A Study on the Epidemiological and Serotype Pattern of Dengue Outbreak in Sikkim

Karma Doma Bhutia*, Pema Yoden Bhutia, Tara Sharma and Shrijana Gurung
STNM Hospital, Gangtok, Sikkim 737101, India

*Corresponding author: Karma Doma Bhutia, STNM Hospital, Gangtok, Sikkim 737101, India, Tel: 08145891089; E-mail: karmabhutia78@yahoo.com

Received date: October 11, 2018; Accepted date: November 19, 2018; Published date: November 25, 2018

Copyright: © 2018 Bhutia KD, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License; which permits unrestricted use, distribution, and reproduction in any medium; provided the original author and source are credited.

Abstract

Introduction: The outbreak of Dengue was reported from South Sikkim (Jorethang) and East Sikkim (Rangpo) in September 2017.

Objective: To confirm the dengue outbreak by ELISA to find the serotype of Dengue virus responsible for the outbreak in Sikkim.

Materials and Methods: Serum samples from the two districts (outbreak areas) were tested by NS1Ag ELISA and IgM ELISA. The NS1Ag positive samples were sent to ICMR unit, NICED (National Institute of Cholera and Enteric disease), Kolkata for serotyping.

Results: The most common age group affected was 16-30 years. Males were more affected than females. The outbreak occurred in the month of September 2017. The predominant serotype was DEN2 few cases of DENV 1, DENV3 and DENV4 were also found.

Conclusion: Recent outbreak has established Dengue as an important disease of concern in Sikkim. Young age groups were more affected. Serotype 2 was the major circulatory serotype.

Keywords: Epidemiological; Dengue outbreak; Serotype pattern

Introduction

Dengue virus belongs to the genus Flavivirus in the family Flaviviridae. It is a positive sense RNA virus that is composed of three structural proteins, an envelope glycoprotein, and seven non-structural proteins. It is transmitted mainly by Aedes aegypti and also by Aedes albopictus mosquitoes. Dengue fever was defined as an acute febrile illness accompanied by myalgia, retro-orbital pain, joint pain or rash. Dengue fever is currently considered re-emerging infectious disease because of the dramatic increase in recent decades with an estimated annual occurrence of 100 million new cases in tropical and sub-tropical regions of the world [1,2]. Dengue virus has five distinct serotypes DV1, DV2, DV3, DV4 and DV5 [3]. Infection with one serotype confers immunity to that particular serotype but protection against other serotypes is only partial and transient [4-6]. Early and accurate diagnosis and management can reduce the mortality and morbidity of DHS and DSS. Early laboratory confirmation is valuable because some patients may deteriorate rapidly resulting in death [7].

The first report of Dengue fever in India was in 1946. After almost 20 years, an epidemic occurred in 1963-1964 in Kolkata [8-10]. It gradually spread to involve North India in 1967-1968 and South India [11,12]. All four serotypes of the virus were reported from South India. 13 The first major outbreak of Dengue Fever/ Dengue Hemorrhagic Fever occurred in Delhi in 1996 where 10,252 cases and 423 deaths were reported [13]. This outbreak was caused by DENV-2, genotype IV strain of the virus [14]. Similar strains of the DEN-V 2 were also reported from Gwalior and South India, indicating that the predominant strain in India was DENV-2 [15]. In the post-epidemic period in Delhi in 1997, DENV 1 was also seen in the circulation. A dramatic increase in outbreaks occurred in India where all four serotypes are present hinting towards hyperendemicity of dengue in India [16,17]. The country faced another outbreak in 2003 by serotype 3. At present all the four serotypes are present in Indian circulation but the predominant serotype keeps changing.

Sikkim is a tiny hilly state in northeast India in the foothills of the Himalayas. It is situated in 27.53 N 88.51 E. It has carried elevations ranging from 300 m to 8583 m above sea level consisting of lower, middle and upper hills, alpine zones and snowbound land. The total geographical area is 7096 sq.kms. The climate varies from tropical, sub-tropical to temperate to Alpine zones. It experiences heavy rainfall, monsoon starts from May to September. The outbreak occurred in Jorethang (South Sikkim) and Rangpo (East Sikkim) in September 2017. Jorethang is a small town in South in the foothills at an altitude of 322 m above sea level while Rangpo is in East Sikkim, a town bordering West Bengal situated at an altitude of 1300 m [18].

Materials and Methods

Study population

The study was done in samples collected from dengue outbreak areas in Sikkim. This study was approved by the Institution ethics committee.

Inclusion criteria:
The most affected age group were 16-30 years (70/155, 45.16%) followed by 31-45 years (34/155, 21.93%). More males (n=80, 51.61%) were affected as compared to females (n=75, 48.38%). The outbreak occurred in the month of September–November 2017. There were no reported cases after December 2017 (Figure 1).

Of 155 NS1Ag positive samples, 76 samples were sent for serotyping. 79 samples could not be sent due to insufficient volume. 76 samples (46 from East Sikkim and 30 from South Sikkim) were sent to ICMR unit, National Institute of Cholera and Enteric Disease (NICED), Kolkata. .75 samples were positive (54.77%). 65 samples were tested by IgM ELISA out of which ten were positive (15.38%) (Table 1).

**Table 1:** District-wise distribution of Dengue cases.

<table>
<thead>
<tr>
<th>District</th>
<th>Total samples received</th>
<th>NS1Ag positive</th>
<th>IgM ELISA positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Sikkim</td>
<td>263</td>
<td>76/198 (38.38%)</td>
<td>10/65 (15.38%)</td>
</tr>
<tr>
<td>South Sikkim</td>
<td>85</td>
<td>79/85 (92.94%)</td>
<td>No samples &lt;5 days of fever</td>
</tr>
<tr>
<td>Total</td>
<td>348</td>
<td>155</td>
<td>10</td>
</tr>
</tbody>
</table>

In India, DENV 1, 2, 4 serotypes were the most common circulating strains from 2008 until 2010 after which DENV 3 rose and led to massive dengue outbreak in Kolkata with more number of DHF and DSS cases in 2012 [20].

283 samples from outbreak areas with fever less than five days were tested by NS1Ag ELISA, 155 (54.77%) samples were positive. NS1Ag (the non-structural protein) is abundant in the serum of patients in early stage of infection from one to nine days. Kumarasamy et al. [20,21] compared the use of NS1 ELISA with viral isolation in cell culture and RT PCR assay and concluded that NS1 Ag detection may be an appropriate marker of acute DENV infection [21].

The most affected age group was 21-30 years. Ukey et al. [22] showed a 15-30 years age group as highly affected with male predominance which was similar to our findings. Gupta et al. [23], Chakravarti and Kumaria et al. [24] also found the most affected age group as 21-30 years.

The outbreak occurred in the post-monsoon period. This could be explained by the fact that the water in the rainy season gets stagnant which favors the breeding of vector mosquito. This finding is consistent with studies by Hati et al. [25] and Gunasekaran et al. [26] which also showed most of the cases in the post-monsoon period.
Clustering of Dengue cases was seen in the postmonsoon season in a study by Gibbons [27].

DEN2V is seen as the predominant serotype in this outbreak. Report of DEN V 2 in Assam and Nagaland appeared during the nineties [28] DENV2 was isolated during the epidemic of Dengue in rural and urban areas of Gujarat during 1988 and 1989 [29]. DV2 was the predominant serotype circulating in northern India including Delhi, Lucknow, and Gwalior [30,31] DEN V 2 was also reported from Mandali village in Madhya Pradesh [32]. DEN 2 was also reported from south India in Kerala along with DENV 3 [33]. Co-infection with multiple serotypes have been reported from places where multiple serotypes co-circulates [34] Though no cases from our study had coinfection, the existence of multiple serotypes in the circulation could lead to co-infection in future dengue outbreaks.

This is the first report of Dengue serotype in the northeast state, Sikkim. This study is also the first to report co-circulation of 4 types of dengue virus serotypes in an outbreak in Sikkim. Dengue serotype 4 has been isolated from 4 cases from samples of Singtam and Rangpo. DENV4 is a rare serotype which has recently been spreading through the country [35,36]. This study indicates the spread of DEN 4 serotype in the northeastern part of India, in Sikkim. Reports regarding the association of DEN 4 serotype with severe cases and its high rate of transmission as a cause of concern [37].

**Limitation of this Study**

Genotyping could not be done.

**References**

18. Geographical information of Sikkim. Sikkim.nic.in