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Original Article

Microbiology Section

First Outbreak of Dengue in Jorhat District of Assam

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ABSTRACT

Introduction: Dengue Virus (DENV) infection is an important human arboviral infection. Though it is endemic in several parts of India, there has been no reported outbreak from Jorhat district of Assam, India.

Aim: To present a comprehensive picture of the first outbreak of dengue fever that occurred in Jorhat (Assam, India) and its adjoining districts from July to December 2016.

Materials and Methods: Serum samples from 289 clinically suspected cases of dengue fever were sent to Microbiology laboratory of Jorhat Medical College and hospital for serological confirmation of the diagnosis. All the samples were tested for DENV specific IgM antibodies and DENV-Non Structural protein 1 Antigen (NS1Ag) by ELISA.

Results: Out of the 289 clinically suspected cases of dengue, 114 (39.45%) were positive for DENV infection. Amongst the seropositive cases, NS1Ag was positive in 80 (27.7%) and IgM antibody was positive in 72 (24.9%) cases. Both NS1Ag and IgM antibody were positive in 38 (13.1%) cases. Adults (n=109; 95.61%) are more commonly affected than children (n=5; 4.39%). Male preponderance was noticed with a male:female ratio of 2.8:1. The maximum number of positive cases was reported in September (n=35; 30.71%) and occurred equally in rural (n=46; 40.4%) and urban areas (n=68; 59.6%). Fever was the most common presenting symptom followed by headache.

Conclusion: Involvement of mainly the young adult population, male predominance and presence of rural dengue cases was seen during the outbreak. Majority of the cases presented with dengue fever without severe manifestations. Vector control measures and increased public awareness is the need of the hour to prevent further spread and complications of the disease in subsequent years.

Keywords: Arbovirus, Clinical profile, Enzyme linked immunosorbent assay, IgM antibody

INTRODUCTION

Dengue is an important re-emerging arboviral disease and its global incidence has increased by several folds [1]. The disease is transmitted by mosquitoes of *Aedes* species, predominantly by *Aedes aegyptii* [2]. The demographic as well as the clinical profile of dengue has also changed over the last few decades [3,4]. DENV infection causes a spectrum of illness ranging from inapparent or mild febrile to severe and fatal haemorrhagic disease [5]. DENVs are single stranded, enveloped, positive sense RNA viruses belonging to genus *Flavivirus* of family Flaviviridae and having four distinct serotypes (DENV 1-4) [6].

India is known to be endemic for dengue with frequent occurrence of outbreaks [7-9]. Though dengue has been reported from several parts of North Eastern Region of India but there has been no reported outbreak from Jorhat district of upper Assam region [10-12]. This study was undertaken to present the comprehensive picture of the first outbreak of dengue in Jorhat and adjoining districts of upper Assam region that occurred during July-December 2016.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Microbiology laboratory of a Tertiary Care Hospital in upper Assam over a period of six months from July-December 2016. The study was done as part of public health response to outbreak investigation and thus did not require a review of Institutional Ethics Committee of Jorhat Medical College and Hospital, Jorhat, Assam, India [13].

A total of 289 consecutive adult and paediatric patients of both sexes with clinical suspicion of dengue infection were referred to the Microbiology department for serological confirmation of the diagnosis. Cases were included based on guidelines of Centers for Disease Control and Prevention (CDC) [14]. Detailed history was taken from all the patients in a pre-structured questionnaire. History was taken regarding fever, headache, arthralgia, myalgia, nausea, vomiting, abdominal pain, retro-orbital pain, any haemorrhagic manifestation, seizure, unconsciousness, altered mental status.

About 5 mL of acute phase clotted blood samples were collected from the patients. Serum was separated by centrifugation and tested for DV specific IgM antibody (Arbovirus diagnostics, National Institute of Virology, Pune, India) and DENV-Non Structural protein1 antigen NS1Ag (Panbio, Australia) by ELISA according to manufacturers' protocols. For both the assays, optical density was measured at 450 nm with the ELISA reader.

STATISTICAL ANALYSIS

Microsoft Excel 2007 was used to enter data from the questionnaire and analysis was done by SPSS version 16.0. Data were presented by using frequencies and percentages.

RESULTS

A total of 289 suspected dengue cases were sent to the Microbiology laboratory, Jorhat Medical College and Hospital during July-December 2016, of which 114 (39.45%) were positive for DENV infection. Amongst the seropositive cases, NS1Ag was positive in 80 (27.7%) and DV IgM antibodies was positive in 72 (24.9%) cases. Both NS1Ag and anti-DV IgM antibody was positive in 38 (13.1%) cases. During the present outbreak, adults (n=109,

95.61%) were more commonly affected than children (n=5, 4.39%). A male preponderance (73.68%) was seen [Table/Fig-1].

The first dengue IgM sero-positive case was in the first week of July. Increase in the number of seropositive cases appeared from the last week of August. Maximum number of specimens was received in November (n=89; 30.79%), followed by October (n=82; 28.37%) and September (n=71; 24.57%). However, the maximum cases were diagnosed in September (n=35; 30.71%), followed by October (n=34; 29.82%) and November (n=32; 28.07%). The rate of seropositivity in the clinically suspected patients peaked in September and October (30.71% and 29.82%, respectively) [Table/Fig-2].

Variables		Number	Percentage
Age groups (in years)	≤10 years	2	1.75
	11-20 years	11	9.65
	21-30 years	36	31.58
	31-40 years	31	27.19
	41-50 years	15	13.16
	51-60 years	11	9.65
	≥61 years	8	7.02
Sex	Male	84	73.68
	Female	30	26.32
Clinical presentation	Fever	114	100
	Headache	83	72.80
	Arthralgia and Myalgia	60	52.60
	Nausea and vomiting	52	45.60
	Retro-orbital pain	25	21.9
	Petechiae	7	6.1
	Seizures	9	7.9
	Unconsiousness	6	5.3
	Altered mental status	5	4.4

[Table/Fig-1]: Demographic and clinical profile of the dengue cases (n=114).

District	July	August	September	October	November	December	Total
Jorhat	1	3	32	28	22	7	93 (81.58%)
Sivasagar	0	0	1	0	5	1	7 (6%)
Majuli	0	0	0	3	2	1	6 (5.26%)
Golaghat	0	0	1	3	0	0	4 (3.50%)
Nagaon	0	0	0	0	1	0	1 (0.88%)
Tinsukia	0	0	0	0	1	0	1 (0.88%)
Dimapur	0	0	0	0	1	0	1 (0.88%)
Guwahati	0	0	1	0	0	0	1 (0.88%)
Total	1 (0.89%)	3 (2.63%)	35 (30.71%)	34 (29.82%)	32 (28.07%)	9 (7.89%)	114 (100%)

[Table/Fig-2]: Seasonal and location distribution of the dengue cases (n=114).

More than 81% of the positive cases were from Jorhat district followed by Sivasagar (n=7, 6%) and Majuli (n=6, 5.26%) [Table/Fig-2]. Around 59.6% (n= 68) of the Dengue positive cases resided in urban areas whereas 40.4% (n=46) were from rural areas.

Fever was present in all cases, (i.e.,100%), followed by headache (72.80%), joint and muscle pain (52. 60%), nausea and vomiting (45.60%), retro-orbital pain (21.9%), petechiae (6.1%). Twenty (17.54%) patients reported with neurological manifestations. Out of these 20 cases, 9 (45%) had seizures, 6 (30%) had unconsiousness while the remaining patients presented with altered mental status [Table/Fig-1].

DISCUSSION

Dengue is one of the major emerging viral infections which are transmitted by mosquitoes of *Aedes* species. Changes in environmental condition leading to establishment of the vector to the newer areas are regarded as one of the causes for endemicity and re-emergence of a disease [15-17].

In the present study, males were more commonly affected than the females, which is in accordance with studies of dengue outbreak conducted in Lucknow and Delhi [18,19]. This is in contrast to an outbreak of dengue in Madhya Pradesh where both the sexes were equally affected [20]. Majority of the cases were in the age group of > 20-30 years, (n=36; 31.57%). Similar pattern of infection was also seen in the studies conducted in Kerala and Karnataka [21,22]. Male preponderance and age group of >20-30 years indicate more transmission of dengue infections at work place. Intensive vector control measures undertaken for other vector borne diseases may have led to shifting of mosquitoes to non-residential areas and thus infecting the productive young adult age group.

Analysis of the data shows that maximum number of cases occurred during the post monsoon season. Our findings were in accordance with another study in Uttar Pradesh where the transmission of dengue occurred throughout the year with a peak incidence in the post monsoon period [4]. This correlation between outbreak of dengue fever and seasonal variation of disease transmission is very important at local level for institution of effective vector control measures. In present study, dengue transmission occurred equally in rural and urban areas. An increasing number of outbreaks of dengue fever have been reported from rural areas of several southern, northern and western Indian states [4,23-27]. Changes in the life style of the rural population as a result of urbanisation as well as water logging in the rainy season, may also be responsible for spread of the disease to rural areas. The district-wise distribution of the cases from the catchment area showed that the present outbreak was mainly concentrated in Jorhat district with a few cases being reported from the adjoining districts.

Regarding the clinical presentation, fever (100%) was the most common symptom followed by headache. Arthralgia/ myalgia and retrorbital pain were the other important presenting features. Our findings were in accordance with studies conducted in Kolkata and Agra [28,29]. Gastrointestinal symptoms like nausea and vomiting were present among 52 (45.60%) of the cases. So in the clinical setting of fever with gastrointestinal symptoms, diagnosis of dengue should be kept in mind along with other infections affecting the gastrointestinal system. Majority of the patients presented with dengue fever (93.9%) while dengue haemorrhagic fever (6.1%) was seen in a small proportion of cases. In a study done in Uttar Pradesh, it was observed that the disease presented with mild-illness in the first year of study. In the subsequent years, significant number of the patients presented with severe manifestations [18]. Severe manifestations and complications of the disease are seen mainly in areas of hyperendemicity of the virus [9,30]. Absence of dengue shock syndrome and complications in the present study may be explained by the fact that dengue is not known to be endemic in this region. So the need of the hour is the institution of proper vector

control measures to prevent further outbreaks since disease may present with more severity and complications in the subsequent outbreaks.

LIMITATION

There was a lack of information on meteorological data and vector control measures in the affected areas during the period of study. Diagnosis of cases which were negative for dengue was not done in the present study which was another limitation of our study. Our study was also limited by the fact that fourth generation diagnostics was not performed due to financial constraints.

CONCLUSION

The main findings of our study were the involvement of high proportion of adult population and majority of the cases presented with dengue fever without severe manifestations. The epidemiology and clinical manifestations of dengue fever has been highlighted in the present study. Vector control measures and increased public awareness, is the need of the hour to prevent further spread and complications of the disease in subsequent years.

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