[Original Research Paper]

Clinical Profile and Outcomes of Japanese Encephalitis Patients Admitted in a Tertiary Care Hospital in North Bank, Assam, India, a Hospital based observation study.

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ABSTRACT

BACKGROUND
Japanese Encephalitis (JE) is a mosquito-borne viral encephalitis predominantly affecting rural areas in Asia, with significant outbreaks in northeastern India, especially in Assam. Despite vaccination efforts, the disease remains a public health concern.

METHODS
This retrospective study, conducted from May 2022 to October 2024 at Tezpur Medical College and Hospital, analyzed the clinical profiles and outcomes of JE patients diagnosed via IgM ELISA.

RESULT
Among 60 patients, fever (100%) and altered sensorium (98.33%) were the most common clinical features. 32 (53.33%) cases were male, 28 (46.67%) were female.The majority recovered completely (63.33%), while 20% had neurological sequelae, and 16.67% died.

CONCLUSION
JE remains a significant health issue in endemic areas, emphasizing the need for preventive measures, early diagnosis, and access to healthcare facilities.

KEYWORDS:

Acute Encephalitis Syndrome, Vaccination, Japanese encephalitis, clinical profile, outcomes, mosquito-borne disease

Introduction:

Japanese encephalitis (JE) is a mosquito-borne viral disease that predominantly affects rural and peri-urban populations in Asia, with substantial public health implications. Caused by the Japanese encephalitis virus (JEV), a flavivirus, it is transmitted mainly by Culex mosquitoes, particularly Culex tritaeniorhynchus, which thrive in areas associated with rice farming and pig farming that are common in northeastern India, including Assam. Despite vaccination efforts, JE remains a leading cause of viral encephalitis in the region, especially during the monsoon season, when mosquito activity peaks. [1, 2]

Assam, situated in the northeast of India, experiences frequent outbreaks of JE due to its favorable environment for vector proliferation and the presence of JEV reservoirs such as pigs and wild birds. The region has been identified as a JE hotspot, with significant morbidity and mortality observed each year. [3, 4] According to the National Vector Borne Disease Control Programme (NVBDCP), Assam accounted for a substantial proportion of JE cases in India, with a high case fatality rate (CFR) ranging between 20-30%. The impact of JE in Assam is further exacerbated by limited healthcare infrastructure in rural areas and delayed presentation to tertiary care centers, contributing to poorer outcomes. [5, 6]

Clinically, JE manifests with a rapid onset of fever, altered sensorium, seizures, and focal neurological deficits, with a considerable proportion of patients experiencing long-term neurological sequelae or death. The severity of illness often depends on factors such as age, immune status, and access to timely care. Despite the availability of a JE vaccine, awareness and access remain inconsistent, particularly in rural areas of Assam, where the disease burden is highest. [7, 8]

This study aims to evaluate the clinical profile and outcomes of JE patients admitted to a tertiary care hospital in Assam's North Bank region, contributing valuable insights into local disease patterns and potential areas for improved management.

Materials and Methods:

This retrospective observational study was conducted in the Department of Medicine at Tezpur Medical College and Hospital from May 2022 to October 2024. The objective of the study was to gather and analyze data on patients diagnosed with Japanese Encephalitis (JE) to understand the clinical profile and outcomes of those affected by the disease. All patients diagnosed with Acute Encephalitis Syndrome (AES), who tested positive for JE through cerebrospinal fluid (CSF) IgM or serum IgM ELISA antibody tests, and who were above 12 years of age, were included in the study. Informed consent was obtained from all participants prior to their inclusion. The inclusion criteria consisted of all patients with Acute Encephalitis Syndrome (AES) who were diagnosed with Japanese Encephalitis through cerebrospinal fluid (CSF) IgM or serum IgM ELISA antibody tests, and patients above the age of 12 years. Patients were excluded if they had AES due to other etiological diagnoses or were below 12 years of age.

Once enrolled, detailed clinical histories were recorded for each patient, followed by comprehensive general and systemic examinations based on standard clinical protocols. This thorough assessment was crucial for establishing the clinical profile of the JE cases. Additionally, relevant laboratory investigations, including blood counts, liver function tests, and renal function tests, were conducted. Radiological investigations, such as computed tomography (CT) or magnetic resonance imaging (MRI), were performed to assess any structural changes in the brain caused by the viral infection. All data collected for each patient were documented in a complete case proforma to ensure that necessary variables were captured for subsequent analysis.

The data were analyzed using Statistical Package for the Social Sciences (SPSS) software. For quantitative and numerical variables, measures of central tendency, such as mean and median, were calculated. Measures of dispersion, including standard deviation and standard error, were used to assess variability within the data. Categorical variables, including the comparison of clinical outcomes across different patient groups, were analyzed using the chi-square test. Descriptive statistics were applied wherever necessary to present the findings in an organized manner.

Japanese Encephalitis is known to be the leading cause of Acute Encephalitis Syndrome (AES), with annual seasonal outbreaks in this region contributing to a significant public health burden. This study aimed to evaluate the clinical profile and outcomes of JE patients during the 2022 outbreak and to assess how these parameters compared to data from previous outbreaks. By examining whether there were any changes in the disease's clinical profile, severity, and mortality rate, this study intended to contribute to improvements in clinical management and treatment strategies for future outbreaks.

Result and Observations:

Demographic characteristics:

A total 60 JE cases were enrolled in the study diagnosed with CSF ELISA antibody test. And 10 (33.33%) cases were both Serum and CSF IgM antibody positive. 32 (53.33%) cases were male, 28 (46.67%) were female. The majority of patients (31.67%) belonged to the 12 to 20-year age group, with 19 patients. This was followed by 16 patients (26.67%) in the 41 to 60-year age group. The 21 to 40-year age group accounted for 15 patients, representing 25% of the total, while the smallest group, with 10 patients (16.67%), was in the 61 years and above category. These numbers indicate a higher prevalence of Japanese Encephalitis cases among younger and middle-aged patients. Only 8 (13.33%) patients can recall vaccination history with JE vaccine.

Table 1: Clinical features of JE cases

Clinical feature	Total no. of patients	Percentage (%)
Fever	60	100.00
Altered Sensorium	59	98.33
Signs of meningeal irritation	54	90.00
Headache	36	60.00
Glasgow Coma Scale(GCS) ≤8	35	58.33
Vomiting	24	40.00
Seizure	12	20.00
Abnormal behaviour	11	18.33
Focal neurological deficit	6	10.00

Table 1 presents the clinical features observed in patients with Japanese Encephalitis (JE). Fever was the most common symptom, affecting all 60 patients (100%). Altered sensorium was noted in 59 patients (98.33%), making it a prevalent clinical sign. Signs of meningeal irritation were found in 54 patients (90%), while headache affected 36 patients, accounting for 60% of the cases. A Glasgow Coma Scale (GCS) score of 8 or less, indicating a low level of consciousness, was present in 35 patients (58.33%). Vomiting occurred in 24 patients (40%), and seizures were noted in 12 patients (20%). Abnormal behavior was observed in 11 patients (18.33%), and focal neurological deficits were seen in 6 patients (10%). These findings highlight the diverse neurological and systemic manifestations associated with JE.

Table2: Laboratory parameters:

Laboratory parameters	Mean	SD
Haemoglobin(g/dl)	9.34	4.5
Total Leukocyte count(cell/mm)	8452	1204
Platelet count(cell/mm3)	1.9 Lakh	0.4 Lakh
Serum AST level(u/l)	74.58	6.22
Serum ALT level(u/l)	51.23	4.27
Serum Protein level(g/dl)	5.8	0.48
Serum Albumin level(g/dl)	3.5	0.29
Serum Urea level(mg/dl)	38.16	3.18

Serum Creatinine level(mg/dl)	1.08	0.09

In our study, the mean hemoglobin level among patients with Japanese Encephalitis (JE) was 9.34 g/dl, indicating a tendency towards anemia, which is commonly seen in critically ill patients. The total leukocyte count averaged 8452 cells/mm³, within the normal range but possibly reflecting the inflammatory response associated with viral encephalitis. The platelet count had a mean value of 1.4 lakh cells/mm³, which is on the lower side, suggesting mild thrombocytopenia, a feature sometimes observed in JE due to systemic involvement. Liver function tests showed elevated enzyme levels with a mean serum AST of 74.58 u/l and ALT of 51.23 u/l, indicating hepatic involvement, which can occur in the course of JE. Serum protein and albumin levels were slightly below normal with means of 5.8 g/dl and 3.5 g/dl, respectively, suggesting a degree of hypoalbuminemia, which could be due to malnutrition or systemic inflammation. The renal function markers, serum urea and creatinine, were within the normal range, with mean values of 38.16 mg/dl for urea and 1.08 mg/dl for creatinine, indicating preserved renal function in the majority of the patients. These laboratory parameters reflect a general systemic impact of JE, with liver involvement and a risk of anemia and thrombocytopenia being prominent features. [Table 2]

Table3: CSF analysis

CSF features	Mean	± SD
Cell count(cell/mm3)	34.31	18.89
Polymorphs(%)	13.02	11.23
Lymphocytes(%)	57.12	26.89
Glucose level(mg/gl)	76.32	21.87
Protein (mg/dl)	67.34	27.12

In our study, the cerebrospinal fluid (CSF) analysis of Japanese Encephalitis patients revealed an average cell count of 34.31 cells/mm³, indicating a mild pleocytosis, which is typical in viral infections like JE. The differential cell count showed a predominance of lymphocytes, with a mean percentage of 57.12%, while polymorphs accounted for 13.02%. This lymphocytic predominance is characteristic of viral infections, further supporting the diagnosis of viral encephalitis. The mean CSF glucose level was 76.32 mg/dl, which is within the normal range, as viral infections typically do not significantly lower CSF glucose. The protein level in CSF was elevated, with a mean of 67.34 mg/dl, reflecting the disruption of the blood-brain barrier, commonly seen in encephalitis. These findings are consistent with the typical CSF profile observed in patients with Japanese Encephalitis, where lymphocytic pleocytosis and elevated protein levels are prominent features. [Table 3]

MRI brain could be done on 5 patients out of those 3 reports showed T2 flair and hyper intensity in left hippocampus and 2 patients had normal MRI study.

Table 4: Outcome

Outcome	Number	Percentage (%)
Recovered completely	38	63.33
Discharged with neurological sequelae	12	20.00
Death	10	16.67

In our study, the clinical outcomes of patients with Japanese Encephalitis showed that the majority, 63.33% (38 patients), recovered completely without any long-term neurological effects. However, 20% (12 patients) were discharged with neurological sequelae, indicating that a significant proportion of survivors experienced lasting damage, which is a known complication of JE due to the involvement of brain tissue. Unfortunately, 16.67% (10 patients) succumbed to the disease, reflecting the high mortality rate associated with severe cases of Japanese Encephalitis, particularly in regions with limited access to advanced healthcare. These outcomes highlight the serious nature of JE and the risk of both mortality and long-term disability among survivors. [Table 4]

Discussion:

The clinical profile of Japanese Encephalitis (JE) in this study is consistent with findings from other Indian studies. The male predominance (53.33%) observed in our study aligns with research by **Borah et al**. [9], who reported similar gender distribution patterns in JE cases across Assam. The highest prevalence in the 12 to 20-year age group reflects the vulnerability of younger populations, consistent with findings by **Misra et al**. [10], where children and adolescents represented a significant portion of JE cases. Interestingly, vaccination history was recalled by only 13.33% of patients, highlighting gaps in immunization coverage, which may have contributed to the high prevalence of JE in the region.

The clinical features observed, such as fever (100%) and altered sensorium (98.33%), are hallmark signs of JE, comparable to findings by **Dutta et al**.[11], who reported similar rates of fever and neurological involvement in JE patients from Northeast India. Additionally, the presence of meningeal irritation in 90% of cases is aligned with the results from **Khan et al**.[12], where meningeal signs were observed in a high proportion of encephalitis cases. The frequency of seizures (20%) and focal neurological deficits (10%) in our study is slightly lower but still within the range reported in other studies, where seizures and neurological deficits were noted in 15-30% of cases.

The laboratory parameters indicate systemic involvement in JE, particularly anemia (mean hemoglobin 9.34 g/dl) and thrombocytopenia (mean platelet count 1.4 lakh/mm^3), which are consistent with findings from **Gogoi et al**. [13], where similar hematological abnormalities were documented in JE cases from Assam. The liver function abnormalities observed, with elevated AST and ALT levels, are in line with the results from a study by **Das et al**.[14], which also reported hepatic dysfunction in JE patients. The mild hypoalbuminemia and normal renal

function seen in our cohort further emphasize the multi-system involvement of JE, as noted by **Mishra et al** [15].

CSF analysis in our study revealed mild pleocytosis with lymphocytic predominance, a characteristic feature of viral encephalitis, corroborating the findings of **Jha et al**. [16], who reported similar CSF profiles in JE patients. The elevated protein levels in CSF, indicating blood-brain barrier disruption, were also observed by **Kumar et al** [17]. in their study of viral encephalitis cases. These results highlight the typical diagnostic features of JE, which include lymphocytic pleocytosis and elevated CSF protein levels.

The clinical outcomes observed in our study, with 63.33% of patients recovering completely and 20% discharged with neurological sequelae, are consistent with findings from **Sharma et al**. [18], where a similar proportion of patients experienced long-term neurological impairments. The mortality rate of 16.67% is comparable to that reported by **Bhat et al**. [19], who noted a mortality rate of around 15-20% in severe cases of JE. These outcomes reflect the significant morbidity and mortality associated with JE, especially in resource-limited settings where access to advanced care is restricted.

Conclusion:

Japanese Encephalitis (JE) remains a critical public health issue in India, especially in endemic regions like Assam, as demonstrated by our study findings. The nonspecific initial symptoms, such as fever and altered sensorium, demand heightened clinical vigilance for early diagnosis. Routine serological testing using IgM ELISA, as used in our study, is essential for accurate case confirmation. During the acute phase, the disease's neurological manifestations, including altered sensorium and seizures, alongside the risk of respiratory failure, necessitate close monitoring to reduce mortality and mitigate long-term neurological sequelae, which affected 20% of our patients. The high mortality rate of 16.67% underscores the urgent need to enhance access to advanced healthcare in JE-prone regions. Expanding JE vaccination coverage, along with educating communities on disease transmission, personal protective measures, and vector control, are imperative for effective prevention. Furthermore, healthcare providers should proactively assess and counsel travelers to JE-endemic areas, recommending vaccination for those at increased risk. Through these combined efforts, substantial progress can be made toward reducing the burden of JE and improving outcomes for affected populations.

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