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**Original Research Article**

# Incidence of Japanese encephalitis virus among patients presenting with acute encephalitis syndrome in a tertiary care hospital, West Bengal, India

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## ABSTRACT

**Background:** Japanese encephalitis virus (JEV) is a flavivirus related to dengue, yellow fever and West Nile viruses, and is spread by mosquitoes. JEV is the main cause of viral encephalitis in many countries of Asia with an estimated 68000 clinical cases every year. Although symptomatic Japanese encephalitis (JE) is rare, the case-fatality rate among those with encephalitis can be as high as 30%. Permanent neurologic or psychiatric sequelae can occur in 30-50% of those with encephalitis. This study was conducted to find the incidence of JEV IgM in patients presenting with acute encephalitis syndrome (AES) in Raiganj govt. medical college and hospital, Uttar Dinajpur, West Bengal, India.
**Methods:** Blood and CSF samples were collected from patients presenting with AES. IgM antibody capture ELISA was performed on the CSF and serum samples by JE virus MAC ELISA kit.
**Results:** The overall prevalence of JEV IgM was 13.8%. Among the positive cases male comprised of 71.4% and female 28.5%. The most common age group affected was above 16 years of age. JEV prevalence was present throughout the year with high number of cases between the monsoon and post monsoon seasons.
**Conclusions:** This study demonstrates the endemicity of JEV in Uttar Dinajpur district of West Bengal, India. As most of the JE cases are asymptomatic strengthening the existing surveillance system is required to find out the actual scenario of JEV in West Bengal. Control of vectors, early diagnosis and treatment, vaccinations are the key to decrease the morbidity and mortality caused by JEV.

**Keywords:** JEV, AES, MAC ELISA

## INTRODUCTION

Japanese encephalitis virus (JEV) is the most important cause of viral encephalitis in Asia. It is a mosquito-borne flavivirus, and belongs to the same genus as dengue, yellow fever, and West Nile viruses. The first case of JE viral disease was documented in 1871 in Japan. Approximately 3 billion people are exposed to the risk of JEV infection. It is estimated that 67,900 JE cases occur annually in 24 JE-endemic countries, with an overall incidence of 1.8 per 100,000.[1] Although symptomatic JE is rare, and only approximately 1 in 250 infections results in severe clinical symptoms, the case fatality rate can be as high as 30%. Permanent neurological or psychiatric sequelae can occur in 30-50% of survivors, resulting in heavy health, social and economic burdens.[2] In India epidemics of JE are reported from many parts of the country and are considered as a major public health problem. The first recognition of JE based on serological surveys was in 1955, in Tamil Nadu, India.[3] Since 1973,

epidemics of JE have occurred in West Bengal, Bihar, Uttar Pradesh, Assam, Andhra Pradesh, Tamil Nadu, and Karnataka.[4] JE is a disease with severe epidemic potential and high fatality rate and hence monitoring its prevalence status is considered to very important especially in countries like India. Every year sporadic JE cases are reported from West Bengal, indicating their endemicity in this state.[5]

JEV is maintained in an enzootic cycle between mosquitoes and amplifying vertebrate hosts, primarily pigs and wading birds. Culex mosquitoes are the principal vectors, especially *Culex tritaeniorhynchus*, and commonly breed in rice fields and other stagnant water collections. JEV transmission occurs predominantly in rural agricultural areas.[6] In West Bengal, the first major outbreak of JEV infection took place in 1973 in the districts of Burdwan and Bankura where more than 700 cases and 300 deaths had been reported.[7] Since then many outbreaks have been reported; every year sporadic cases are continuously being reported from different districts of West Bengal.[8,9] This study was conducted to determine the incidence of JE IgM among patients presenting with AES in a tertiary care hospital in the district of Uttar Dinajpur, West Bengal.

## METHODS

This retrospective study was conducted in the department of microbiology, Raiganj govt. medical college and hospital, Uttar Dinajpur, West Bengal for a period of 2 years from January 2019 to December 2020. Serum and CSF samples were collected from patients presenting with signs and symptoms of AES, i.e., fever, convulsions, comatose/unconscious, meningeal signs, and change in mental status. One ml CSF and 2-5 ml of clotted blood sample were collected as per standard procedures. The samples were transported to the microbiology laboratory maintaining cold chain. The CSF and serum samples were stored at 4°C in the refrigerator if tested within 3 days or minus 80-degree freezer for long-term storage. Serological study for JE IgM antibody capture (MAC) ELISA was performed on the CSF and serum samples by JE virus MAC ELISA kit supplied by the national institute of virology, Pune, as an integral part of the national vector borne disease control program. The samples were tested strictly following the manufacturer's guidelines.

## RESULTS

A total of 152 patients of different age groups presented with signs and symptoms of AES. Among the 152 samples tested, serum comprised of 117 (76.9%) and CSF 35 (23.1%). Out of the 152 patients' males comprised of 96 (63.2%) and females 56 (36.8%). The most common age groups were patients above 16 years of age. JE IgM positive was seen in 21 (13.8%) out of the 152 patients. Among the JE IgM positive patients, males comprised of maximum number of cases 15 (71.4%) and females 6 (28.6%). Serum positivity was seen in 17 (14.5%) of the cases and CSF positivity was seen in 4 (11.4%) of the cases. The most common age group infected were patients above 16 years of age 11 (52.4%) followed by 0 to 5 years of age and 6 to 10 years of age with 19% cases each. JE IgM positive cases were seen throughout the year with maximum cases in the month of August 28.5%. The most common presentation was fever seen in all 21 (100%) of the positive cases, followed by convulsion found in 17 (80.9%) of the cases.

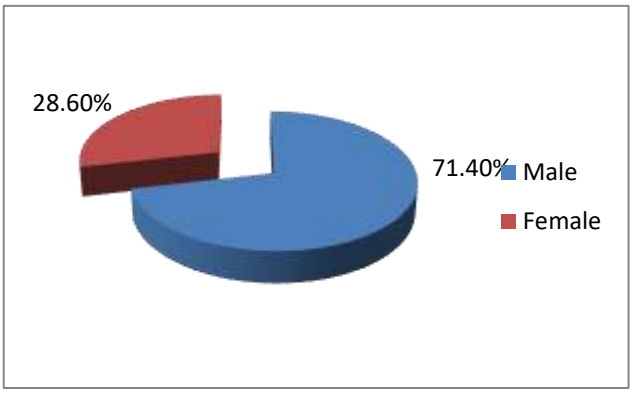


**Figure 1: Gender wise distribution of the positive cases.**

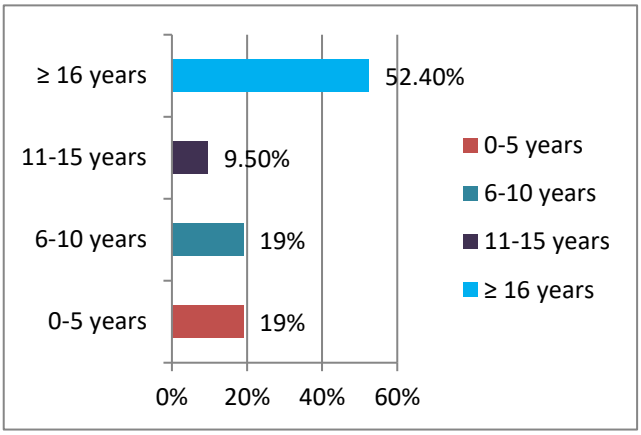


**Figure 2: Age wise distribution of positive cases.**

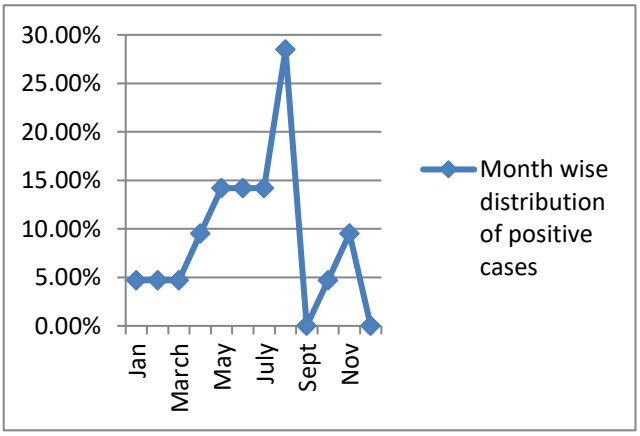


**Figure 3: Month wise distribution of positive cases.**

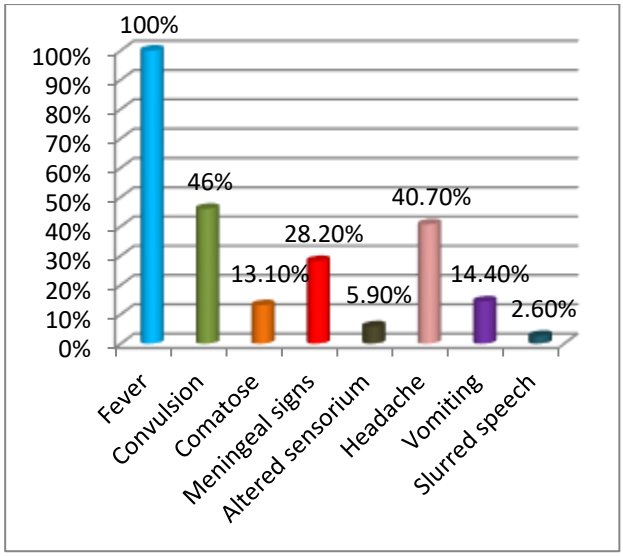


**Figure 4: Distribution of positive cases based on sign and symptoms.**

## DISCUSSION

In this study patients clinically diagnosed with AES were subjected to detection of JE IgM in their serum and CSF. The overall positivity was seen in 13.8% of the cases. Other studies conducted in West Bengal have shown various positivity rates. Chatterjee et al in their study reported 29.8% positivity which is higher than our finding.[10] Bandopadhyay et al has also reported higher number of cases 22.76% in patients presenting with AES.[11] Saha et al in their 5 years study reported 10.24% and Chakraborty et al reported 11.61% which is similar to our studies.[12,13] These variations in positivity may be due to different variables like duration of the study, geographic location, socioeconomic status of patients, density of amplifier host etc. In our study positivity in males (71.4%) was higher compared to females. This compares favorably with other studies by Aneeta et al and Rayamajhi et al.[14,15] The male predilection for JE may be due to increased number of outdoor activities in males as most of them are from rural areas and farming or working in fields were the most common source of income. Although, JE cases have been observed from all age groups, the highest numbers of positive cases have been recorded in the age group above 16 years 52.4%, followed by 0-5 years and 6-10 years with 19% each. This could be because people from this age group actively take part in the cultivation of crop fields in rural areas. Similar findings have been reported by Chatterjee et al.[10] Saha et al reported maximum number of cases belonging to the age group of 0-15 years (63.3%) which was different from our study.[12] Chakraborty et al also reported maximum number of cases in the age group under 15 years.[13]

In this study, all the JE cases were from rural areas, and most were from low socioeconomic group. The JE virus is particularly common in rural areas where irrigated rice fields attract the natural avian hosts and provide abundant breeding site for the vector and the association of pigs as amplifying hosts in such areas. Farming being the main occupation of these groups of people makes them more vulnerable to this infection. Other studies also have reported predilection of JE cases in rural areas.[16,17] Fever was the most common presentation found in this study followed by convulsions, headache, meningeal signs, vomiting, comatose, altered sensorium and slurred speech. Other studies from West Bengal have also reported fever to be the most common presentation.[10,11]

Although JE positive cases were seen throughout the year, it peaked during the monsoon and post-monsoon period. In other studies, conducted from West Bengal, authors reported that large number of cases occurred during rainy and post rainy season.[18] Studies from different states of India also showed higher JE positivity during rainy season because the paddy fields are covered with stagnant water which serves as good breeding site for the vector.[19,20]

## CONCLUSION

JE is a major public health problem in developing countries like India. This study demonstrates the endemicity of JE virus in Uttar Dinajpur district of West Bengal, India. As most JE infections are asymptomatic the cases of JE may not represent the original scenario of JE in this part of the state. Although proper surveillance system for JE is in place, the number of cases may be much more than reported. Strengthening of the existing surveillance system and development of infrastructure in rural areas for early diagnosis of infection is required to find out the actual scenario of JEV in different parts of West Bengal. High clinical suspicion, early diagnosis and treatment, vaccination, control of vectors and educating the general population are the key to decrease the morbidity and mortality caused by JEV.

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