International Journal of Current Advanced Research
ISSN: O: 2319-6475, ISSN: P: 2319-6505, Impact Factor: 6.614
Available Online at www.journalijcar.org
Volume 9; Issue 02 (A); February 2020; Page No.21174-21177
DOI: http://dx.doi.org/10.24327/ijcar.2020.21177.4153

Research Article

JAPANESE ENCEPHALITIS AMONG ACUTE ENCEPHALITIS SYNDROME CASES: A 4 YEAR RETROSPECTIVE ANALYSIS FROM NORTHERN PART OF WEST BENGAL

Dr Sayantani Endow[1], Dr Arpita Paul Dutta*[2], Sanjay Kumar Mallick[2], Sumana Moitra[2], Binita Pradhan[2] and Arunabha Sarkar[2]

[1]Department of Microbiology, Midnapore medical College
[2]Department of Microbiology, North Bengal Medical College

A R T I C L E I N F O

Article History:
Received 15th November, 2019
Received in revised form 7th December, 2019
Accepted 13th January, 2019
Published online 28th February, 2020

Key words:
acute encephalitis syndrome, Japanese encephalitis, Bengal, trend

A B S T R A C T

Background: Japanese encephalitis (JE) is a disease of major public health importance due to its high epidemic potential, high case fatality rate (CFR), and sequelae among survivors.The current study is done to assess the status of JE among Acute encephalitis syndrome (AES) patients and to find out the changing trends of Japanese Encephalitis with respect to various parameters.

Methods: A hospital based retrospective study was carried out among 1082 clinically suspected acute encephalitis syndrome (AES) patients for a period of 4 years.CSF and serum samples from those patients were processed for IgM MAC ELISA for Japanese Encephalitis (JE) .

Results: Of 1082 clinically suspected AES patients, 29.9% (324) were positive for JE IgM MAC ELISA. There was a decreasing trend in the number of JE cases till 2016 with an increase again in 2017.Though males were more affected than females, the difference was not clinically significant. Adults of age group more than 60 years followed by 46-60 years were more affected. JE cases were found to be in its peak during the month of July and August.

Conclusion: Though the etiology of acute encephalitis syndrome varies with time and geographical location, Japanese Encephalitis (JE) remains one of the most important causes in this part of Bengal.

INTRODUCTION

Acute encephalitis syndrome is a major public health concern in India. According to the World Health Organization (WHO) clinical case definition, Acute Encephalitis Syndrome (AES) is defined as the acute-onset of fever with change in mental status including symptoms such as confusion, disorientation, coma or inability to talk and/or often with new onset of seizures (excluding simple febrile convulsion) in a person of any age at any time of the year. Although viruses are the most common cause of encephalitis, bacteria, fungus, and parasites may also be responsible for infection (Saxena *et al*. 2009). Japanese encephalitis is one of the leading causes of viral neurologic disease and one of the most common causes of AES in India. About 3 billion people live in countries where the Japanese encephalitis virus (JEV) is endemic (United Nations Prospect, 2005). In Asia, annual incidence of the disease is about 50 000 cases (Solomon 2006). Every year, 10 000-15 000 people die due to this disease and about 15000 people who survive develop neuropsychiatric complications (Potula *et al* 2003,WHO 2006).

Corresponding author:* **Dr Arpita Paul Dutta
Department of Microbiology,North Bengal Medical College

Japanese encephalitis virus (JEV) belongs to the family *flaviviridae* and genus *Flavivirus.*(Karabatsos 1985). It is a single stranded, positive-sense polarity RNA genome of approximately 11 kb in length. The virion of JEV contains three structural proteins –nucleocapsid or core protein (C), non-glycosylated membrane protein (M), and glycosylated envelope protein (E), as well as seven non-structural (NS) proteins – NS1, NS2A, NS2B, NS3,NS4A, NS4B, and NS5 (Chambers *et al* 1990). JEV exists in a zoonotic cycle between mosquitoes and pigs and/or water birds (Tiwari *et al* 2012). JE virus (JEV) is an arthropod-borne flavivirus and is transmitted to human beings by *Culex tritaeniorrhynchus* and other related rice field-breeding mosquitoes of genus *Culex* (Saxena *et al* 2009).

Japanese encephalitis (JE) is endemic in many parts of India including the state of West Bengal 9Lawrence 2005). In India, the first case of JE was recorded from Vellore, Tamil Nadu in 1955 (Reuben *et al* 1997). Until 1970, JE was confined within southern part of India. In West Bengal, the first major outbreaks of JE occurred in the districts of Bankura and Burdwan in 1973 where about 700 cases and 300 deaths occurred (Banerjee *et al* 1976). Subsequently, another

outbreak in the same state occurred in 1976 with 307 cases and 126 deaths. Widespread outbreak were reported from Andhra Pradesh, Assam, Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal in l976(Taraphdar *et al* 2012). A major outbreak of Japanese Encephalitis was reported from eastern Uttar Pradesh during 2005 resulting in recording of more than 6000 cases and 1500 deaths. This led to a major decision of introduction of vaccine in high endemic areas in 2006. From 1978 to 2007, 103 389 cases and 33 729 deaths due to JEV infection were reported from this country (Dutta *et al* 2010).As per published literature the vaccination programme against JE (live attenuated JE vaccine SA-14-14-2) has been conducted in some districts of West Bengal by the State Health Department, Govt. of West Bengal, still sporadic JE/AES cases and deaths were continuously being reported in every JE season from the State which proves the endemicity in this state (Chakraborty *et al* 2015).

JE virus is maintained in a cycle involving mosquitoes and vertebrate hosts, mainly pigs and wading birds. It is important to note that eco-epidemiological factors interact with the less well-defined soci-cultural drivers in a complex continuum to influence the overall disease epidemiology.[16] Confirmation of JE is usually done by specific titres of IgM antibodies in serum or CSF during acute illness of a suspected AES case.[17] The exact burden of Japanese encephalitis in Northern part of West Bengal is difficult to state as there are very few published reports. This study was done to estimate the positivity rate of Japanese encephalitis among the AES cases and also to study the trend of Japanese encephalitis during this period with respect to sample positivity rate, sex, age and seasonal distribution.

MATERIALS AND METHODS

This is a descriptive hospital based retrospective study done in patients presenting with acute encephalitis syndrome (AES) in North Bengal Medical College. The study was conducted in the Department of Microbiology, North Bengal Medical College, for a period of four years from January 2014 to December 2017. Blood (2-5ml) and CSF (1-2ml) samples from clinically diagnosed cases of AES attending the indoor, outdoor and emergency departments of North Bengal Medical College and Hospital were collected over a period of five years. Blood samples were left at room temperature for 30 minutes for clot formation and then serum was separated by centrifugation. Only serum samples were included in the study from patients in whom CSF could not be obtained or lumbar puncture was contraindicated. Specimen collection and transportation were strictly monitored. Samples were transported to the Department of Microbiology maintaining cold chain. Both serum and CSF samples were kept at 4-8^{O}C if testing was done within 3 days and at -80^{O}C if testing was further delayed.

IgM antibody capture (MAC) ELISA was performed on CSF and serum samples by JE virus MAC ELISA kit supplied by National institute of Virology (NIV), Pune as an integral part of National Vector Borne Disease Control Program (NVBDCP). The samples were strictly tested following manufacturer's instructions. Patient details were uploaded in excel sheet and analysed using Epi Info Software (Centres for Disease Control and Prevention, Atlanta, USA).

RESULTS

A total of 1082 clinically suspected cases of Acute Encephalitis Syndrome (AES) attending North Bengal Medical College over a period of four years were included in the study. Of these, 324 (29.94%) were positive for JE IgM MAC ELISA. Of the JE positive cases, 121(37.3%) were positive for both CSF and serum, 89((27.4%) were positive only for CSF and 114 (35.1%) were only serum positive.

Table 1 shows that out of 1082 clinically suspected AES cases, JE positive cases for the year 2014, 2015, 2016 and 2017 were 32.27%, 30.4%, 27.33%, 33.72% respectively. There was a gradual decline in the percentage of JE positive cases in 2015(30.4%) and 2016(27.33%) with an increase seen again in 2017 (33.72%).The decrease in cases in 2015 and 2016 was not significant as compared to 2014 ($p>0.05, Z<1.96$).

During the study period, there was higher occurrence of JE positive cases among males (62.03%) than females (37.96%) but the difference was not statistically significant (Chi square 3.61, p value: 0.057). (Table 2).

A significant variation was observed in the occurrence of JE positivity with age (Chi square : 27.31, p value =0.000).Though maximum number of AES cases were seen in the age group 0-15 years, JE positivity was seen maximum in > 60 years of age followed by 46-60 years (Table 3).

JE positivity was significantly associated with rainy season. Maximum number of JE positive cases occurred in the month of July followed by August and September which corresponds to the rainy season in this part of Bengal. (Fig1). Case fatality rate was found to be highest in the year 2016 (47.5%).

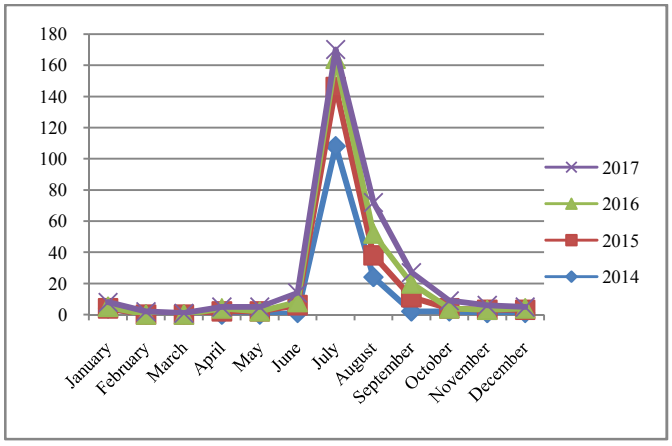

Fig 1 Month wise distribution of JE positive cases

Table 1 Year wise distribution of JE positive cases

Year	Total number of AES cases tested	Number of JE positive cases (%)	Number of JE negative cases	Z and p values when compared to 2014	
2014	443	143 (32.27)	300	Z	P
2015	250	76 (30.40)	174	0.25	0.60
2016	182	47 (27.33)	135	1.22	0.11
2017	207	58(33.72)	149	0.61	0.27

Table 2 Sex wise distribution of JE positive cases

Gender	JE positive cases	Non-JE cases	Total AES cases
Male	201	423	624
Female	123	335	458
Total	324	758	1082

Chi square: 3.61; p value: 0.057

Table 3 Age wise distribution of JE positive cases

Age group	Number of JE positive cases (%)	Non-JE cases	Total
0-15years	66 (21.15)	246	312
16-30years	72 (29.14)	175	247
31-45 years	51(27.12)	137	188
46-60 years	81(37.50)	135	216
>60 years	54(45.37)	65	119

Chi square: 27.31; p value = 0.000

DISCUSSION

In our study, the overall JE positivity rate during 4 years study period was 29.94% which is similar to the findings of the study conducted by Sarkar *et al* at ICMR Virus unit (27%), but is much higher than study reported by Bandyopadhyay *et al* (12.21%) and Shresta *et al* (17.7%). A decline in JE positive cases was observed from 32.27% in 2014 to 27.33% in 2016. The decrease in JE positive cases among the AES patients may be attributed to increase in awareness among the general public and mass vaccination program introduced during these years. Cross-protection by other flaviviral diseases such as dengue could be a reason for decline of JE cases. The State Health Department of Government of West Bengal undertook mass vaccination programme against JE in several districts using live attenuated vaccine SA-14-14-2.The significant decline may be attributed to the mass vaccination programme carried out in these districts. The surge in cases again in 2017 may be due to increased rainfall in these districts during this year.

In our study, JE positive cases were found to be more among males than females (62.03%vs 37.96%).However gender differences were not found to be statistically significant. Similar findings of male preponderance of JE cases were reported by UP outbreak in 2005, Bandopadhyay *et al*, Sarkar *et al* and Anuradha SK *et al*. In contrast, a female preponderance was noted in a study done at Patan Hospital, Nepal (Shrestha *et al* 2009). The male predilection of JE cases can be explained by increase in outdoor activities which increases their chances of being bitten by Culex tritaenorhynicus mosquito. The vector usually breeds in stagnant water in the cultivation fields and males working in paddy fields get exposed during outdoor activities.

Though JE is predominantly a disease of the paediatric population, in our study maximum JE cases were observed in adults of >60 years of age (45.37%) followed by 46-60 years (37.5%). Previous studies from West Bengal by Bandopadhyay *et al* , Sarkar *et al* and Taraphdar *et al* reported maximum cases in the age group of <20 years. However study done by Medhi *et al* from Assam showed higher positivity in adults.JE vaccination campaign was carried out for children of 1-15 years of age in five districts of North Bengal during 2013.The districts covered were Jalpaiguri, Darjeeling, Dakhin Dinajpur, Malda and Uttar Dinajpur (Sharma *et al* 2014). The vaccination programme targeting the younger age group may have resulted in the shift to the adult population. The climatic condition of the area is hot and humid most of the time and adult population may remain outdoor for work most of the time and may even sleep outdoor. Also most of the districts falls under rural areas where main occupation is crop cultivation. The vector usually breeds in the stagnant water in the paddy field and majority from the adult age group gets exposed to the vector directly while working outdoors.

The maximum number of cases was reported during the month of July to September which corroborates with the warm, rainy season in West Bengal, an ideal environment for growth of mosquitoes and disease spread. Previous studies from West Bengal also reported July to September as the peak season for JE (Bandopadhyay *et al* 2013; Sarkar *et al* 2012).With the onset of winter, number of JE cases declined substantially, except for a few scattered cases. Maximum numbers of cases were observed from the districts of Jailpaiguri and Coochbehar.

Conclusion

Japanese Encephalitis is the most common form of sporadic encephalitis in West Bengal and should be ruled out first before considering the other viral causes for acute encephalitis syndrome. Our study establishes Japanese encephalitis as one of the most important cause of acute encephalitis syndrome in this part of Bengal. Pig-mosquito-pig and bird-mosquito-bird cycle is responsible for the maintenance of the virus in nature. Man is the 'dead end' host. The virus causes large epidemics at intervals and has been endemic in many rural areas of West Bengal. Environmental and ecological factors are responsible for the spread of JEV. There is no specific treatment for JE; only prevention can control the disease. Control may be possible only after developing a strong surveillance system together with a high-quality immunization program aiming people of all age group, modified agricultural practices, pig vaccination, rigorous monitoring, vector control, and improved living standards.

Acknowledgements

We are also grateful to National Institute of Virology, Pune for providing us JE IgM ELISA kit.

Funding: None
Competing interests: None declared

References

1. Shailendra K. Saxena, Niraj Mishra1, Rakhi Saxena, Maneesh Singh, Asha Mathur.Trend of Japanese encephalitis in North India: evidence from thirty-eight acute encephalitis cases and appraisal of niceties**.** Infect Dev Ctries 2009; 3(7):517-530.
2. United Nations. The United Nations urbanization prospects: the 2005 revision. POP/DB/WUP/Rev.2005/1/F1. New York: United Nations; 2005.
3. Solomon T. Control of Japanese encephalitis-within our grasp? N Engl J Med 2006; 355: 869-871.
4. Potula R, Badrinath S. Japanese encephalitis in and around Pondicherry, South India: A clinical appraisal and prognostic indicators of the outcome. J Trop Pediatr 2003; 49: 48-53.
5. World Health Organization. Handbook: Japanese encephalitis vaccines. Wkly Epidemiol Rec 2006; 81: 331-340.
6. Karabatsos N. International catalogue of arboviruses. San Antonio, Texas: The American Society of Tropical Medicine and Hygiene; 1985.
7. Chambers TJ, Hahn CS, Galler R, Rice CM. Flavivirus genome organization, expression, and replication. Annu Rev Microbiol. 1990;44:649–88.

8. Tiwari S, Singh RK, Tiwari R, Dhole TN. Japanese encephalitis: a review of the Indian perspective. Braz j infect dis. 2012;16(6):564–573.
9. Lawrence J. Japanese encephalitis outbreak in India and Nepal. Euros Surveill 2005; 10(38).
10. Reuben R, Gajanana A. Japanese encephalitis in India. Indian J Pediatr 1997; 64(2): 243-251.
11. Banerjee K, Sengupta SN, Dandawate CN, Tongaonkar SS, Gupta NP. Virological and serological investigations of an epidemic of encephalitis which occurred at Bankura district, West Bengal. Indian J Med Res 1976; 64: 121-130.
12. Taraphdar D,Sarkar A, Mukhopadhyay BB, Chakraborty D,Khatun T,Chatterjee S. *Increasing trend of Japanese encephalitis cases in West Bengal, India - a threat to paediatric population.* Asian Pacific Journal of Tropical Disease. 2012 : 358-361.
13. Dutta K, Rangarajan PN, Vrati S, Basu A. Japanese encephalitis: pathogenesis, prophylactics and therapeutics. Curr Sci 2010; 98 (3): 326-334.
14. 14.Chakraborty D,Banerjeee S,Maji D,Dey TK,Mondol P,Basu M. A Descriptive Study of Japanese Encephalitis in West Bengal, India, Based on Surveillance Data: Changing Pattern Observed in Recent Years. Sch. J. App. Med. Sci., 2015; 3(1):320-328.
15. Dutta BS,Bezborah K,Begum S, Pathak M, Biswas S. A retrospective study of acute encephalitis syndrome with special reference to Japanese encephalitis in tertiary care centre, Tezpur, Assam.J of entomology and Zoology Studies,2017;5(6):1231-1235.
16. Saxena V, Dhole TN. Preventive strategies for frequent outbreaks of Japanese encephalitis in Northern India.Journal of Biosciences.2008;33:505-514.
17. Kumari R,Joshi PL.A review of Japanese encephalitis in Uttar Pradesh, India.WHO South –East Asia J Public Heal.2012;1:374-395.
18. Bandopadhyay B,Bhattacharya I,Adhikary S, Mondal S, Konar J,Dawar N *et al*.Incidence of Japanese encephalitis among Acute Encephalitis Syndrome cases in West Bengal, India.Bio-med Research International.2013;1: 1-5.
19. Sarkar A, Taraphdar D, Mukhopadhyay BB, Kumar M, Mukhopadhyay SK, Chatterjee S. Influence of socio-economic status and environmental factors on serologically diagnosed Japanese encephalitis cases in the state of West Bengal, India during 2005-2010.Health. 2012; 4(1):6-12.
20. Anuradha SK, Surekha YA,Sathnarayan MS,Suresh S, Satish P,Mariraj J *et al*. Epidemiological aspects of Japanese encephalitis in Bellary,Karnataka,India. Int J Bio Med Res. 2011; 2(3):691-695.
21. Shrestha SR,Awale P,Neupane S,Adhikari N,Yadav BK. Japanese encephalitis in children admitted at Patan hospital.J Nepal Paediatric Soc.2009;29:17-21.
22. S. N. Sharma, S. Sen, K. S. Anand, B. V. Tandale, Nitin Sinha, Nibedita Das, R. K. Jaiswal, P. K. Sen, A. C. Dhariwal. An Outbreak of JE/AES in North Bengal Districts of West Bengal during 2014. J. Commun. Dis. 2014; 46(2): 51- 58.
23. Medhi M, Saikia L,Patgiri SJ,Lahkar V,Hussain ME, Kakati S. Incidence of Japanese Encephalitis amongst acute encephalitis syndrome cases in upper Assam districts from 2012 to 2014: A report from a tertiary care hospital. Indian J Med Res 146, August 2017, pp 267-271.

How to cite this article:

Dr Sayantani Endow *et al* (2020) 'Japanese Encephalitis Among Acute Encephalitis Syndrome Cases: A 4 Year Retrospective Analysis from Northern Part of West Bengal', *International Journal of Current Advanced Research,* 09(02), pp. 21174-21177. DOI: http://dx.doi.org/10.24327/ijcar.2020.21177.4153

****