First outbreak of dengue fever in East Sikkim in Northeastern part of India

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ABSTRACT

Background: Dengue viruses, single-stranded positive polarity ribonucleic acid (RNA) viruses of the family Flaviviridae, are the most common cause of arboviral disease in the world and has turned this disease into a serious public health problem. Aims: To study retrospectively the incidence of laboratory confirmed dengue cases among the clinically suspected patients, the clinical profile of dengue-positive cases, and to correlate with the environmental conditions. Materials and Methods: Five hundred and eighty blood sample was collected in the microbiology laboratory of district hospital Singtam, from clinically suspected cases of dengue infection, from 22nd August 2013 till 30th November 2013 for rapid dengue kit test initially followed by confirmation test by Immunoglobulin M (IgM) capture ELISA test. Conclusions: Fever with myalgia should be evaluated for Dengue fever (DF) in Sikkim, northeastern part of India. We also report the first outbreak of dengue fever in the east district (Singtam) of Sikkim.

Keywords: Dengue fever, ribonucleic acid, Dengue haemorrhagic fever

Introduction

Dengue viruses, single-stranded positive polarity ribonucleic acid (RNA) viruses of the family Flaviviridae, are the most common cause of arboviral disease in the world. Dengue viruses have four serotypes, 1–4, which are transmitted mainly by bite of Aedes aegypti mosquito and also by Aedes albopictus. More than two-fifths of the world’s population (2.5 billion) live in areas potentially at risk for dengue. The global incidence of dengue fever (DF) and dengue hemorrhagic fever has increased dramatically in recent decades, and has turned this disease into a serious public health problem, especially in the tropical and subtropical countries. In India, the first epidemic of clinical dengue-like illness was recorded in Madras (now Chennai) in 1780. Our study is a retrospective study of first dengue outbreak in Singtam [Figure 1], in the east district of Sikkim, a northeastern state of India during the year 2013.

The objectives of the study were to find out the incidence of serologically confirmed dengue cases among the clinically suspected patients, the clinical profile of dengue-positive cases, and to correlate with the environmental conditions.

Materials and Methods

Blood sample was collected in the laboratory of district hospital Singtam, from clinically suspected cases of dengue infection, from 22nd August 2013 till 30th November 2013. Serum was separated and rapid test was done in Singtam Hospital with Dengue Duo SD Bioline. SD Bioline dengue Duo rapid test is an in vitro immunochromatographic test, one step assay designed to detect IgM, IgG antibodies, and NS-1 antigen of dengue virus in human serum. The test was read after 20 min. It is a

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two-test device in which one side is for qualitative determination of NS1 antigen and the other side is designed for simultaneous differential detection both of IgG and IgM antibodies to dengue virus. For detection of NS1 antigen the test device contains a precoated membrane strips with antidengue NS1 antigen capture antibody on region showing test band. The result window has two lines, T line is the NS1 test line and C is control line for procedural control. Dengue test device for IgG/IgM has three precoated lines, G (dengue IgG test line), M (dengue IgM test line), and C (control line in the result window). The positive rapid test samples were confirmed by IgM capture Mac enzyme-linked immunosorbent assay (ELISA) test (ELISA kit was supplied by the National Institute of Virology, Pune, under the National Vector Borne Disease Control Program) in Sir Thutop Namgyal Memorial Hospital, Gangtok, a tertiary referral hospital. Manufacturer's instructions were strictly followed for performing the test and interpreting the results. Optical density (OD) was measured at 450 nm using ELISA reader (Robonik). NS1 ELISA could not be done as the test kit was not available.

Clinical and demographic details of patients
First index case was a 34-year-old male patient, resident of Rangpo and he was diagnosed with DF on 22/08/2013 by doing rapid dengue test and which was later confirmed by ELISA test. This patient had presented with fever of 5 days duration associated with low backache and generalized myalgia. His platelet count was about 90,000 per mm³. He was managed conservatively and recovered within 1 week. Thereafter any patient coming with fever was tested for dengue by rapid test followed by ELISA test. Thrombocytopenia (platelet count <100,000 cells per microliter of blood) was seen in 84 (84/318, 26.40%) DF patients. The maximum number of confirmed ELISA positive samples (45.18%) was from the age-group 16–30 years [Figure 3]. The youngest patient was a 5-year-old female child and the oldest was an 87-year-old male patient. Thrombocytopenia (platelet count <100,000 cells per microliter of blood) was seen in 84 (84/318, 26.40%) DF patients. The maximum number of confirmed ELISA positive cases [Table 1] was in September (n = 98; 72.59% of 135), followed by October (n = 22; 16.29% of 135), August (n = 9, 6.66% of 135), and November (n = 6, 4.44% of 135). Out of 135 patients, none had dengue hemorrhagic fever or dengue shock syndrome. Aedes albopictus was the vector identified in the outbreak.

Results
In our study, dengue serology test was done on a total of 580 samples, of which 318 was positive for rapid test (54.8%). Of the 318 rapid positive tests, only 135 samples were positive for IgM capture Mac ELISA test. Majority of the patients presented with fever in 51 patients (51/135, 37.77%), fever with joint pains in 43 patients (43/135, 31.85%), fever with myalgia was present in 29 patients (29/135, 21.48%), and fever with rash in 12 patients (12/135, 8.88%). Among the 135 ELISA positive dengue cases, male-to-female ratio was 1.5:1. The largest number of ELISA positive samples (45.18%) was from the age-group 16–30 years [Figure 3]. The youngest patient was a 5-year-old female child and the oldest was an 87-year-old male patient. Thrombocytopenia (platelet count <100,000 cells per microliter of blood) was seen in 84 (84/318, 26.40%) DF patients. The maximum number of confirmed ELISA positive cases [Table 1] was in September (n = 98; 72.59% of 135), followed by October (n = 22; 16.29% of 135), August (n = 9, 6.66% of 135), and November (n = 6, 4.44% of 135). Out of 135 patients, none had dengue hemorrhagic fever or dengue shock syndrome. Aedes albopictus was the vector identified in the outbreak.

Discussion
India experienced the highest dengue incidence in 2013 (about 61 per million populations), in 2012 (about 41 per million population) and in 2014 (about 32 per million populations). Based on the data of National Vector Borne Disease Control Programme, the number of dengue cases reported in 2013 was about 74,454 and there was 167 deaths. The overall mortality rate of 1.2% in 2007 had dropped to 0.25% in 2013. This reduction is probably the result of the cumulative effects of better patient management, increased diagnostic capabilities, and better reporting. Compared with the rest of South-East Asia, the number of dengue shock syndrome cases in India remains low.\textsuperscript{10}

The 2009 WHO criteria classify dengue according to levels of severity: dengue without warning signs; dengue with warning signs (abdominal pain, persistent vomiting, fluid accumulation, mucosal bleeding, lethargy, liver enlargement, increasing hematocrit with decreasing platelets); and severe dengue (dengue with severe plasma leakage, severe bleeding, or organ failure). Patients who recover following defervescence are considered to have nonsevere dengue, but those who deteriorate tend to manifest warning signs. These individuals are likely to recover with intravenous rehydration. However, further deterioration is classified as severe dengue, though recovery is possible if appropriate and timely treatment is given.\textsuperscript{11}
In our study, DF without warning sign was present in 51 patients (51/135, 37.77%), DF with warning signs (lethargy, abdominal pain, and thrombocytopenia) was seen in 84 (84/135, 62.22%) patients. In our study, dengue serology test was done on a total of 580 samples, of which 318 was positive for rapid test (54.8%) out of which 135 tested positive by IgM ELISA. Dengue affects humans of all age-groups. In our study, maximum dengue cases (191; 87.6% of 218) were from the age group 16–30 years. This is consistent with study by Azgar Ali et al.,[11] Debnath et al.,[12] which showed highest attack rate in 17–40 years age group, and Islam et al. which showed maximum number of dengue positive cases in the age group 21–30 years.[13]

The role of environmental factors in infectious diseases is well-known. In most countries, dengue epidemics are reported to occur, during the warm, humid, and rainy seasons, which favor abundant mosquito growth and shorten the extrinsic incubation period as well.[14-16] In our study, the largest proportion of serologically positive cases was recorded in the postmonsoon period and it was the first outbreak in east district.

Maximum number of cases was found in September to October. Bandhyopadhyay et al.[17] also observed maximum number of cases in postmonsoon period from September to October. The mean annual rainfall in Sikkim varies from 2000 to 4000 mm with intensity from drizzle to torrential rains. Greater part of the rainfall is from May to September. The maximum temperature in September in Sikkim was 22.3 and minimum temperature was 15.5. Rainfall in September was 429.3 mm. Even though Sikkim being located in foothills of Himalayas, the temperature not being very high and much cooler than the other parts of India, an outbreak of DF in East Sikkim had occurred.[17] Prolonged and heavy rains led to a rise in mosquito growth, thus increasing transmission of mosquito-borne infections.

Among the 135 ELISA positive dengue cases, male-to-female ratio was 1.5:1 this is similar to studies from Lakhimpur district[18] where males (76.92%) were more affected than females. This could be because males are more engaged in outdoor activities.[19] No case fatality was reported. Most of the patients recovered after complete treatment and no long-term sequelae was reported in any of the patients.

Conclusion

We report our experience of the DF outbreak in the east district of Sikkim, Singtam, a hilly state in the northeastern part of India in year 2013. Unprecedented rains, uncovered collection of water lead to outbreak of DF. Even though Sikkim being a hill state this dengue outbreak study could guide the treating physician that DF is also not an uncommon disease in the state and that fever cases especially during postmonsoon should be evaluated for DF.

Drawback of our study was we could not do serotyping of the dengue viruses.

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Conflicts of interest

There are no conflicts of interest.

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