another study by Ahmed et al., higher JE cases were observed in older people (>30 years) compared to younger age groups (<30 years).[6] A study by Suma et al. found that out of 101 AES patients, the majority were men (62.4%), adults aged 17–59 years (61.38%), and from rural areas (64.4%).[1] Another study by Phukan et al. found that the JE was confirmed in 53.7% of patients with the ratios of 1.8:1 and 1.4:1 for male-to-female and pediatric to adult patients, respectively, and the majority of cases belong to the pediatric age group of 7 to 12 years (34.2%).[11] A study by Kumar et al. found that the positivity for males and females was 57.77% and 42.23%, respectively, and the pediatric group was found to be more susceptible than others.[12] A study by Medhi et al. found a higher occurrence of JE in the 15 years and above age group.[8] And a study by Baruah et al. found that the age groups of 0 to 15 years were mostly affected. [9] Another study by Dey et al. found that among 300 clinically diagnosed cases of AES, 189 were males (63%), and the remaining 111 (37%) were females. [13] Outdoor work and shorter garments expose males to mosquito bites, leading to a higher incidence of JE when compared to females. The majority were Hindu by religion. This might be a reflection of the demographic pattern.

Most AES cases reported were from the Dibrugarh district (34%), followed by the Tinsukia district (18%). The majority of JE cases were reported from the Sivsagar district (9%), followed by Dibrugarh (7%) and Tinsukia (6%). The high prevalence of JEV in Sivsagar can be attributed to its agricultural landscape and the common practice of pig rearing.

In our study, an increasing trend was seen from June (15.33%), taking a peak during July (49.52%), followed by August (15.97%). In a study by Kumar et al., high positivity was observed from July to November in the Northern states, which includes monsoon and post-monsoon seasons.[3] Another study by Ahmed et al. observed that the spikes of the JE outbreak started in May every year and continued till August. The highest JE cases were reported in July, followed by June, almost every year from 2011 to 2020.[6] The study by Medhi et al. found a significant association of JE cases with the rainy season of the year, i.e., June to August.[8]A study by Dey et al. found that the JE cases showed seasonal peaks from June to October, coinciding with rainy and post-rainy seasons.[13] This seasonal pattern is related to paddy cultivation as the Culex mosquito prefers to breed in the stagnant water of paddy fields. This emphasizes the importance of timely implementation of antilarval measures using different biological measures like the use of Gambusia or Guppy fish and better immunization coverage to protect the vulnerable population along with vaccination of pigs.

Conclusions

JE remains a major public health concern in Assam, particularly among the rural young population with a seasonal trend with an epidemic peak in July, suggesting interventions to be implemented before July and also after the rainy season. Proper drainage system should be available to avoid stagnation of water, thereby disrupting the potential breeding places of the mosquitoes. Implementing evidence-based interventions like immunization, personnel protection against mosquito bites, integrated vector management, early diagnosis, and prompt treatment at peripheral hospitals and early referral must be promoted. Better diagnostic facilities to evaluate other causes of AES should also receive equal importance in the form of proper research, diagnosis, and treatment.

Recommendations: Enhancing JE vaccination coverage, strengthening vector control programs, and improving diagnostic facilities. Adult vaccination drives in all the districts of upper Assam. Further research in the Sivsagar district, along with special vaccination drives, is necessary, as JE is the major cause of AES in the district. Personal protection measures like wearing full-length garments and using mosquito repellents should be encouraged to reduce exposure to mosquito bites in endemic districts. Improvement

in the quality of recording the JE cases will help in getting an accurate status of JEV in the future. Research should also focus on the diagnosis, treatment, and prevention of the non-JE causes of AES.

Limitation: This is a single center record-based study, so there may be under-reporting.

Declarations:

Acknowledgment: We sincerely acknowledge the NVBDCP & IDSP unit, Dibrugarh, Assam, for their guidance during the study.

Data availability: The data that support the findings of this study are not openly available due to reasons of sensitivity.

Ethics approval: The study was approved by Assam Medical College and Hospital, Dibrugarh, Assam, Institutional Ethics Committee (IEC). Complete confidentiality was maintained throughout the process. After obtaining the necessary ethical approval, IDSP records were obtained for the study.

Research involving human participants and/or animals: Not applicable.

Authors Contribution: Dr. Raj Kumar Dutta (Data collection, Conceptualisation), Dr. Kankana Gogoi (Manuscript writing, Conceptualisation, Data analysis), Prof. Tulika Goswami Mahanta (Conceptualisation, Data collection), Prof. Gourangie Gogoi (Conceptualisation), Dr. Baidurjya Mahanta (Data Analysis)

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