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Original Research Article

Profile of Acute Encephalitis Syndrome and Japanese Encephalitis in Dibrugarh District of Assam, India

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Abstract:

Background: Acute encephalitis syndrome (AES) and JE is a significant public health problem in India and around the world. The name Acute Encephalitis Syndrome (AES) is used by the National Vector Borne Disease Control Programme to facilitate diagnosis and surveillance. This study was an attempt to determine the status and trends of AES and JE in Dibrugarh, Assam.

Methods: IDSP routinely collects and analyses disease data from a number of reporting units. The data for the study was obtained from the IDSP section of the District Health Service in Dibrugarh, Assam.

Results: There was a mixed pattern in encephalitis cases during the research period. The number of AES deaths was found to be highest in 2013 (17.7% of total cases), followed by 2017 (14.9%), 2012, 2014, and 2018, and lowest in 2010 (7.3%). The average annual AES and JE CFRs were 17.6% and 26.2%, which is in accordance with global fatality rate of 20 to 30%. Among the patients with AES, 36.2% were found positive for JE. The most commonly affected age group is 31-60 years for both AES and JE, closely followed by the age group of 16-30 years. Among the AES-affected patients 60.3% were males and 39.6% were females.

Conclusion: The study showed a high JE positivity amongst AES cases but with a declining trend over the years. It also highlighted on the association of JE with different parameters such as age, sex etc. Japanese encephalitis continued to occur in this part of India, although at lower levels as compared to high-endemic regions. The national programme activities including surveillance, management and vaccination need to positively consider strengthening efforts for monitoring and consider evaluating the need for the expansion of vaccination to new areas that reported cases recently.

Keywords: Acute Encephalitis Syndrome, case fatality rate, Japanese encephalitis.

Introduction

Acute encephalitis syndrome (AES) is a multifactorial clinical disease, with Japanese encephalitis (JE) being the most common cause. JE virus transmission is widespread in India [2] .The JE virus of group B arbovirus (Flavivirus) causes the disease, which is transmitted to humans by the bite of infected Culicine mosquito. [1] It is found all across the world, most notably in Southeast Asia and, less frequently, in the western Pacific and Australia. [3] In Assam, cases begin to occur in February and reach their peak in July. [4] In 2019, there were an estimated 56,847 JE cases and 20,642 deaths based on the baseline number of people at risk of infection. [5] The annual incidence of clinical disease varies per endemic country, ranging from 1 to >10 per 100 000 population or greater during outbreaks. An estimated 25% of affected children die from the condition, while 30%-40% of those who survive have physical and mental damage. Children are the most vulnerable to attacks due to a lack of cumulative immunity from natural diseases. [6] JEV and Acute Encephalitis Syndrome (AES) killed 277 persons in Assam in 2018. In 2019, 2020, and 2021, there were 514, 147, and 131 fatalities, respectively. JE has a fatality incidence of 20%-30%, with neurologic or mental sequelae seen in 30%-50% of survivors.[7] The first case of JE in India was documented in 1955 in Vellore, Tamil Nadu, and the first big outbreak occurred in 1973 in the Burdwan area of West Bengal. Since then, AES and JE have been detected in 171 districts across 19 states in India. [8] The first incidence of JE in Assam was recorded in the Lakhimpur district in 1978. [9] Up until 2005, all AES cases were classified as Japanese Encephalitis (JE). However, in 2005, the etiological diagnosis for AES was established, and it was thought that not all AES cases were JE positive. [10] JE outbreaks were mostly isolated to Upper Assam regions till 2015. However, the

situation has altered, and outbreaks of the disease have occurred in lower Assam and even the Barak valley regions. [11] The disease burden and mortality from AES, including JE, have increased (8249 cases/1169 deaths, 8344 cases/1256 deaths, 7825 cases/1273 deaths, and 9693 cases/1490 deaths in 2011, 2012, 2013, and 2014, respectively. [12] To overcome the load, a JE vaccination program was initiated in 2006 in Sivasagar for the first time across Assam, with 11 of the most vulnerable districts being vaccinated in Assam until now.

The health department launched adult immunization again in 2011 to assess the impact and efficacy of the vaccine. [13] The current study was conducted to establish the status of AES/JE cases in the Assam district of Dibrugarh from 2009 to 2018, as well as the epidemiological trends of AES/JE cases. Age, gender, geographical region, vaccination status, and seasonal variation were all considered as characteristics with altering trends related with JE/AES.

Aim: To observe the trends of AES/JE cases reported under IDSP diseases for ten years in Dibrugarh district of Assam.

Methodology

This is a record based retrospective research undertaken in the Dibrugarh District of Assam, which has a population of 13,27,748 (2011 Census) and is divided into seven administrative divisions. The concerned nodal officer of the health facility reports each case admitted with AES to district health authority.

Following that, district health officials report instances to the state's Integrated Disease Surveillance Project (IDSP) arm of District Health Services. The data for the study was obtained from the IDSP section of the District Health Service in Dibrugarh, Assam. After obtaining prior approval, the data received was placed into an MS Office Excel Spreadsheet. The information was presented in the form of a table, a bar diagram, a line diagram, and so on. Ethical clearance for the study was obtained from the Institutional Ethics Committee.

The data were first organized year by year to show the yearly incidence of AES and JE cases, as well as the number of deaths among affected patients in the state from 2009 to 2018. These data were evaluated to determine illness occurrence trends in relation to the number of deaths and case fatality rates (the proportion of deaths compared to the total number of cases reported per year) for both AES and JE. The data was then broken down into the number of cases reported from each division during the course of the year.

Results

Trend of AES and JE cases

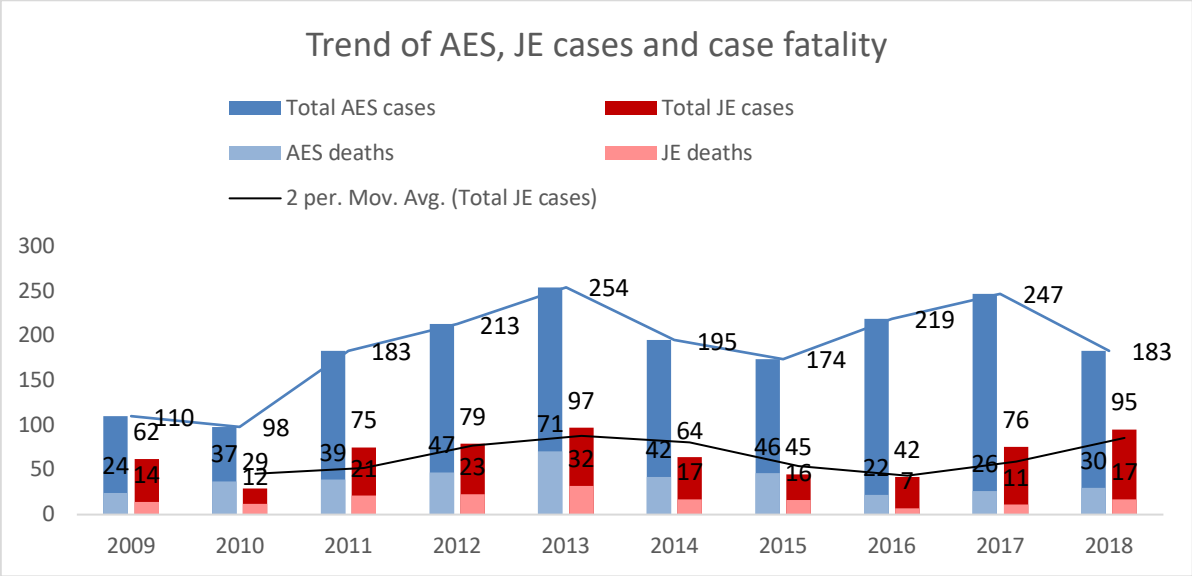

Figure 1: Trend of AES, JE case and case fatality

Figure 1 depicted the trend of AES, JE, and mortality rates in the Assam district of Dibrugarh from 2009 to 2018. The total number of AES and JE cases over the study period was 1876 and 664, respectively. Similarly, the death cases for AES and JE were determined to be 384 and 170, respectively. In total, 36.26% of AES cases were found to be JE cases, and 44.2% of JE deaths were reported. There was a mixed pattern in encephalitis cases during the research period. The number of AES deaths was found to be highest in 2013 (17.7% of total cases), followed by 2017 (14.9%), 2012, 2014, and 2018, and lowest in 2010 (7.3%). Similarly, the biggest number of recorded deaths

occurred in 2013, followed by 2012 and 2014. However, the cases were increased in 2014 and 2018. Figure 2 showed the Case Fatality Rate (CFR) due to Japanese Encephalitis that ranges between 14-35% during 2009 to 2018. The overall CFR of the district during the period 2009 to 2018 was found to be 22.2%.

There was a fluctuation of CFR from 2011 to 2013, reaching the highest to 45.31% and lowest to 36.72%. However, from 2016 onwards, there was a significant increase (P≤0.05 level) in JE cases.

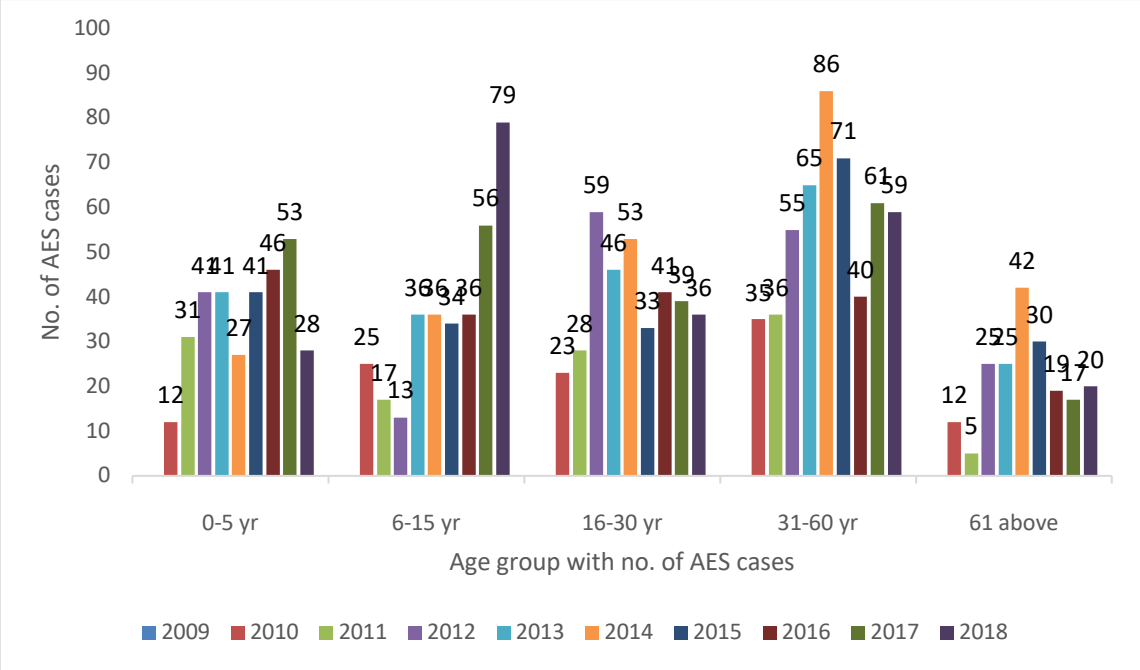

Figure 2A: Age group with no. of AES cases

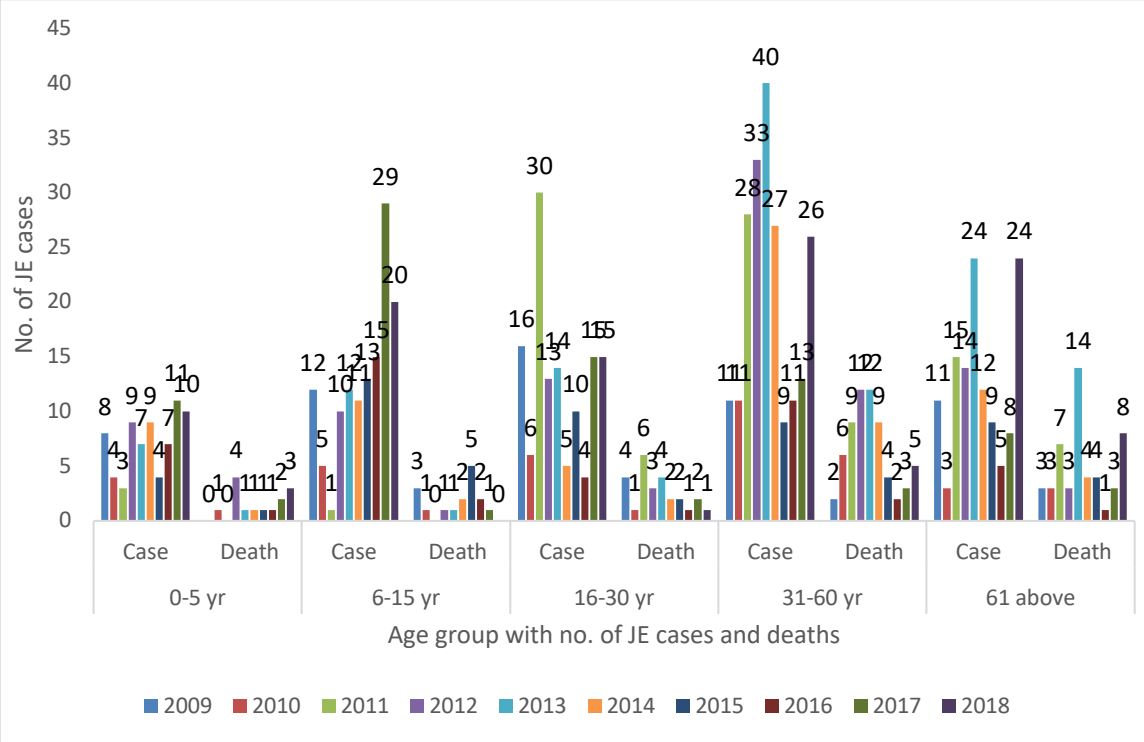

Figure 2B: Age group with no. of JE cases and deaths

Age-wise distribution of AES and JE cases

It was revealed that AES instances were significantly greater in the district's age-group>30 years compared to a younger age. The overall number of AES cases during the period was 332, 370, 385, 563, and 230 instances, respectively, for the age groups 0-5, 6-15, 16-30, 31-60, and above 60 years.

The age group 31 to 60 years had the highest AES susceptibility (30%), followed by the age group 16-30 years (20.4%). The lowest recorded cases were from people over the age of 60, accounting for 12.2% of all cases. In comparison to other age groups, there was a significant increase in AES cases in the age group 31-60 years during 2013-14. Figure 2B depicted the prevalence of JE cases in all five age groups in the Assam district of Dibrugarh from 2009 to 2018. Cases of JE were observed to be significantly varied across age groups. As with AES, older adults (>30 years) had more JE instances than younger age groups (30 years).

The transmission rate among youngsters (0-5 years) was much lower, with only 10.8% documented. In the age groups 6-15 and 15-30 years, 19.2% of JE cases were reported. Almost 31.4% of JE cases were reported in people above the age of 30. Out of the total JE cases in the district, 25.6% were reported as deaths. Death from JE is much greater in people over the age of 60 (40%). 31.1% of all recorded deaths were between the ages of 30 and 60.

Sex-wise distribution of AES and JE cases

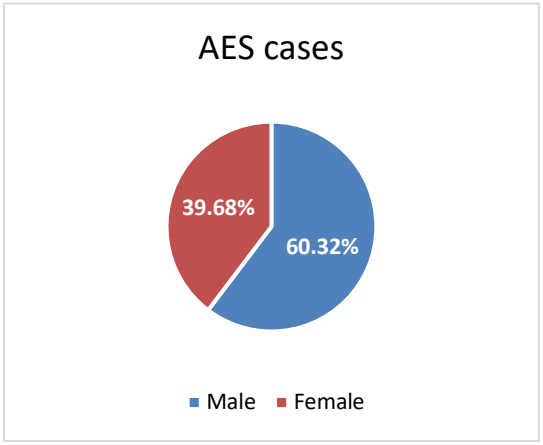

Figure 3A: AES Cases

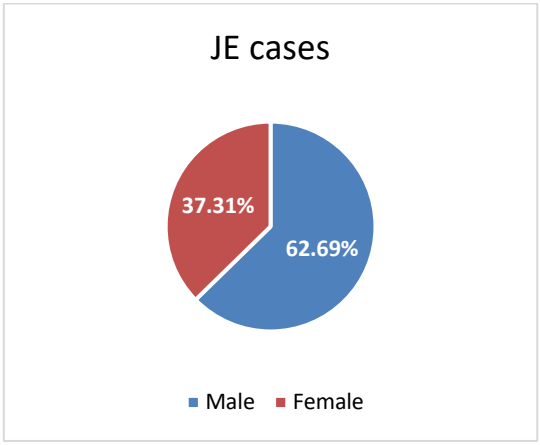

Figure 3B: JE Cases

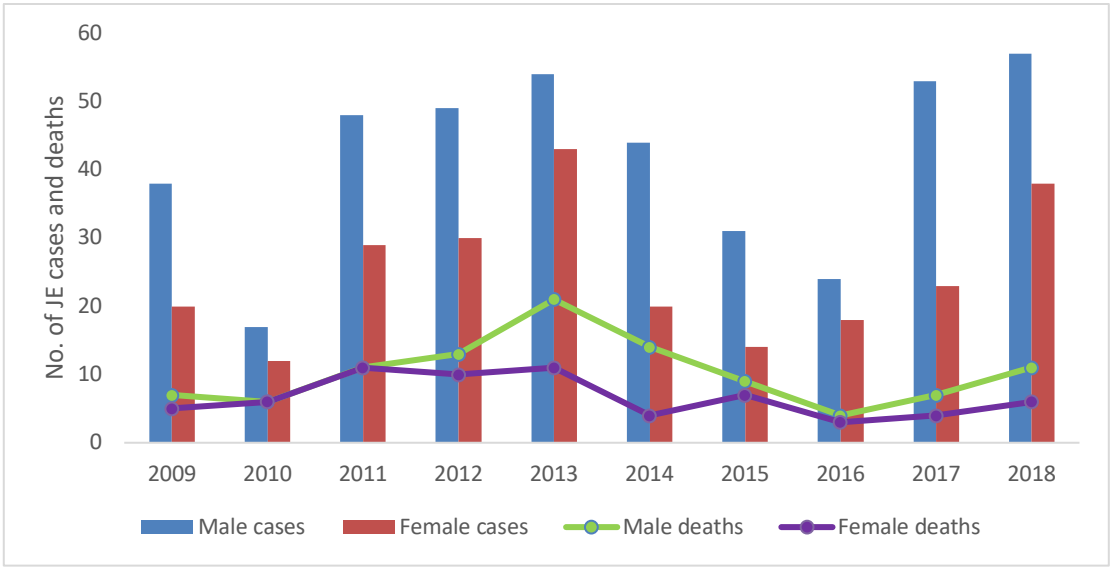

Figure 4: No. of JE cases and deaths

According to the study, the male population had considerably more AES and JE cases than the female population (Figure 4). In our study, 1134 and 746 AES instances were recorded in males and females, respectively, out of 1880 AES patients. Both male and female groups revealed nearly identical patterns in JE positive and mortality cases. JE cases were observed in the district in a similar pattern of frequency during the research period. In the research area, 350 JE cases were recorded in the

male population, whereas 312 cases were reported in the female population. Male and female susceptibility to JE differed significantly (P0.05 level) throughout the trial. Similarly, out of 170 JE death cases, 103 (60.6%) and 67 (39.4%) deaths in males and females were reported. It was also discovered that JE cases were significantly greater in the male population across practically all age categories. Figure 4d depicts the percentage of JE cases and deaths recorded in the district's male and female populations during the research period. Correlation study revealed that an increase in male or female cases has significant relation (P≤0.01level) to AES or JE cases.

Block-wise distribution of AES and JE cases

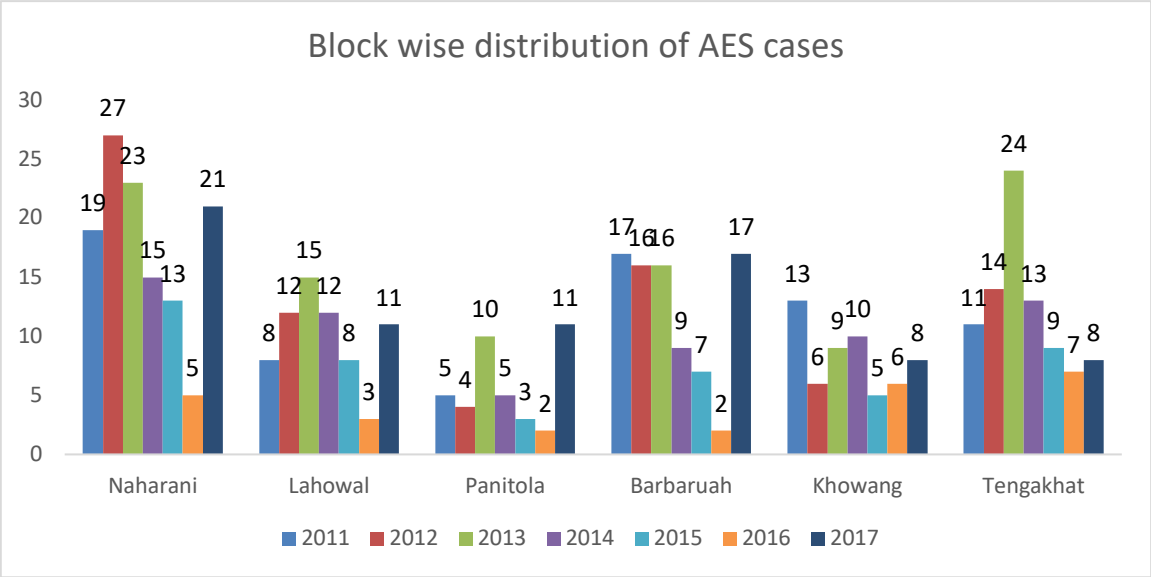

Figure 5A: Block wise distribution of AES cases

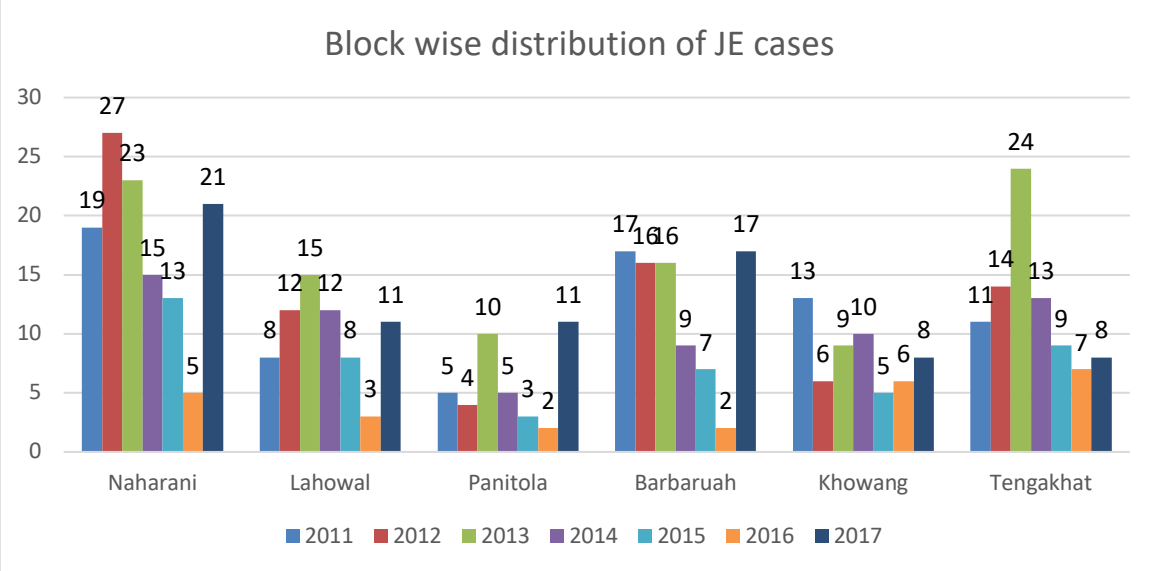

Figure 5B: Block wise distribution of JE cases

Figure 5(A-B) depicts the distribution and prevalence of AES and JE cases in different blocks from 2011 to 2017. The study found disparities in the prevalence of AES and JE patients in all six Dibrugarh district blocks. During the study period, the total number of AES cases in Naharani, Lahowal, Panitola, Barbaruah, Khowang, and Tengakhat block was 123, 69, 29, 84, 57, and 86 respectively. JE cases, on the other hand, were found to be most prevalent in Naharani block (22.6%), followed by Tengakhat (19.8%), Barbaruah (19.3%), Lahowal (15.6%), Khowang (13.1), and Panitola (9.2%). During the research period, the majority of the blocks had a spike in encephalitis cases in 2012-13. Naharani, Tengakhat, and Barbaruah were the hardest hit blocks. In compared to other blocks, the Panitola block was determined to have a low endemicity.

During the study period, a maximum of two to four years of continuous increase or decrease in the number of cases was recorded from the block level disease surveillance.

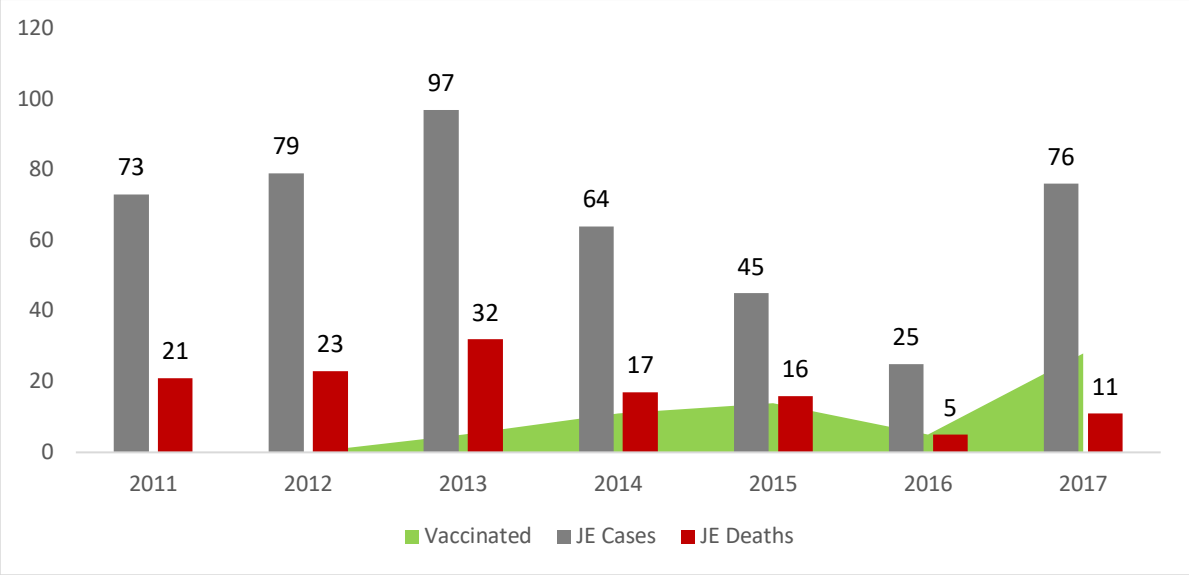

Figure 6: JE Vaccination

Vaccination is the least expensive treatment option for long-term protection. Figure 7 depicts JE cases and deaths in relation to vaccination. Vaccinated people are less likely to die as a result of JE. Since 2013, there has been a decrease in JE cases and deaths, with a sharp increase in 2017. In 2011-12, mass JE immunization programs were conducted in children aged 1 to 15 years and people aged 16 and up. Similarly, an adult (aged 16-60 years) JE campaign for those who were left out in 2011-12 was undertaken out in 2014-15.

Discussion

The north-eastern area of India has been identified as a vulnerable area for Japanese encephalitis, and it is regarded as a severe health issue in Assam. Assam, like other VBD states, is more vulnerable to JE infection than other Indian states. As a result, AES/JE surveillance is a crucial and necessary activity for understanding disease epidemic prevalence and warning signs. Surveillance data is also valuable in determining the impact of immunization and vaccine efficacy. [14]

In the present study, we observed that Dibrugarh district is highly endemic to AES and JE cases. The most commonly affected age group is 31-60 years for both AES and JE, closely followed by the age group of 16-30 years. On the other hand, a study conducted by Ghosh *et al*. in Agartala reported that the maximum JE patients were from the age group of 5-10 years. [15] The average annual AES and JE CFRs were 17.6% and 26.2%, which is in accordance with global fatality rate of 20 to 30%.[16] During the monsoon period (June to September), the agricultural fields are filled with water which provides a suitable breeding ground for mosquito vectors. Pig rearing has long been regarded as one of the most significant livestock in Upper Assam, notably in the Dibrugarh district. The number of AES/JE cases decreased during the study period, as did the case fatality rate (CFR) of JE, which fell from 45.31% in 2013 to 36.67% in 2016. Kumari and Joshi (2012) [17] investigated the decadal JE fatality rate in Uttar Pradesh and discovered that cases decreased from 33% in 1978-1987 to approximately 22% in 1998-2009. Similarly, between 2009 and 2014,[18] the average case fatality rate of AES and JE in Bihar was estimated to be 30% and 14%, respectively. Similarly, from 2013 to 2018, a high (53.8%) number of JE cases were reported in Uttar Pradesh's male population.[19] However, no statistically significant link existed between gender and JE positivity. According to Medhi et al. (2017),[20] roughly 62.04% of JE cases in Tinsukia and Sivasagar districts of upper Assam during 2012-14 were male.

The cause of the increased rate of AES/JE cases in male populations compared to female ones is unknown. Differential AES/JE cases in both sexes could be attributed to immune system differences. Among the AES-affected patients 60.3% were males and 39.6% were females. It was also discovered that among the elderly (>60 years), males had nearly twice as many JE cases as females, which could be attributed to the fact that adult females acquire stronger innate and adaptive immune responses than males and hence have better disease resistance.21Bandyopadhyay B conducted a study in Kolkata and found JE positivity to be 59.92% in males and 41.08% in females, whereas Kumari R et al. found JE

positivity in 61% males and 39% females in Uttar Pradesh [22,17]

Conclusion

The study showed a high JE positivity amongst AES cases but with a declining trend over the years. It also highlighted on the association of JE with different parameters such as age, sex etc. Japanese encephalitis continued to occur in this part of India, although at lower levels as compared to high-endemic regions.

The incidence of acute encephalitis syndrome is still high after the implementation of childhood Japanese encephalitis vaccination in routine immunization schedules. The national programme activities including surveillance, management and vaccination need to positively consider strengthening efforts for monitoring and consider evaluating the need for the expansion of vaccination to new areas that reported cases recently.

Acknowledgement

Authors sincerely acknowledged the District Health Society, IDSP Unit and District Health Society, Dibrugarh district, for their active collaboration and guidance during the study.

Limitations

As secondary data was employed in the study, it has the inherent flaws of such data. Because that would go beyond the scope of this research, not all diseases were included.

Underreporting, over reporting, and data input errors are all possibilities. The quality of data recorded and collected may not accurately reflect the situation.

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