Seroprevalence of Dengue cases in a tertiary care hospital : A six year study

ABSTRACT

Background: Dengue is a mosquito-borne viral disease of global public health concern and is a major cause of morbidity in most of the endemic regions of the world. In northeast India, particularly Guwahati, Assam has been experiencing dengue every year with high morbidity since its first outbreak in 2010 and therefore emerging as major public health concern in northeast India and spreading with increased morbidity.

Objective: To analyse the seroprevalence and epidemiological trend of dengue among patients presenting in Gauhati Medical College and Hospital from the year 2012 to 2017.

Method : A retrospective study was done from the year 2012 to 2017 in blood samples received in the department of Microbiology, Gauhati Medical College & Hospital. Dengue NS1 antigen and Dengue IgM antibody ELISA tests were performed for the confirmation of dengue cases which was performed as per the manufacturer's guidelines. . We estimated the incidence by applying age and sex distribution of Dengue cases in Assam.

Results: From the six years study we found that the prevalence of Dengue was highest in 2012 (47%) and lowest in 2014 (10%). Highest sample load was seen in 2016 .In all the years, males patients were more than the female patients. Commonest age-group of the affected patients was between 25- 34 years of age. In Assam , Kamrup (Metro) district followed by Kamrup (Rural) showed highest case load in all the years.

Conclusion: Dengue has remained a persistent problem in Assam with the increasing distribution range of Aedes aegypti. There is a need of identification of high-risk areas, vector incrimination and seasonal infectivity of dengue so that future outbreaks can be avoided by targeted interventions

Key words: Dengue, seroprevalence, IgM antibody, NS1antigen, ELISA

INTRODUCTION

Dengue is a mosquito-borne viral disease of global public health concern and is a major cause of morbidity in most of the endemic regions of the world.[1] Dengue is caused by dengue virus (DENV) belonging to genus *Flavivirus* of family Flaviviridae that comprises four serotypes (DENV 1–4) and transmitted in humans by Aedes mosquito species. Infection may range from mild, self-limiting febrile illness (dengue fever) to a more severe form of dengue haemorrhagic fever and dengue shock syndrome. [2]

In northeast India, particularly Guwahati, Assam has been experiencing dengue every year with high morbidity since its first outbreak in 2010. [3] Guwahati is the largest and fast-growing metropolis and gateway of northeast India. Over the past decade, there has been an increase in urbanization, deforestation, massive

developmental activities, rapid population movement and increased air connectivity between Guwahati and other metropolitan cities resulting in increased receptivity for mosquito breeding and possible importation and spread of dengue virus through the human host in the region. The disease is currently spreading to semi- urban areas of other districts of Assam supported by serological evidence for circulating dengue virus serotypes.[4]

Dengue infection is usually confirmed by identification of viral genomic RNA, antigens, or the antibodies it elicits. Antigen detection tests based on NS1 detection have been designed to detect the dengue viral NS1 protein which gets released from the dengue infected cells and appears early in the bloodstream. ELISA-based serological tests are easy to perform and are cost-effective for dengue detection. [5]

Dengue fever represents a real economic burden especially in affected countries and endemic areas including Assam. Widespread efforts are needed to reduce disease spread and lessen the mortality rates and the associated healthcare cost. There is a need for more scientific research which we believe is a key route to provide further insight into the pathogenesis of dengue infection to understand the distribution and reasons for repeated endemicity. Hence we have conducted this research and compiled relevant data so as to understand the distribution and prevalence of dengue infection in Assam.

AIMS AND OBJECTIVES:

To analyze the seroprevalence and epidemiological trend of dengue cases tested in Gauhati Medical College and Hospital from January 2012 to December 2017.

MATERIALS AND METHODS :

Blood samples were collected and processed in the Department of Microbiology, Gauhati Medical College & Hospital. This centre is one of the dengue sentinel surveillance sites in the country under the National Vector Borne Disease Control Program (NVBDCP) of India. Patients attending the various departments of GMCH and those referred from different hospitals and laboratories, with clinical suspicion of dengue were screened over a period of six years from January 2012 to December 2017. The patients presenting with fever of sudden onset with headache, retrobulbar pain, conjunctival injection, pain in back and limbs, lymphadenopathy and maculopapular rash, haemorrhagic manifestations, who had recent travel history and blood picture suggestive of thrombocytopenia were included. Patient demographic details were collected in the prescribed formats.

All the samples of the patients with a history of fever of less than 5 days were tested by NS1Ag ELISA employing Standard Diagnostic Inc kits and the patients with a history of fever beyond 5 days were tested by Dengue IgM MacELISA which was provided by National Institute of Virology, Pune. The tests were performed as per the manufacturer's guideline. The serum samples were stored at 4°-8° C, but when longer duration of storage was required, it was stored at -20° C. The results were recorded properly and sent to the patients and the concerned authorities.

The test results and other epidemiological variables were put in a proforma for analysis of the results.

RESULTS AND OBSERVATION

From the six years study we found that the prevalence of Dengue was highest in 2012 (47%) and lowest in 2014 (10%). Highest sample load was seen in 2016 and lowest in 2014. Sample wise ELISA test is shown in Table 1.

Table 1: Seropositivity for Dengue from 2012-2017

Year	NS1Ag ELISA			IgM ELISA			Total		
	Sample tested	Positive	%	Sample tested	Positive	%	Sample tested	Positive	%
2012	2100	1225	58.3%	1017	307	30.2%	3117	1532	49.2%
2013	7553	2041	27%	1976	976	49.4%	9529	3017	32%
2014	1173	51	4.3%	327	46	14.1%	1500	97	6.5%
2015	1959	1648	84.1%	1251	874	69.9%	3210	2522	78.6%
2016	10672	6157	57.7%	3953	1686	42.7%	14625	7843	53.6%
2017	5411	2476	45.8%	2862	910	32%	8273	3386	41%

The age distribution of the cases is discussed in Table 2. As is clear from the table we have found that in all the years, males patients were more than the female patients. Commonest age-group of the affected patients was between 25- 34 years of age.

Table2: Age Wise Distribution Of Positive Dengue Cases

Age group in years	2012		2013		2014		2015		2016		2017	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0-5	5	12	20	11	2	5	35	21	75	64	12	8
6-14	8	2	11	14	8	11	151	77	199	152	53	20
15-24	47	36	128	77	10	12	348	201	1126	526	723	174
25-34	292	99	555	262	6	10	520	277	1270	603	750	421
35-44	570	129	671	384	3	2	270	148	860	539	206	119
45-54	108	68	320	287	9	5	183	129	281	209	128	197
≥ 55	104	52	218	59	6	8	102	60	1009	930	421	154
Total	1134	398	1923	1094	44	53	1609	913	4820	3023	2293	1093

Table 3 shows the district wise distribution of the Dengue cases in different districts of Assam. It was observed that the highest number of cases of Dengue belonged to the Kamrup (Metro) district followed by Kamrup (Rural) in all the years. From the two districts of Dibrugarh and Dima Hasao no samples were received .

Table3: District-wise Distribution Of Positive Dengue Cases

Sl. No.	DISTRICT	2012	2013	2014	2015	2016	2017
1	Baksa	18	28	6	16	105	129
2	Barpeta	16	29	8	41	112	93
3	Bongaigaon	16	7	2	11	21	14
4	Cachar	4	2	2	2	6	4
5	Chirang	6	6	0	2	1	4
6	Darrang	18	33	13	33	80	155
7	Dhemaji	0	9	0	9	10	15
8	Dhubri	10	14	3	17	56	44
9	Goalpara	10	3	2	10	22	41
10	Golaghat	4	3	0	7	12	9
11	Hailakandi	0	5	0	1	1	0
12	Jorhat	4	3	0	4	10	5
13	Kamrup Rural	161	121	13	133	452	365
14	Kamrup Metro	1098	2490	29	1871	6150	1459
15	Karbi Anglong	2	2	0	12	51	10
16	Kamrimganj	4	2	0	4	2	3
17	Kokrajhar	0	0	1	8	15	365
18	Lakhimpur	33	10	0	23	25	27
19	Morigaon	3	10	3	17	30	58
20	Nagaon	12	20	2	48	102	75
21	Nalbari	34	78	2	50	136	120
22	Sonitpur	4	6	0	18	52	27
23	Tinsukia	0	0	0	1	0	3
24	Sibsagar	4	3	0	1	10	7
25	Udalguri	7	7	9	24	26	32
26	Other States	64	124	2	159	356	322
	Total	1532	3017	97	2522	7843	3386

DISCUSSION

Dengue is emerging as a major public health problem in India. As with other states in India the occurrence of Dengue cases in Assam too is seen to be more in the urban and semi-urban areas. [6-13] Dengue is spreading rapidly and becoming established in Assam, owing to socio-economic and developmental changes, with a dramatic increase in unplanned urbanization, population movement, lack of proper waste management and inadequate vector-control measures. Our study shows that it has come to affect a large populace in the State for the past six years. Death of two Dengue cases were reported for the first time in 2010 in Assam among 237 confirmed cases of dengue. [14] Subsequently, there was a significant increase in 2012 and 2013 with 1058 and 4526 cases and five and two deaths respectively. But, it decreased in 2014 with 85 cases and no death. Again there was a significant increase in 2015, 2016 and 2017 with 1076, 6157 and 5016 cases respectively. Of the total confirmed cases for each year in Assam, the majority (70–90%) were reported in Guwahati. In 2013, 91% (4121/4526) of the total reported dengue cases were reported in Guwahati alone. The cases were, however, unevenly distributed in different zones of Guwahati, with large concentrations in the East zone and Capital zone. A few confirmed cases have also been reported from other district towns (Dibrugarh, Tinisukia, Lakhimpur, etc.) supported by serological evidence for circulating strains of dengue virus. Cases were reported mostly from those places where people harvest rain water and often leave tyres, drums and canisters out in the open. The actual disease burden is estimated to be much higher, with many cases undiagnosed and additional cases reported in public/private sectors.

Serological testing for Dengue was first started in GMCH in 2010. Since then the sample load has been growing with fluctuant positivity rates. However an encouraging trend in health seeking behaviour which we noticed was that majority of the samples over the six years from 2012-2017 could be tested for Dengue NS1Ag implying that the patients reported early to the hospital (i.e. before five days fever). The commonest age group affected in all the years was between 25-34 which is the most economically productive age-group. A male preponderance seen in this study can be attributed to the fact that most women tend to stay indoors while males are the ones to be more outdoors and mobile for work .

Incidence of Dengue in Assam has been documented in many studies [2-4,15-19]. In our study we have seen that the Kamrup (Metro) district has reported the highest number of cases in all the years. An interesting finding of this study is the occurrence of Dengue in districts that were unaffected in previous years (table 3) which can be attributed to increase in long-distance travel, population growth and urbanisation, lack of sanitation, ineffective mosquito control etc.

Poor economic condition and deplorable conditions of living of the people in the country is a hindrance in the control of Dengue in spite of several efforts from the government and NGOs. Misconceptions and wrong beliefs are common, which increases the gap between knowledge and practice in the public, ultimately leading to diseases that can be otherwise controlled by public awareness.

CONCLUSION

Dengue has remained a persistent problem in Assam with the increasing distribution range of Aedes aegypti. There is a need of identification of high-risk areas, vector incrimination and seasonal infectivity of dengue

so that future outbreaks can be avoided by targeted interventions. Surveillance for detection of Dengue infections, monitoring of vector activity and initiation of vector control measures should be ensured so as to prevent disease transmission in the high risk zones. The control of Aedes mosquitoes in Assam is very challenging and requires community involvement. Destroying the breeding grounds of mosquitoes through an intense public campaign, proper solid waste disposal, improved water storage practices, including covering containers, to prevent access to egg-laying female mosquitoes, supplying medicated mosquito nets in affected areas, protecting oneself from mosquito bites using clothes with long sleeve and mosquito repellent, educating the people on the basics of health and hygiene are a simple yet very effective way of minimizing the impact of Dengue in Assam. In the absence of a licensed vaccine or specific drugs, the containment of spread of the vector and the disease is still important.

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