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OUTBREAKS OF JAPANESE ENCEPHALITIS ; A FOUR YEAR STUDY FROM DIFFERENT DISTRICTS OF JHARKHAND

Microbiology

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ABSTRACT

Japanese encephalitis virus JEV is the most important cause of viral encephalitis in Asia. JE primarily affects children. Most adults in endemic countries have natural immunity after childhood infection, but individuals of any age may be affected. **Aim:** To test for the presence of JE infection in AES patients in Jharkhand state between 2018 -2021 and to analyze trends according to age, sex, residency and seasonality. Methods: Surveillance data were collected monthly, as a part of the Integrated Disease Surveillance program, India. The clinical definition of cases and outbreak were used for the surveillance rates and outbreaks. **Results:** The number of outbreak attacks were 2 in 2018 , 3 in 2019, 1 in 2020 and 2 in 2021.Maximum number of cases occurred in Godda district of Jharkhand in the year 2018, 2019 and 2020. But in 2021, a large number of cases of Japanese Encephalitis occurred in Hazaribagh district of Jharkahnd. A seasonal pattern was also observed. **Conclusion:** Safe and effective vaccines are available to prevent JE. WHO recommends that JE vaccination be integrated into national immunization in all regions where the disease is a recognized public health priority, along with strengthening surveillance and reporting mechanisms.

KEYWORDS

Japanese Encephalitis , JE, Surveillance; Outbreaks; India, Vaccine

Introduction :

Japanese encephalitis (JE) is a mosquito-borne viral disease prevalent in Southeast Asia and the Indian sub-continent. Japanese encephalitis virus (JEV) is transmitted by infected mosquitoes with pigs (or birds) as amplifiers. Fifteen to 25% of JE cases are fatal and approximately one third recover with mild to severe neurological sequelae [1,2].

Japanese encephalitis (JE) is an important public health problem in South East Asian region and India as most of the outbreaks and sporadic encephalitis cases have been attributed to it[3]. In the last few years States like Uttar Pradesh (UP), West Bengal, Bihar, Andhra Pradesh (AP) and North Eastern States have been reporting regular cases of JE infection in India and it is also spreading to naive non endemic regions of the country[4,5].

Although countries including Japan and Korea have already controlled JE through extensive JE vaccine programmes, JE still heavily affects persons living in developing countries in the endemic areas.Major factors that make the control of JE difficult are: (i) difficulty in controlling JEV vectors (mainly *Curex tritaeniorryncus*) [6], (ii) increased number of pigs (JEV amplifier) are an important source of income in the community, (iii) unaffordable price of currently available JE vaccine for general use [7], (iv) absence of specific treatment for JE [8] and (v) expansion of mosquito breeding sites by national development scheme (e.g. irrigation for rice fields, dam constructions). Although most human infections are mild or asymptomatic, about 50% of patients who develop encephalitis suffer permanent neurologic defects and 30% of them die due to the disease [9]. In 1973, JE outbreak was first recorded in the districts of Burdwan and Bankura in West Bengal where 700 cases and 300 deaths were reported [10-14].

Since 1973, epidemics of JE have occurred in West Bengal, Bihar, Uttar Pradesh, Assam, Andhra Pradesh, Tamil Nadu, and Karnataka [15]. Every year sporadic JE cases are reported indicating their endemicity in this state[16].

In most temperate regions of Asia, Japanese Encephalitis is transmitted mainly during warm season but in the tropics and subtropics, transmission occurs all year round but mostly during rainy season and pre-harvest period in rice-cultivating regions[17].

Currently there is no specific antiviral or any other curative medicines for JE. Hence, immunisation is the only reliable and effective method to control the disease[18]. JE vaccination campaign got underway in India in 2006 in a phased manner following massive JE outbreak in 2005 in Eastern Uttar Pradesh and adjoining districts of Bihar.

Individuals who live in or have travelled to a JE-endemic area and experience encephalitis are considered a suspected JE case. A laboratory test is required in order to confirm JEV infection and to rule out other causes of encephalitis. WHO recommends testing for JEV-specific IgM antibody in a single sample of cerebrospinal fluid (CSF) or serum, using an IgM-capture ELISA. Testing of CSF sample is preferred to reduce false-positivity rates from previous infection or vaccination.Surveillance of the disease is mostly syndromic for acute encephalitis syndrome. Confirmatory laboratory testing is often conducted in dedicated sentinel sites, and efforts are undertaken to expand laboratory-based surveillance. Case-based surveillance is established in countries that effectively control JE through vaccination[19].

Our main objectives of this study was to test for the presence of JE infection in AES patients in Jharkhand region between 2018 -2021 and to analyze trends according to age, sex, residency and seasonality.

Methods:

Case Definition For the purpose of this study : the clinical diagnosis was taken as the case definition .Outbreak was defined as ≥ 5 Japanese Encephalitis cases that are related in place and are epidemiologically linked .

Cases: Comprised of blood samples from clinically diagnosed Acute Encephalitis Syndrome patients in our laboratory from different districts of Jharkhand through IDSP Programme. **Time Of Study:** January 2018 to December 2021. **Sample Testing:** IgM antibody capture (MAC) ELISA was performed on serum samples by JE virus MAC ELISA kit (kit supplied by National Vector Borne Disease Control Programme). The samples were tested in accordance to the procedure guidelines provided by the National Institute of Virology, Pune for JE IgM capture ELISA.

Results :

Table 1. Number of outbreaks from 2018-2021

Year	2018	2019	2020	2021
Number of outbreaks	2	3	1	2

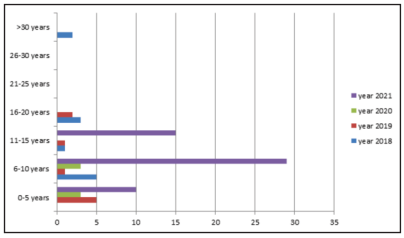
The number of outbreak attacks were 2 in 2018 , 3 in 2019, 1 in 2020 and 2 in 2021.

Table 2. Number of cases occurring every year during outbreak

Year	2018	2019	2020	2021
Number of cases	11	9	6	54

During a four-year period, from January 2018 to December, 2021, in Jharkhand region we reported an increasing rate of cases .

Figure 1 : Distribution of number of cases in different age groups from Year 2018-2021



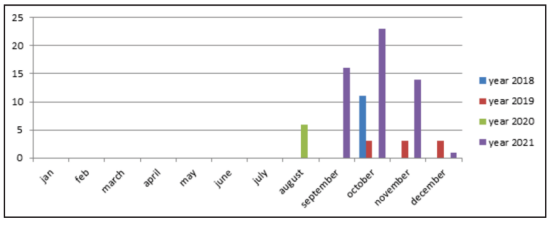
In 2018, the maximum number of cases occurred in age group of 6-10 years (5 cases) followed by 16-20 yrs. (3 cases) , > 30 yrs(2 cases) , and 11-15 yrs. (1 case). In 2019, the maximum number of cases occurred in age group of 0-5 years (5 cases) followed by 16-20 years (2 cases) , 6-10 years (1 case) and 11-15 yrs. (1 case). In 2020, equal number of cases occurred in 0-5 years of age group and 6-10 years of age group(3 cases each). In 2021, maximum cases occurred in 6-10 years (29 cases) followed by 11-15 years of age group (15 cases) and 0-5 years (10 cases).

Table 3: Distribution of cases among different district of Jharkhand in the Year 2018-2021

Year	Districts	Number of cases
2018	Godda	6
	Jamtara	5
2019	Godda	3
	East Singhbhum	3
	Sahebganj	3
2020	Godda	6
2021	Hazaribagh	49
	Chatra	5

Maximum number of cases occurred in Godda district of Jharkhand in the year 2018, 2019 and 2020. But in 2021, a large number of cases of Japanese Encephalitis occurred in Hazaribagh district of Jharkahnd.

Figure 2 : Distribution of number of cases in different months of Year 2018-2021



The male to female ratio was 0.57 in 2018, 0.8 in 2019, 2.0 in 2020 and 1.34 in 2021.

DISCUSSION:

Patients with high grade fever (≥39°C) for 5–15 days including any 2 of the following symptoms, namely, headache, vomiting, stupor, delirium, abnormal movements, presence of kernig's sign, convulsions, neck rigidity, altered sensorium, and unconsciousness were considered as acute encephalitis syndrome (AES) cases[20].In the present study, we reported an increasing trend of Japanese Encephalitis cases and ongoing outbreaks in the state of Jharkhand, during a four year passive surveillance study period (2018-2021). Increased number of cases occurred in pediatric age group compared to the older age group . This finding is similar to others studies. Also lack of immunity against JE virus in the younger age group could be responsible for the increased incidence of disease in this age group[21,22,23].

Interestingly, there is a clear seasonal pattern in JE occurrence. Maximum number of cases occurred in October, followed by September and then November. This is the post monsoon season . No outbreak cases occurred during April to July. Anuradha et al. [24], Sarkar et al. [25], Benakappa et al. [26], and Reuben and Gajanana [27] have also reported higher incidence of JE during similar months due to increased prevalence of the vector mosquitoes. Culex mosquitoes breed abundantly in the paddy fields covered with stagnant water during the rainy season.

With respect to gender, more cases occurred in females in the year 2018 and 2019, but in 2020 and 2021, males were greater affected.

CONCLUSION:

It is a mosquito-borne flavivirus, and belongs to the same genus as dengue, yellow fever and West Nile viruses.The first case of Japanese encephalitis viral disease (JE) was documented in 1871 in Japan.The annual incidence of clinical disease varies both across and within endemic countries, ranging from <1 to >10 per 100 000 population or higher during outbreaks. A literature review estimates nearly 68 000 clinical cases of JE globally each year, with approximately 13 600 to 20 400 deaths. Safe and effective vaccines are available to prevent JE. WHO recommends that JE vaccination be integrated into national immunization schedules in all areas where JE disease is recognized as a public health issue. WHO recommends having strong JE prevention and control activities, including JE immunization in all regions where the disease is a recognized public health priority, along with strengthening surveillance and reporting mechanisms. Even if the number of JE-confirmed cases is low, vaccination should be considered where there is a suitable environment for JE virus transmission. There is little evidence to support a reduction in JE disease burden from interventions other than the vaccination of humans. Thus, vaccination of humans should be prioritized over vaccination of pigs and mosquito control measures.

REFERENCES

1. Umenai T, Krzysko R, Bektiminov A, Assaad F. Japanese encephalitis ± current worldwide status. Bull WHO 1985; 63: 625-31.
2. Tsai TF Japanese encephalitis. In: Feigin RD Cherry GM. Textbook of pediatric infectious diseases 4th edn. Philadelphia: Saunders, 1995: 1997.
3. Solomon T. Viral encephalitis in Southeast Asia. Neurol Infect Epidemiol 1997; 2 : 191-9.
4. Joshi R, Kalantri SP, Reingold A, Colford JM Jr. Changing landscape of acute encephalitis syndrome in India: a systematic review. Natl Med J India 2012; 25 : 212-20.
5. Japanese encephalitis. Ministry of Health & Family Welfare. Government of India. Available from: http://www.nvbdcp.gov. in/je-action-taken.html, accessed on December 27, 2015.
6. Wada Y. Control of Japanese encephalitis vectors. Species complex of the vectors. Southeast Asian J TropMed Publ Hlth 1989; 20: 623-5.
7. Siraprapasiri T, Sawaddiwudhipong W, Rojanasuphot S. Cost bene®t analysis of Japanese encephalitis vaccination programme in Thailand. Southeast Asian J Trop Med Publ Hlth 1997; 28: 143-8.
8. Hoke CH, Vaughn DW, Nisalak A, et al. Effect of highdose dexamethasone on the outcome of acute encephalitis virus. J Infect Dis 1992; 165: 631-7.
9. G. N. Babu, J. Kalita, and U. K. Misra, "Inflammatory markers in the patients of Japanese encephalitis," Neurological Research, vol. 28, no. 2, pp. 190–192, 2006. View at: | Publisher Site Google Scholar
10. S. N. Ghosh, F. M. Rodrigues, and G. P. Seth, "Investigations on the outbreak of Japanese encephalitis in Burdwan district, west Bengal. Part II. Serological survey of human population," Indian Journal of Medical Research, vol. 63, no. 10, pp. 1472–1477, 1975. View at: Publisher Site Google Scholar
11. F. M. Rodrigues, S. N. Ghosh, and K. Banerjee, "A post epidemic serological survey of humans in Bankura district, west Bengal, following the epidemic of Japanese encephalitis in 1973," Indian Journal of Medical Research, vol. 63, no. 10, pp. 1478–1485, 1975. View at: Publisher Site Google Scholar
12. P. K. Rajagopalan and K. N. Panicker, "A note on the 1976 epidemic of Japanese encephalitis in Burdwan district, west Bengal," The Indian Journal of Medical Research, vol. 68, article 3938, 1978. View at: Publisher Site Google Scholar
13. K. Banerjee, S. N. Sengupta, and C. N. Dandawate, "Virological and serological investigations of an epidemic of encephalitis which occurred at Bankura district, west Bengal," Indian Journal of Medical Research, vol. 64, no. 1, pp. 121–130, 1976. View at: Publisher Site Google Scholar
14. B. B. Mukhopadhyay, B. Mukherjee, S. B. Bagchi, M. Chakraborty, K. K. Mukherjee, and M. K. Mukherjee, "An epidemiological investigation of Japanese encephalitis outbreak in Burdwan, district of west Bengal during 1987–1988," Indian Journal of Public Health, vol. 34, no. 2, pp. 107–116, 1990.
15. C. V. Mohan Rao, S. R. Prasad, J. J. Rodrigues, N. G. Sharma, B. H. Shaikh, and K. M. Pavri, "The first laboratory proven outbreak of Japanese encephalitis in Goa," The Indian Journal of Medical Research, vol. 78, pp. 745–750, 1983. View at: Publisher Site Google Scholar
16. A. Sarkar, D. Taraphdar, S. K. Mukhopadhyay, S. Chakrabarti, and S. Chatterjee, "Serological and molecular diagnosis of Japanese encephalitis reveals an increasing public health problem in the state of west Bengal, India," Transactions of the Royal Society of Tropical Medicine and Hygiene, vol. 106, no. 1, pp. 15–
19, 2012. View at: Publisher Site Google Scholar
17. Media Centre, Japanese Encephalitis..Factsheet No. 386, December 2015 [http://www.who.int/mediacentre/factsheets/fs386/en/]
18. Borthakur A K, Das N, Bora B J. Data from the world Health Organisation (WHO) National Network Laboratory for Japanese Encephalitis. J Glob Infect Dis.2013;5(2):76-79.
19. World Health Organization : Home/Newsroom/Fact sheets/Detail/Japanese encephalitis
20. T. Solomon, T. T. Thi, P. Lewthwaite et al., "A cohort study to assess the new WHO Japanese encephalitis surveillance standards," Bulletin of the World Health Organization, vol. 86, no. 3, pp. 178–186, 2008.
View at: Publisher Site Google Scholar
21. D. S. Burke, W. Lorsomrudee, and C. J. Leake, "Fatal outcome in Japanese encephalitis," American Journal of Tropical Medicine and Hygiene, vol. 34, no. 6, pp. 1203–1210, 1985. View at: Publisher Site Google Scholar
22. D. H. Libraty, A. Nisalak, T. P. Endy, S. Suntayakorn, D. W. Vaughn, and B. L. Innis,

"Clinical and immunological risk factors for severe disease in Japanese encephalitis," Transactions of the Royal Society of Tropical Medicine and Hygiene, vol. 96, no. 2, pp. 173–178, 2002. View at: Publisher Site Google Scholar
23. S. B. Halstead and J. Jacobson, "Japanese encephalitis," Advances in Virus Research, vol. 61, pp. 103–138, 2003. View at: Publisher Site Google Scholar
24. S. K. Anuradha, Y. A. Surekha, M. S. Sathyanarayan et al., "Epidemiological aspects of Japanese encephalitis in Bellary, Karnataka, India," International Journal of Biological and Medical Research, vol. 2, no. 3, pp. 691–695, 2011. View at: Publisher Site Google Scholar
25. A. Sarkar, D. Taraphdar, S. K. Mukhopadhyay, S. Chakrabarti, and S. Chatterjee, "Molecular evidence for the occurrence of Japanese encephalitis virus genotype I and III infection associated with acute encephalitis in patients of west Bengal, India, 2010," Virology Journal, vol. 9, article 271, 2012. View at: Publisher Site Google Scholar
26. D. G. Benakappa, G. A. Anvekar, D. Viswanath, and S. George, "Japanese encephalitis," Indian Pediatrics, vol. 21, no. 10, pp. 811–815, 1984. View at: Publisher Site Google Scholar
27. R. Reuben and A. Gajanana, "Japanese encephalitis in India," Indian Journal of Pediatrics, vol. 64, no. 2, pp. 243–251, 1997. View at: Publisher Site Google Scholar