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Epidemiology of Japanese encephalitis cases in Dhemaji district of Assam, India

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ABSTRACT

Japanese encephalitis (JE) is one of the most important encephalitis in globe caused due to arthropod borne (arbo) virus infection. A study was carried out in Dhemaji district of Assam to comprehend the epidemiology of AES/JE cases prevailing in different locality across the district. Out of 48 nos of AES cases reported so far over the year from different areas in Dhemaji district of Assam, 28.13% were found JE positive with a case fatality rate of 44.44%. The predominant age group affected was 0 to 15 years. Clinical symptoms revealed that fever and change in mental state was a common problem among the AES/JE patient. The initial case was noticed during the month of January and since then sporadic cases were reported from different zone under Dhemaji district over the year. However, the incidence of AES/JE cases was elevated during the month of June to July in Dhemaji district of Assam. Most of the AES/JE cases were reported from Sissiborgaon locality followed by Gogamukh whereas the incidence rate of JE cases/deaths was far above the ground in Sissiborgaon and Begenagarah area. Vaccination status confirmed that only diminutive patients were taken JE vaccine. 22.22% of JE positive cases were JE vaccinated and the remaining 77.78% were not vaccinated. One JE positive patient from Sissiborgaon locality expired after taking JE vaccine. This finding should through huge glow to the health authorities to scrutinize the effectiveness of currently used SA-14-14-A vaccine.

Key words: AES, Arthropod, Dhemaji, Japanese encephalitis, SA-14-14-A vaccine etc

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INTRODUCTION

Japanese Encephalitis (JE) is an arthropod borne viral disease transmitted by infective bites of female mosquitoes mainly belonging to Culex groups. In India, epidemics of JE are reported from many parts of the country, and it is considered a major pediatric problem. The first recognition of JE based on serological surveys was in 1955, in Tamil Nadu, India [1]. Subsequently, the disease spread to other states and caused a series of outbreaks in different parts of the country. Highest rates of human disease reported from the states of Andhra Pradesh, Assam, Bihar, Goa, Haryana, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh, and West Bengal. Incidence of JE has been reported in early seventies from North-eastern region of India. In Assam first outbreak was reported in Lakhimpur district in 1978 [2]. Since then major outbreaks occurred in 1985-1988. An outbreak of JE has been accounted from north-east regions in Lakhimpur district of Assam between July-August 1989, affecting 90 villages of the district, covering a population of approximately 36,000 and 50% case fatality rate [3]. Later, several outbreaks are reported from Assam in consecutive years. Over the year incidence has spread nearly almost the majority of the districts of Assam. It was

noticed that most of human cases were reported during the month of May to October, the season may be extended or year-round in some areas. To triumph over the burden, JE vaccination campaign was launched during 2006 wherein 11 of the most sensitive districts were covered in Assam. In 2011, adult vaccination was introduced by the health department in mostly affected Sivasagar district of Assam to perceive the impact and efficacy of the vaccine [4].

Beside the development of several interventions, epidemiology revealed that currently AES/JE have become quite common in the state of Assam because a lot of people are engaged in pig farming which is the foremost reason for the spread of the disease. Assam shares about 53.11% of the total JE cases reported in India during 2013 of which Dhemaji district contributed approximately 1.9 % of total JE cases reported from Assam over the year in 2013 [5]. Keeping in mind, the present study was conducted to perceive the incidence of AES/JE cases in Dhemaji district of Assam. The study was also focused to distinguish the seasonal transmission of AES/JE cases as well as to be acquainted with present situation of JE epidemiology in Dhemaji district of Assam.

MATERIALS AND METHODS

Study area:
Dhemaji District is one of the districts situated in the remote corner of North East India on the north bank of river Brahmaputra. The district has a total population of 688,077 (as per 2011 census), covering geographical area of 3237 sq. Kilometers. The climate of the district is moderate. The temperature varies between 8^oC (min) to 35^oC (max). The district receives rainfall on an average at 3000 mm with North East Monsoon contributing a major share.

Sample collection:
2 ml of blood samples were collected from acute encephalitis syndrome cases for detection of JE IgM antibody by Enzyme linked immunosorbent assay (ELISA). Patient's clinical and demographic characteristics were recorded in a predesigned proforma. Patients consent was taken before collecting blood samples. All age groups and both the sexes were included in our study

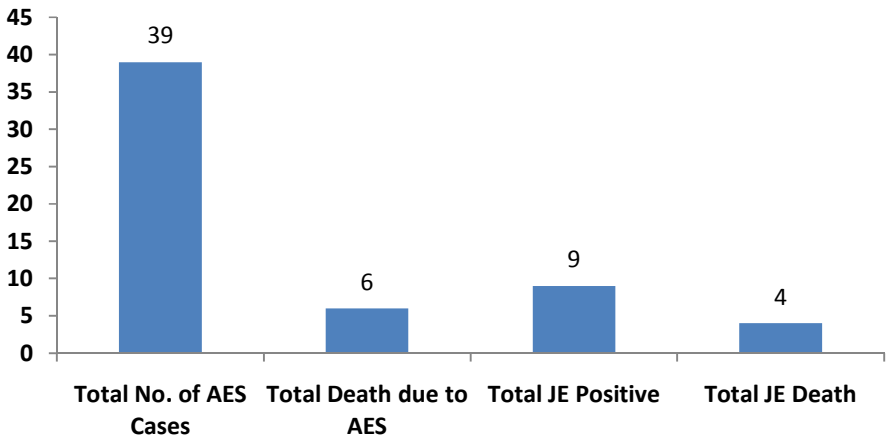
JE IgM Elisa test:
The technique is based on micro plate IgM ELISA which detects virus specific IgM antibody. They are highly sensitive (96%) and specific. IgM antibodies in the patient's blood were captured by Anti -human IgM (µ chain specific) that are coated on to the solid surface (wells).In the next step, JE antigen is added which binds to capture IgM if the IgM and antigen are homologous. Unbind antigen is removed during the washing step. In the subsequent step Biotinylated flavivirus cross reactive monoclonal antibody (Hx-B) is added followed by Avidin HRP. Subsequently, substrate /chromogen (TMB/H_2O_2) is added and watched for development of colour. The reaction is stopped by 1 N H_2SO_4.The intensity of color/optical density is monitored at 450 nm .OD reading are directly proportional to the amount of JE virus antibodies in the sample.

If any sample showed equivocal then the sample in question was repeated for second time for authentication.

RESULTS

Demographic characteristics
A total of 48 numbers of AES cases were reported from different locality in Dhemaji district of Assam during the year 2013. JE IgM Mac Elisa was performed in 66.67% AES cases out of which 28.13 % of AES cases were found JE IgM positive, 6.25% were established as equivocal and the aetiology of remaining 65.63% cases were still unknown. It was set up that 20.83% of AES cases expired whereas 44.44% cases expired due to JE during 2013, in Dhemaji district of Assam (Figure 1). The predominant age group affected was 0 to 15 years (Table 1). Both the sexes were approximately equally affected (Table 2). Majority of the patients (80%) were from the rural area and belongs to low socio economic group (75%). Case fatality rate of AES cases was higher among pediatric age groups (Table 1).
From clinical analysis it was come into conclusion that among the total AES patients, 83.33% were having the complain of fever and change in mental state, 4.17% encompass Fever, irritability and convulsion like symptoms whereas remaining 12.5% were having high grade fever.

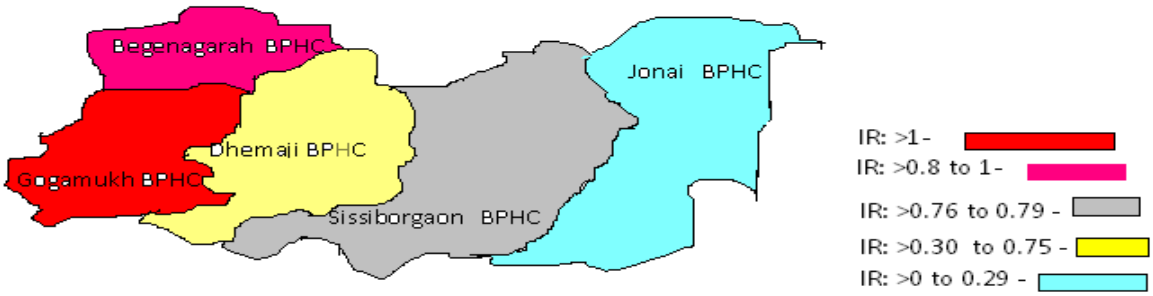
Figure 1: AES/JE cases and deaths in Dhemaji district in 2013



Epidemiological upshot

Epidemiological observation revealed that there was an initial AES cases on 16 th January, 2013 from Simenchapori locality. Sporadic cases were reported from different zone under Dhemaji district over the year (Figure 2). The last case was reported on 10 th November, 2013 found JE IgM positive. Although number of AES/JE cases occur over the year but the incidence was found far above the ground during the month of June-July (Figure 3).

Fig : 2 Map showing incidence rate of AES/JE cases in different block PHC of Dhemaji district



Most of the AES/JE cases were reported from Sissiborgaon locality followed by Gogamukh. The incidence rate of AES cases were high in Gogamukh BPHC followed by Begenagarah BPHC (Figure 2).Incidence rate of AES death was more in Begenagarah followed by Sissiborgaon and Dhemaji. Otherwise, incidence rate of JE cases/deaths were more in Sissiborgaon and Begenagarah area as compared to other localities in Dhemaji district.

Figure 3: Month wise AES/JE cases & deaths in Dhemaji, Assam, 2013

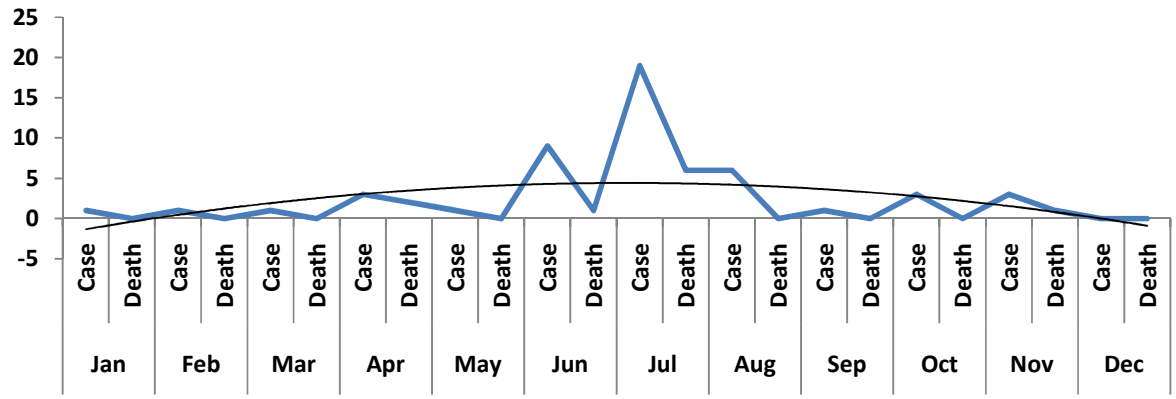


Table 1: Age group wise distribution of AES/JE cases & death in Dhemaji, Assam, 2013

Age groups	AES cases	AES death	JE positive	JE death
0 to 5	16	4	2	1
6 to 15	6	0	2	0
16 to 30	8	1	1	1
31 to 60	7	1	3	2
61 above	2	0	1	0
Total	39	6	9	4

Vaccination coverage was found very poor in Dhemaji district of Assam as it was set up that only 6.25% of total AES cases reported over the year were vaccinated with JE and remaining were not vaccinated. 22.22% of JE positive cases were JE vaccinated and the remaining 77.78% were not vaccinated with JE vaccine. One JE positive patient from Sissiborgaon locality expired after taking JE vaccine which becomes a question of mammoth anxious for health authorities.

Table 2: Age group/sex wise distribution of AES/JE cases and death in Dhemaji, Assam, 2013

Age groups	0 to 5		6 to 15		16 to 30		31 to 60		61 above	
Sex	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
AES cases	8	8	4	2	5	3	2	5	1	1
AES death	2	2	0	0	1	0	1	0	0	0
JE+Ve	2	0	2	0	0	1	1	2	1	0
JE death	1	0	0	0	0	1	1	1	0	0

DISCUSSION

Vector-borne diseases represent one of the biggest challenges to the current and future human wellbeing [6, 7]. Presence of JE virus specific antibodies in patient's serum /CSF sample is a marker for detection of recent infection which helps in early treatment. The incidence of AES/JE has been reported over the year in Dhemaji district which showed future possibility of seasonal transmission of AES/JE in this part of Assam. Although, high incidence was found during the month of June-July in our finding showed comparable with previous consequence [8, 9]. In our study, children mostly affected were from rural areas (80%) and belong to low socioeconomic group (75%). This may be due to favorable epidemiological factors like presence of water logged paddy field supporting profuse breeding of vector mosquitoes, piggeries in close proximity to residence, non use of bed nets and outdoor playing habits of children. There may be other reason as Dhemaji district is mostly flood affected and the virus causing Japanese encephalitis is transmitted by mosquitoes belonging to the *Culex tritaeniorhynchus* and *Culex vishnui* groups, which breed particularly in flooded rice fields. The flooding of the fields at the start of each cropping cycle leads to an explosive build-up of the mosquito population.

The study revealed a maiden report regarding occurrence of JE positive case from Begenagarah area during atypical instance of year which is an indication of capability to persisting JEV in all the six term of a year. Another maiden finding was that one JE positive patients from Sissiborgaon locality expired but the patient in question taking JE SA-

14-14-A vaccine previously. This may be due to improper maintenance of vaccine and due to certain other reason. This finding should through some light to the health authorities to scrutinize the effectiveness of currently used SA-14-14-A vaccine.

Our study established that 77.78% of JE positive cases in Dhemaji district were not vaccinated with JE vaccine. Previously to clear the backlog in children 1-15 years of age mass vaccination programme was conducted in 11 JE endemic districts of Assam in a phase wise manner since May 2006. The campaign for JE vaccination in Dhemaji District was done in April, 2008. However, it was evident from the present study that the vaccination programme could not cover the target population adequately. The Case fatality rate was recorded as high as (44.44%) due to JE positive admitted with AES. These significant research findings seek the attentions of the global community to combat the menace of this arboviral encephalitis in saving the life of patients. In summary health education plays an important footstep. In high risk areas it is worth considering inclusion of JE vaccination along with other vaccines under EPI. JE should be declared as a notifiable disease and laboratory facilities should be provided to confirm the outbreak in an early manner which helps in taking adequate control measures in an apposite way in the high risk areas.

CONCLUSION

Japanese encephalitis is a frequent setback in Dhemaji district of Assam from last few years. There is no specific treatment for the disease. In this regard early symptomatic management is an imperative means in controlling the saddle. Thus, what is needed today is high vaccine coverage along with a strong and active surveillance system which helps in prevention of disease occurrence, by the detection of early warning signals for any potential JE outbreak and initiates timely proficient control measures.

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