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 present situation of AES/JE cases prevailing in different locality across the district. The study was conducted in 2013 for a period of 1 year. 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 IgM positive. The age groups of 0 to 15 years were mostly affected. The case fatality rate due to JE virus infection was 44.44%. Clinical symptoms revealed that fever and changes 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 zones 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 area. The incidence rate of JE cases was higher in Gogamukh and Begenagarah area. Only 22.22% JE positive cases were JE vaccinated and the remaining 77.78% were not vaccinated. High vaccine coverage along with a strong and active surveillance system is required to reduce the incidence of the disease.

1. Introduction

Japanese encephalitis (JE) is an arthropod borne viral infection. It is transmitted by the bites of an infective female mosquito mainly belonging to Culex groups. Pigs and birds are the amplifying host. JE is commonly known as a major pediatric problem. In India, the first serological confirmed JE positive case was identified in 1955 from the state of Tamil Nadu (Namachivayam and Umayal 1982). Subsequently, the disease spread to other states and caused a series of outbreaks in different parts of the country. Now, JE cases are frequently noticed from the states of Andhra Pradesh, Assam, Bihar, Goa, Haryana, Karnataka, Kerala, Tamil Nadu, Uttar Pradesh and West Bengal. In North-eastern (NE) region of India, the incidence of JE has been reported in early seventies. In Assam, the first outbreak of JE was reported from Lakhimpur district in 1978 (Hazarika 2005). Since then many outbreaks have been occurred from 1985-1988. Between the periods from July-August 1989, a major outbreak of JE has been taken place in Lakhimpur district of Assam (Vajpayee et al., 1992; Saxena and Dhole 2008). During the outbreak, 90 villages are affected covering a population of approximately 36,000. The case fatality rate was 50% (Vajpayee et al., 1992; Saxena and Dhole 2008). In consecutive years, several outbreaks were reported from Assam. Nowadays, the incidence of JE is spread in all districts of Assam except Hailakandi, Karimganj and Dima Hasao. Most of human cases were reported during the month of May to October every year. The season may be extended or year-round in some areas. In 2006, JE mass vaccination programme was conducted among the children (below 15 years age groups) in Assam. The vaccination campaigned covers 11 mostly endemic districts in Assam (http://nvbdcp.gov.in/je-action-taken.html). Again in 2011, adult vaccination was introduced by Government of Assam in mostly affected. Sivasagar district of Assam to perceive the impact and efficacy of the vaccine among the adult people (www.indianexpress.com/news/assam.
vaccination, je-to/857886; Kakoti G et al., 2014). Recently in 2014, Govt. of Assam has introduced adult JE vaccination in nine districts of Assam. These districts are Kamrup (Dimoria development block and Chandrapur development block), Sivasagar, Golaghat, Jorhat, Dibrugarh, Tinsukia, Dhemaji and Lakhimpur.

At present situation, cases of acute encephalitis syndrome (AES) or JE have become quite common in the state of Assam. The state of Assam shares about 53.11% of the total JE cases reported in India during 2013 (www.nvbdcp.gov.in/mp-assam.html). Understanding the epidemiology of the disease is very important in this aspect. So, the present study was conducted in Dhemaji, district of Assam and believed that the research work will provided a comprehensive epidemiological picture of AES/JE cases prevailing in this area.

2. Materials and methods

2.1. Study area

'Dhemaji' is one of the districts located in the remote corner of NE India. It is situated 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 and the NE monsoon contributing a major share.

2.2. Study period

The study was conducted for a period of one year (January to December 2013).

2.3. Case definition of AES

Patients with acute onset of fever, headache along with any one of symptoms like changes in mental status, new onset of seizures, irritability, abnormal behavior etc were provisionally diagnosed as AES cases (Source: NVBDCP).

2.4. Sample collection

Two milliliter of blood samples were collected from AES cases for detection of JE IgM antibody by using 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.

2.5. JE IgM Elisa test

The IgM antibody ELISA test kit was supplied by NVBDCP, Assam. The technique is primarily based on micro plate IgM ELISA which detects virus specific IgM antibody in the patient’s serum sample. They are highly sensitive and specific. IgM antibodies in the patient’s blood were captured by Anti-human IgM (µ chain specific) that is coated on to the solid surface of the 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 steps, Biotinylated flavivirus cross reactive monoclonal antibody (Hx-B) is added followed by Avidin HRP. Subsequently, substrate/chromogen (TMB/H2O2) is added and watched for development of colour. The reaction is stopped by 1N H2SO4. The intensity of color/optical density (OD) is monitored at 450 nm. The OD readings are directly proportional to the amount of JE virus antibodies present in the sample. The equivocal samples were repeated second time for further authentication.

3. Results

3.1. Demographic characteristics

During 2013, a total of 48 numbers of AES/JE cases were reported from Dhemaji district of Assam. JE IgM Mac Elisa was performed in 66.67% AES cases. JE IgM positive was detected in 28.13% tested samples, 6.25% were equivocal and the aetiology of remaining 65.63% cases was unknown. The mostly affected age groups were 0 to 15 years (Table 1). Both the sexes were approximately equally affected (Table 2). The case fatality rate for AES/JE and JE alone were 20.83% and 44.44% respectively (Fig. 1). Case fatality rate of AES was higher among pediatric age groups. However, the case fatality rate for JE was higher in adult age groups. It has been observed that, 80% of the patients were inhabitants of rural areas and 75% of the study subjects belonged to low socio economic group.

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

<table>
<thead>
<tr>
<th>Age groups</th>
<th>AES cases</th>
<th>AES death</th>
<th>JE positive</th>
<th>JE death</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 5</td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6 to 15</td>
<td>6</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>16 to 30</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>31 to 60</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>61 above</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>6</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Age groups</th>
<th>0 to 5</th>
<th>6 to 15</th>
<th>16 to 30</th>
<th>31 to 60</th>
<th>61 above</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
<td>Sex</td>
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<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>AES cases</td>
<td>8</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>5</td>
<td>3</td>
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<tr>
<td>AES death</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>JE+Ve</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>JE death</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

|            |        |         |          |          |          |       |
|            | Male   | Female  | Male     | Female   | Male     | Female |
| Total      | 39     | 6       | 9        | 4        |          |       |
Among the total AES patients, 83.33% were having the complained of fever and changes in mental state, 4.17% with fever, irritability and convulsion like symptoms whereas remaining 12.5% were having high grade of fever with abnormal activities.

3.2. Epidemiological upshot

During 2013, the first case of AES in Dhemaji district was detected from Simenchapori locality on 16th January. Later on, sporadic cases were reported from different zones under Dhemaji district over the year (Fig. 2). The last case was detected on 10th November, 2013 and it was found JE IgM positive. The incidence of AES/JE cases was reached at peak level during the month of June-July (Fig. 3). Most of the AES/JE cases were reported from Sissiborgaon locality followed by Gogamukh area. However, the incidence rate of AES/JE cases was high in Gogamukh BPHC followed by Begenaagarah BPHC (Fig. 2). Incidence rate of AES death was more in Begenaagarah followed by Sissiborgaon and Dhemaji. Otherwise, incidence rate of JE deaths were more in Sissiborgaon and Begenaagarah area as compared to other localities in Dhemaji district. It was found that, only 6.25% of total reported AES cases were immunized. Out of total JE positive cases, only 22.22% were immunized with JE vaccine and the remaining 77.78% were not vaccinated. In Sissiborgaon locality, one patient expired due to JE virus infection; however the patient had already taken JE vaccine.

4. Discussion

Vector-borne diseases are the biggest challenges for current and future human wellbeing (Varmus et al., 2003; Hill et al., 2005). The Assam state shares a large proportion (53.11%) of the total JE cases reported in India (www.nvbdcp.gov.in/mp-assam.html). In Assam, the cases of AES/JE have been reported at frequent interval from last few years. In our study it was observed that, the AES/JE cases have been reported over the year in Dhemaji district which is not in accordance with previous findings (Sharma and Soni 2015; Sharma et al., 2013). However, this finding has shown resemblance with other studies conducted in elsewhere (Ompusunggu et al., 2008). In our study, the incidence of AES/JE cases has achieved its peak level during the month of June-July every year. The finding has also shown comparable with previous consequence (Sharma and Soni 2015; Sharma et al., 2013). Children were found mostly affected, may be due to outdoor playing habits of children (Kakoti et al., 2014). However, few studies have observed age shift in JE patients (Borah et al., 2011). People belonged to rural areas (80%) and below poverty level (75%) are mostly at risk for carrying JE virus infection. Many water logged paddy fields were observed in the affected areas and it favors for breeding of mosquito vectors. Apart from this, the existence of piggeries in close proximity to residence, lack of knowledge and non use of insecticide treated mosquito nets are also responsible factors associated with JE virus infection. Dhemaji is well known as flood affected area and the virus causing JE is transmitted by mosquitoes belonging to the Culex tritaeniorhynchus and Culex vishnui groups. This species are breed particularly in flood rice fields. The flooding of the fields at the start of each cropping cycle leads to an increase in numbers of the mosquito population (www.who.int/water_sanitation_health/diseases). However, the study revealed a significant report regarding occurrence of JE positive case from Begenaagarah area during non seasonal period (November) of year. It indicates that JE virus is circulating in all the six term of a year. Another important finding was that, one JE positive patients from Sissiborgaon locality expired but the patient had taken JE SA-14-14-2 vaccine previously. The case fatality rate for JE was recorded very high (44.44%). It may be believed that, by vaccination of entire people irrespective of age and sex may limit the burden of JE virus infection. Health education is also an important footstep in preventing the saddle.
5. Conclusion

Early symptomatic management is an imperative means which helps in reducing the incidence of AES/JE as well as its case fatality rate. Detection of early warning signals for any potential JE outbreak may help in taking timely and proficient control measures.

Conflict of interest statement

We declare that we have no conflict of interest.

References


