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Trend of Japanese Encephalitis in Rural Areas of West Bengal, India: *A Retrospective Study*

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Abstract: *The present study was conducted to find out the clinico-epidemiological profile of Japanese encephalitis (JE) during the year 2013 to 2018 (till June) in a tertiary care teaching hospital, MMC, Malda, West Bengal. It was a retrospective study. The AES (Acute Encephalitis Syndrome) cases were tested for IgM antibodies against JE virus by using IgM Mac ELISA (National Institute of Virology, Pune). A total of 293 sera samples from the patients clinically suspected with AES were collected from the year 2013 to 2018 (till June). Out of which 30/293 (10.24%) were JE positive by IgM Mac ELISA kit, where 19 (63.33%) were male and rest 11 (36.67%) were female. Maximum number of JE cases was reported in the age group 0-15 yrs (63.33%: 40% in the age group of less than 5 years and 23.33% in the age group of 5-15 years). Death occurred in 6/30 (20%) patients. The present study showed a low JE seropositivity in this region of northern part of West Bengal. As most JE infections are asymptomatic, the cases of JE may not represent the original scenario of JE in this northern part of West Bengal, may only represent the tip of the iceberg compared to the large number of inapparent infections. So JE surveillance system and the vaccination programme need to be strengthened to keep this vector borne disease under control.*

Keywords: *Acute encephalitis syndrome, Japanese encephalitis, ELISA, Malda*

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I. Introduction

Japanese Encephalitis (JE) is among the most common cause of viral encephalitis in human beings and is found worldwide, especially in South-east Asia and less commonly in the Western Pacific regions and Australia.[1]JE is induced by infection with Japanese encephalitis virus (JEV),which belongs to the JEV serogroup in the genus Flavivirus, family Flaviviridae.[2] The JEV is mainly transmitted by the mosquito *Culex tritaeniorrhynchus*, which prefers to breed in irrigated rice paddies.[3] In the tropics and subtropics, transmission can occur year-round but often intensifies during rainy season.[4] Pigs serve as amplifying hosts and high density of pigs in an area can be associated with increased number of cases of JE. Humans and horses are dead- end hosts for the virus.[5] Worldwide, it is estimated that around 68,000 cases occur annually, 40,000 in the Western Pacific region alone. Most of these cases in endemic countries occur among children under 15years of age, as adults are often already immune to the disease.[6] In India, nearly all states have reported JE cases except that of Jammu and Kashmir, Himachal Pradesh, and Uttaranchal.[7] In India, the first human case was reported from North Arcot district of Tamil Nadu in 1955.Until 1973, the disease was confined to southern parts of India, with low prevalence; subsequently, the disease spread to various other parts of India. The first outbreak of JE was recorded in 1973 from Burdwan and Bankura districts of West Bengal. Since 1973, epidemics of JE have occurred in West Bengal, Bihar, Uttar Pradesh, Assam, Andhra Pradesh, Tamil Nadu, and Karnataka. Every year, sporadic JE cases are reported indicating their endemicity in this state.[8] The Incidence of JE in India is still increasing and the case fatality rate of reported cases is high, 10-30%. However overall trends for India are difficult to predict because JE endemicity is heterogenous and socioeconomic conditions for control differ substantially from one state to another.[9]In West Bengal, the disease occurred between May and October, and was shown to be related to the summer monsoon. During 2011-2012, JE outbreaks occurred in many parts of eastern States including Bihar and North West Bengal. During the recent outbreak JE cases were reported from four different districts (i.e. Cooch Behar, Dakshin Dinajpur, Darjeeling and Jalpaiguri) of North West Bengal from the first quarter of 2011 onwards.[10]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.[8] Most JE infections are asymptomatic, and the ratio of symptomatic to asymptomatic infections ranges from 1 in 300 to 1 in 1,000.[11] Without early diagnosis and management, it may have mortality rate of 15-30%, and up to half of the survivors may have permanent, residual neuropsychiatric

sequelae.[12] With a view to identify the JE cases from the AES cases, our aim in this study is to observe the present scenario of JE in rural areas of Northern district of West Bengal.

II. Aims And Objectives

To observe the present scenario of JE in rural areas of West Bengal using recent data for the purpose of guiding prevention and control efforts.

III. Materials And Methods

It was a retrospective record based study. The study was conducted in the department of Microbiology, Malda Medical College, Malda. All the previous cases of AES (Acute Encephalitis Syndrome) including JE cases, from Jan 2013 to June 2018 recorded in the department of Microbiology were included in this study. Data were obtained from departmental archive.

World Health Organization has quoted "a person of any age, at any time of the year, with the acute onset of fever and a change in mental status or new onset seizures (excluding simple febrile seizures)" as the basis for defining acute encephalitis syndrome (AES) cases.[13]Japanese encephalitis (JE) is the AES case that is confirmed by detection of JE virus specific antibody in a single sample of cerebrospinal fluid (CSF) or serum.[14] Clinically diagnosed AES cases of all age groups and either sex who admitted in IPD (in patient department) of Malda Medical College & Hospital throughout the year were selected for the study.

Blood and / or CSF samples were tested in the microbiology laboratory, Department of Microbiology, Malda Medical College, Malda. 1-2 ml CSF and 2-5 ml of clotted blood samples were obtained from the AES cases as per standard procedures. The serum was separated from the blood and both serum and CSF were stored at -30^{o}C. The CSF and serum samples were tested for JE virus specific IgM by JE virus MAC ELISA kit supplied by the National Institute of virology, Pune. The samples were tested strictly following the manufacturer's protocol.

IV. Results

The present study was carried out in the department of Microbiology, MMC, Malda, West Bengal. During the present study period of five and half years, a total of 293 AES cases were reported. A total of 293 sera samples from the patients clinically suspected with acute encephalitis syndrome (AES) were collected from the year 2013 (January) to 2018 (till June). Out of which only 30 (10.24%) were positive for JE. Table 1 shows total AES and JE cases, and AES and JE deaths for Malda district from 2013 (January) to 2018 (till June).

Table 1: AES and JE cases for Malda district from Jan 2013 to 2018 (till June)

Year	AES cases	AES deaths	**JE cases**	JE deaths
2013	57	1	4	2
2014	72	34	0	0
2015	76	9	11	0
2016	30	2	12	4
2017	21	1	0	0
2018 (till June)	37	0	3	0

Among 293 clinically diagnosed cases of AES, 170 were male (58.02%) and rest 123 (41.98%) were females. Highest (154/293, 52.56%) positivity was found amongst the age group less than 5 years. Table 2 shows age and sex distribution of AES cases.

Table 2: Age and Sex wise distribution of AES cases

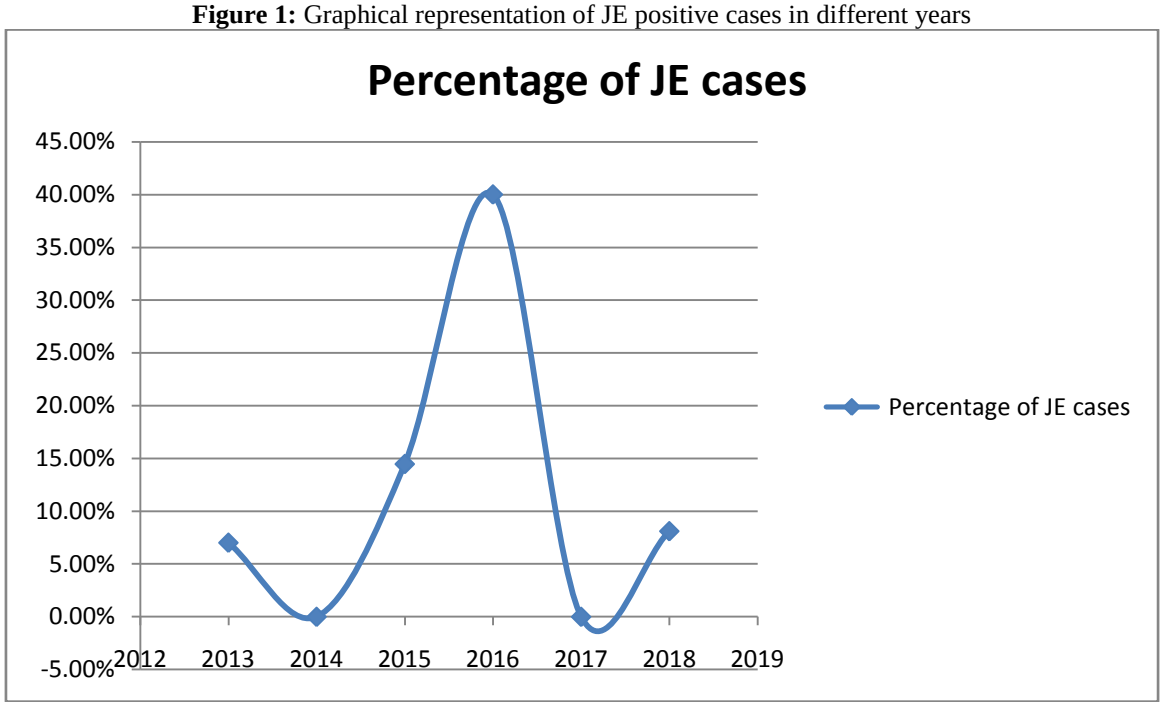
Characteristics	**2013 n=57**	**2014 n=72**	**2015 n=76**	**2016 n=30**	**2017 n=21**	**2018 (till June) n=37**	**Total n=293**
Sex							
Male	37	47	40	16	16	14	170
Female	20	25	36	14	05	23	123
Age group							
Less than 5 yrs	33	50	40	18	08	05	154
5-15 yrs	21	22	27	03	09	07	89
More than 15 yrs	03	0	09	09	04	25	50

Total AES cases in the year 2013 were 57, of which 4 were positive for JE. So the JE detection rate was 7.02%. In 2014, out of 72 AES cases, no IgM positive JE case was found. In 2015 and 2016, out of 76 and 30 AES cases, JE positive cases were 11 and 12 respectively. So the JE detection rates were 14.47% and 40% respectively. Again in the year 2017 no JE case was detected out of 21 AES cases. In 2018 (till June) 3 JE cases were detected from 37 AES cases and JE detection rate was 8.11%. Table 3 shows JE positivity rate in the year 2013 to 2018 in Malda district and figure 1 shows graphical representation of JE positive cases in different years.

Table 3: Percentage of JE positive cases in the following years

Year	AES cases	JE cases	JE positivity rate (JE/AES)
2013	57	04	7.02%
2014	72	0	0
2015	76	11	14.47%
2016	30	12	40%
2017	21	0	0
2018 (till June)	37	03	8.11%
Total	293	30	10.24%

Figure 1: Graphical representation of JE positive cases in different years



Out of 293 AES cases, only 30 (10.24%) cases were diagnosed as JE positive. Of them 19 (63.33%) were male and rest 11 (36.67%) were female. Maximum number of JE cases was reported in the age group 0-15 yrs (63.33%): 40% in the age group of less than 5 years and 23.33% in the age group of 5-15 years. Table 4 shows age and sex wise distribution of JE cases from January 2013 to 2018 (till June).

Table 4: Age and Sex wise distribution of JE cases from Jan 2013 to 2018 (till June)

characteristics	Number of JE cases	Percentage
Sex		
Male	19	63.33%
Female	11	36.67%
Age group		
Less than 5 yrs	12	40%
5-15 yrs	07	23.33%
More than 15 yrs	11	36.67%

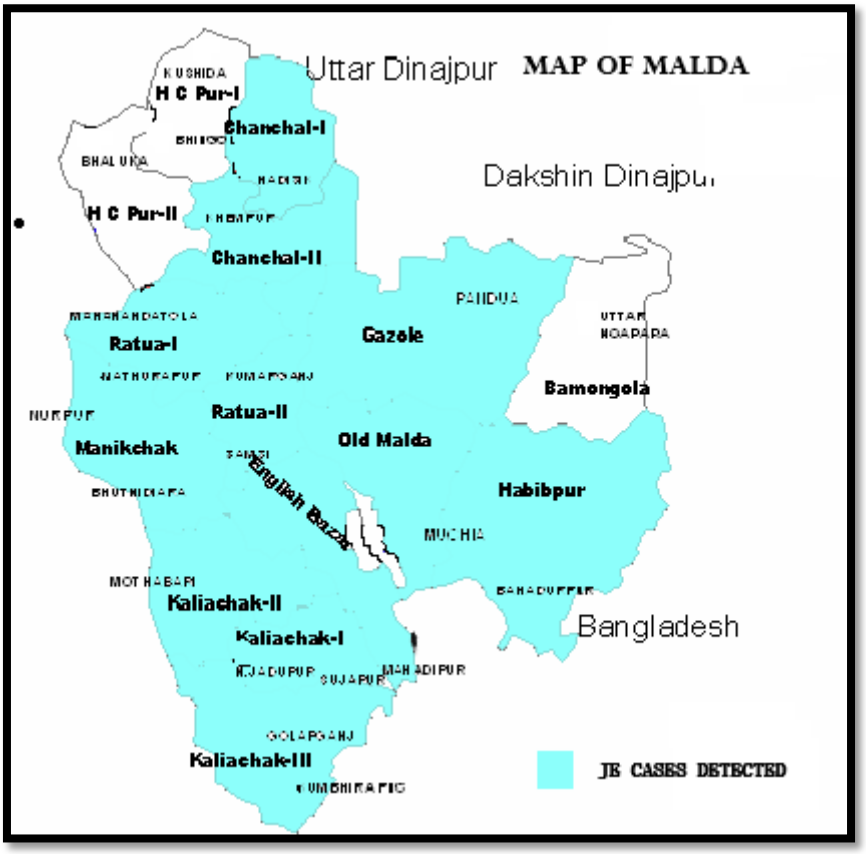
All the JE cases were from rural areas and most were belong to low socioeconomic group. As to the seasonal variations, most of the JE positive (23/30, 76.67%) cases were reported during the monsoon and post-monsoon period (June to September). Table 5 shows Block wise distribution of JE cases in Malda District. Figure2 shows the map of Malda and JE affected areas in Malda District.

Table 5: Block wise distribution of JE cases

Serial no	Name of Blocks/ Municipality	No of JE cases
1	Chanchal I	4
2	Chanchal II	2
3	RatuaI	2
4	Ratua II	1
5	Manikchak	1
6	Gazole	3

7	Old Malda	3
8	KaliachakI	6
9	KaliachakIII	5
10	Habibpur	1
11	Kaliachak II	1
12	English Bazar	1
Total		30

Figure 2: Different blocks and JE affected areas in Malda district



V. Discussion

In this study it was reported that a total of 293 sera samples from the patients clinically suspected with acute encephalitis syndrome (AES) were collected from the year 2013 to 2018 (till June). Out of which 30/293 (10.24%) were JE positive, diagnosed by IgM Mac ELISA kit. In this present study overall JE positivity rate was 10.24%, which was corroborative with the findings of the studies conducted by Chakraborty et al. (11.61%, 9 months study) and Bandyopadhyay et al. (12.21%, 2 years study).[15,16] However it was quite lower than the findings of studies conducted by Sarkar et al. (5 years study,27%), Taraphdar et al. (6 years study, 35.14%) and Kumar et al. (23%),[17,18,19] may be due to different variables like year of study, geographic location, socioeconomic status, density of amplifier host etc. An unusual outbreak of acute encephalitis syndrome (AES) with high case fatality was reported from Kaliachak- I, II, III Blocks of Malda District of West Bengal in the month of June 2014 affecting 72 children with 34 deaths. It was also the time of litchi harvesting in the affected blocks of Malda.[20] The causative virus remained unidentified.

Out of 30 JE cases, 19 (63.33%) were male and rest 11 (36.67%) were female. Death occurred in 6/30 (20%) patients. In our study, JE was found to be more common in males compared to females. This compares favorably with other studies by Aneeta et al. and Rayamajhi et al.[21, 22] The male predilection for JE may be explained by an increased amount of outdoor activities in males. They remain outside for late hours and wear fewer clothes on the body and even sleep outdoors.

In our study maximum number of JE cases was reported in the age group 0-15 yrs (63.33%: 40% in the age group of less than 5 years and 23.33% in the age group of 5-15 years). Similar observations were seen in studies by Chakraborty et al. and Bista et al. [15, 23] Although maximum JE cases were below 15 years of age group, a significant number of JE positive cases were also found in the older age group (above 15 years).

In this recent study, all the JE cases were from rural areas and most were belong to 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 also the association of pigs as viremic amplifying hosts complemented the JE virus activity in such areas. Rural predilection of JE cases was also observed in other studies.[16, 17, 24, 25]

As to the seasonal variations, most of the JE positive (23/30, 76.67%) cases were reported during the monsoon and post-monsoon period (June to September). In other studies conducted from West Bengal, authors reported that large number of cases occurred during rainy and post rainy season.[16, 18] Studies from different states of India also showed higher JE positivity during rainy season because the paddy fields covered with stagnant water serves as good breeding environment for the vector.[26, 27]

VI. Conclusion

In West Bengal, JE is an important disease particularly in rural areas. No proper antiviral against JEV is available. Though at present, Suramin, a drug used to treat trypanosomal disease and diethyldithiocarbamate have shown reasonably good antiviral efficacy against Japanese encephalitis virus in vitro. The present study showed a low JE positivity amongst AES cases in this northern region of West Bengal. But, the present system of reporting JE case may not reflect the actual level of transmission. As most JE infections are asymptomatic, the cases of JE may not represent the original scenario of JE in this northern part of West Bengal, may only represent the tip of the iceberg compared to the large number of inapparent infections. So JE surveillance system and the vaccination programme need to be strengthened to keep this vector borne disease under control.

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References

[1]. Malhotra S, Sharma S, Kumar P and Hans C. Japanese Encephalitis and its Epidemiology. Journal of infectious Diseases and Therapy, 2015, vol 3(5) Doi: 10.4172/2332-0877.1000243

[2]. Huanyu Wang, Guodong Liang. Epidemiology of Japanese encephalitis: past, present, and future prospects. Therapeutics and Clinical Risk Management 2015:11:435-448

[3]. Tobias E. Erlanger, Svenja Weiss, Jennifer Keiser, Jürg Utzinger, Karin Wiedenmayer. Past, Present, and Future of Japanese Encephalitis. Emerging Infectious Diseases.www.cdc.gov/eid • Vol. 15, No. 1, January 2009.

[4]. Grant L Campbell, Susan L Hills, Marc Fischer, Julie A Jacobson, Charles H Hoke,Joachim M Hombach, Anthony A Marfin, Tom Solomon, Theodore F Tsai, Vivien D Tsui & Amy S Ginsburgi . Estimated global incidence of Japanese encephalitis: a systematic review. Bull World Health Organ 2011; 89:766–774.

[5]. Johanna Lindahl, Jan Chirico, Sofia Boqvist, Ho Thi Viet Thu, Ulf Magnusson. Occurrence of Japanese Encephalitis Virus Mosquito Vectors in Relation to Urban Pig Holdings. Am. J. Trop. Med. Hyg., 2012, 87(6): 1076–1082

[6]. Anna Lena Lopez, Josephine G. Aldaba, Vito G. Roque, Jr., Amado O. Tandoc, Ava Kristy Sy, Fe Esperanza Espino, Maricel DeQuiroz-Castro, Youngmee Jee, Maria Joyce Ducusin, Kimberley K. Fox. Epidemiology of Japanese Encephalitis in the Philippines: A Systematic Review. PLOS Neglected Tropical Diseases 2015; Dis 9(3): e0003630 doi:10.1371

[7]. Kakoti Gitali, Dutta Prafulla, Das BR, Borah Jani and Mahanta Jagadish. Clinical Profile and Outcome of Japanese Encephalitis in Children admitted with Acute Encephalitis Syndrome. BioMed Research International,Vol 2013, Article ID 152656, 5 pages, http://dx.doi.org/10.1155/2013/152656

[8]. Sharma SN, Sen S, Anand KS, Tandale BV, Sinha N, Das N, Jaiswal RK, Sen PK and Dhariwal AC. An outbreak of JE/AES in North Bengal Districts of West Bengal During 2014. J. Commun. Dis, 2014; 46(2): 51-58

[9]. Borthakur AK, Das N and Bora BJ. Data from the world health organization (WHO) national network laboratory for japanese encephalitis. J. Glob Infect Dis. 2013 April-Jun; 5(2): 76-79

[10]. Mariappan T., Samuel PP., Thenmozji V., Paramasivan R., Sharma PK., Biswas AK and Tyagi BK. Entomological investigations into an epidemic of Japanese Encephalitis (JE) in northern districts of West Bengal, India (2011-2012). Indian j Med res 139, May 2014, pp 754-761.

[11]. Komang Kari, Wei Liu, Kompiang Gautama, Mammen P Mammen Jr, John D Clemens, Ananda Nisalak, Ketut Subrata, Hyei Kyung Kim and Zhi-Yi Xu. A hospital-based surveillance for Japanese encephalitis in Bali, Indonesia.BMC Medicine 2006,4:8 doi:10.1186/1741-7015-4-8

[12]. Kakkar M, Chaturvedi S, Saxena VK, Dhole TN, Kumar A, Rogawski ET, Abbas S, Venkataramanan V and Chatterjee P. Identifying sources, pathways and risk drivers in ecosystems of Japanese Encephalitis in an epidemic-prone north Indian district. PLOS ONE 12(5):e0175745.https://doi.org/10.371/journal pone.0175745.

[13]. World Health Organization. (2006) Japanese Encephalitis surveillance standards. Available from: http//www.path.org/files/WHO_surveillance_standards_JE.pdf. Last accessed on 15-8-2014.

[14]. World Health Organization. (2007). Third Bi-regional Meeting on Control of Japanese Encephalitis. Meeting Report. Ho Chi Minh City, Viet Nam. Printed and Distributed by World Health Organization, Regional Office for the Western pacific, Manila, Philippines.

[15]. Dr Chakraborty D, Dr Banerjee S, Dr Maji D, Dr Dey TK, Mr Mondal P and Dr 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(1E):320-328

[16]. Bandyopadhyay 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; 2013(1):1-5

[17]. 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.
[18]. 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; 2(5): 358-361.
[19]. Kumar R, Mathur A, Sharma S et al. Clinical Features and Prognostic Indicators of Japanese Encephalitis in Children in Lucknow. Indian J Med Res. 1990; 91:321-7.
[20]. Bandyopadhyay Bhaswati, Chakraborty Debjit, Ghosh Sibarjun, Mishra Raghunath et al. Epidemiological Investigation of an Outbreak of Acute Encephalitis Syndrome (AES) in Malda District of West Bengal, India. Clin Microbial 2014,Vol 4;issue1:http://dx.doi.org/10.4172/2327-5073,1000181
[21]. Jassar Aneeta, Srinivas S. Epidemiological and clinical profile of Japanese Encephalitis in Bendubi garrison in West Bengal. International Journal of Medical Microbiology and Tropical Diseases, January-March, 2017; 3(1):1-6
[22]. Ajit Rayamajhi et al. Study of Japanese Encephalitis and other Viral Encephalitis in Nepali children. Paediatrics International. 2007;49:978-84.
[23]. Bista MB, Shrestha JM; Epidemiological situation of Japanese encephalitis in Nepal. J Nepal Med Assoc., 2005; 44(158): 51-56
[24]. Phukan AC, Borah PK, Mahanta J. Japanese encephalitis in Assam, Northeast India. Southeast J Trop Med Public Health. 2004;35:618-22. [PubMed: 15689077]
[25]. Reuben R, A Gajanana. Japanese encephalitis in India. Indian J of Paediatr. 1997; 64:243-251.
[26]. Anuradha SK,SurekhaYA ,Sathyanarayan MS,Suresh S,Satish P,Mariraj J,et al. Epidemiological aspects of Japanese encephalitis in Bellary, Karnataka, India. Int J Biol Med Res. 2011;2:691-5.
[27]. Kumari R,Joshi PL.A review of Japanese encephalitis in Uttar Pradesh,India. WHO South East Asia J Public Health. 2012;1:374-95. [PubMed:28615603]

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