Epidemiological characteristics of dengue disease in Saurashtra region, India, during year 2015

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Abstract

Background: Dengue is an important vector-borne disease with a spectrum of classical fever to hemorrhagic fever to dengue shock syndrome. The present study was conducted with objective to study epidemiological and demographic characteristics of dengue infections during the year 2015 in Saurashtra region, Gujarat state, India. Materials and Methods: The study was conducted at Tertiary Care Hospital, Rajkot, during the year 2015. A total of 3312 blood samples were collected and tested for dengue NS1 antigen and IgM antibody by capture ELISA testing from various districts of Saurashtra region. A pretested structured data sheet was used as a tool for data collection, and data analysis was done. Results: Out of 3312 tested samples, 33.4% samples were found positive for dengue. Suspected cases were reported from all age groups, including majority from 15 to 24 years (31.1%) and 25 to 44 years (30.0%) and also 8.4% from 0 to 4 years. More than two-third (68.7%) of males were dengue positive than female cases. Significant numbers of cases (P < 0.01) were residing in urban areas (65.7%). Two-third cases (66.8%) diagnosed after 7 days of fever by IgM antibody test. Increasing number of dengue cases reported from July and reached to peak during October 2015. Conclusion: The present study reported that dengue mainly affected males and urban population. Perennial occurrence with seasonal increase during monsoon and postmonsoon months was reported. Effective implementation of vector control measures through efforts toward vector breeding source reduction and with the use of personal prophylactic measures against mosquito bites will help in reducing the dengue prevalence in the community.

Keywords: Demography, dengue, epidemiology, NS1 antigen test, Saurashtra region

Introduction

Dengue emerged in the second half of the twentieth century as a major public health concern in many tropical and subtropical regions of the world.¹ It is an acute viral disease transmitted by Aedes aegypti and Aedes albopictus mosquitoes and is caused by four serotypes (viz. DENV-1, DENV-2, DENV-3, and DENV-4) of the genus Flavivirus.²⁻⁴ It is considered a major global threat by the World Health Organization (WHO).³ These infections may be asymptomatic or may lead to (a) classical dengue fever, or (b) dengue hemorrhagic fever (DHF) without shock, or (c) DHF with shock. Some 2.5 billion people, i.e., two-fifth of the world's population in tropical and subtropical countries are at risk of the disease. An estimated 50 million dengue infections occur worldwide annually and about 500,000 people require hospitalization each year.⁵ Dengue infection is endemic in more than 100 countries of different WHO regions. The South-East Asia Region (SEAR) and Western Pacific regions are most seriously affected with detection of all four serotypes of dengue.⁶ It is found in tropical and sub-tropical regions around the world, predominantly in urban and semi-urban areas, and is now spreading to rural areas.⁷ Since the mid-1990s, epidemics of dengue in India have become progressively larger and more frequent.⁸ WHO has kept India under category A depending on the endemicity of dengue in SEAR, considering the dengue as a...
major public health problem, leading cause of hospitalization and death among children, hyperendemicity with all four serotypes circulating in urban areas, and spreading to rural areas. The risk of dengue has shown increase in recent years due to rapid urbanization, lifestyle changes, and deficient water management including improper water storage practices in urban, periurban, and rural areas, leading to proliferation of mosquito breeding sites.

The disease has a seasonal pattern, i.e., the cases peak after monsoon but in the Southern states and Gujarat state, the transmission is perennial. The dengue is endemic in all states/union territories of India. During year 2014–2015, highest numbers of cases were reported from Maharashtra, Odisha, Karnataka, Tamil Nadu, Kerala, and Gujarat states. The Western part of Gujarat state is known as Saurashtra region and includes 8 districts of Gujarat state. The present study was conducted with objective to study epidemiological and demographic characteristics of dengue infections during the year 2015 in Saurashtra region of Gujarat state, India.

Materials and Methods

From January 1, 2015, to December 31, 2015, the present study was conducted at a Tertiary Care Teaching Institute – P.D.U. Government Medical College, Rajkot of Saurashtra region. Rajkot district is located in the center of Saurashtra region (Western part) of Gujarat state. The Saurashtra region includes various other districts such as Jammagar, Bhavnagar, Amreli, Surendranagar, Kutch, Probendar, and Junagadh. Administratively from above 8 districts, three more districts formed Morbi, Gir Somnath, and Devbhumi Dwarka, but still health setup is not differentiated and so analysis is shown as of 8 districts. Microbiology Department of P.D.U. Government Medical College as a Tertiary Care Institute is receiving blood samples from Rajkot district and also from above-mentioned districts for investigation of dengue. Under National Vector Borne Disease Control Program (NVBDCP), virology section of microbiology department is identified as one of the sentinel surveillance centers in Gujarat state for dengue testing. It is responsible for investigating blood samples from patients with suspected dengue infection, maintaining records of positive cases, and capacity building of primary health centers within the districts. Patients with acute febrile illness of 2–7 days duration with two or more of the following manifestations: headache, retro-orbital pain, myalgia, arthralgia, rash, and hemorrhagic manifestations were considered as clinically suspected case of dengue virus infection as per the NVBDCP guidelines.

A total of 3312 blood samples were received from patients of all age suspected of dengue, DHF, and dengue shock syndrome during the year 2015. All the patients who presented with fever and found positive for dengue NS1 Ag and/or IgM Ab were included in the present study. However, patients with other coinfections, such as malaria, typhoid or with any other comorbid diseases were excluded from the study. Demographic and clinical details were obtained and recorded from laboratory request forms such as age, sex, residential status, and number of days between onset of fever and diagnosis. A pretested structured data sheet was used as a tool for data collection. The date of onset of fever and the date of blood sample collection were also recorded in the data entry form for calculation of sample age. Sample age is defined as the interval in days between the date of onset of fever and the date of collection of blood sample. It was considered day 0 if the blood samples were collected on the same day as the date of fever onset.

As soon as the blood samples with the completed standardized requisition forms received in virology section, the blood samples were allowed to clot at room temperature. As the blood had clotted, serum samples were separated and proceed for IgM Ab and NS1 Ag testing according to the days of illness. The patients having history of illness <5 days proceed for NS1 Ag test, and the patients having history of illness more than 7 days proceed for IgM Ab test. Those having history of illness between 5 and 7 days proceed for both NS1 Ag and IgM Ab testing. The IgM dengue ELISA capture test kits are supplied by the National Institute of Virology, Pune, under the NVBDCP and dengue NS1 antigen-capture ELISA assay was performed by PLATELIA DENGUE NS1 Ag (Bio-Rad, Marnes-la-Coquette, France). When a dengue case is confirmed by serological testing, the district vector-borne disease control officer, chief district medical officer, concerned medical officer, and epidemiic medical officers are informed. The data were entered and analyzed using EpiInfo (version 3.5.1) software by Centers for Disease Control, Atlanta, USA.

Results

Totally, 3312 samples were received and tested for dengue during the study period from Saurashtra region. Out of 3312 tested samples, 33.4% samples were found positive for dengue. All age groups reported suspected cases for dengue [Table 1]. Majority of samples were tested in age group 15–24 years (31.1%) and 25–44 years (30.0%). More males (62.0%) were tested than female among suspected dengue cases. More than two-third (68.7%) males (P < 0.01) reported dengue positive. Almost two-third (65.7%) dengue positive cases (P < 0.01) were residing in urban areas of Saurashtra region. Males were at significant risk (P < 0.05) of getting dengue cases than females. Majority dengue positive cases (84.3%) were from Rajkot district (P < 0.01).

The suspected cases were grouped according to the onset of fever and laboratory diagnosis made. Out of 3312 suspected cases, 1183 (35.7%) were tested within 5 days of onset of fever. Only 266 (8.0%) cases reported positive for dengue within 2 days of onset of fever. Almost two-third (66.8%) cases were tested after 7 days of illness. A positive diagnosis for dengue after 7 days of onset of fever was more than within 5 days of fever. Figure 1 shows distribution of total cases tested and positive dengue cases of Saurashtra region during the year 2015.
Cases of dengue reported throughout the year from Rajkot and other districts of Saurashtra region [Table 3]. Reporting of dengue positive cases remained low during the first 6 months of year 2015, followed by a significant increase from July to September and again during December. Figures 2 and 3 shows month-wise distribution of total and dengue positive cases reported in Saurashtra region and Rajkot district, respectively. Increasing number of cases reported from July 2015 and reached to peak during September 2015 followed by decrease in cases till December 2015.

**Discussion**

Dengue is an infectious disease with persistent occurrence, especially in developing countries. Despite the recent economic growth, success in controlling the disease has not been achieved, and dengue has evolved from cyclic epidemic outbreaks to a lack of seasonality, given the increase in dengue cases.[13] Every aspect of dengue viral infection continues to be a challenge; the pathogenesis of severe dengue disease is not yet known, no vaccine is yet available for protection, and the vector control measures are inadequate.[14] A. aegypti the primary vector for dengue fever is well adapted to breeding in human-made breeding sites in urban and periurban environments.[15]
The present study was conducted at a tertiary care center of Saurashtra region involving 3312 suspected dengue cases during the year 2015. In total, 33.4% of cases found positive for dengue during the study, little lower (41.1%) than reported previously in year 2013 in same area. The reported prevalence of 33.4% is higher than reported in other districts of Gujarat state and also from other states of India. Almost all age groups reported a significant number of dengue positive cases in this study. Majority of cases were reported in productive age group of 15–44 years, including 31.1% in 15–24 years and 30.0% in 25–44 years age group. In contrast to the previous study, a significant number of cases (P < 0.05) also reported in under 5 years age group. In SEAR countries including India, the dengue was acknowledged as a disease of early childhood and also with an evidence of increase of dengue incidence in older age group (16–45 years).

Significantly, high case positivity rate among male patients (68.7%) was reported, higher than the previous study from same area, and also various studies from India. Males have more outdoor activities compare to females results in more exposure to mosquito bite during day time. Males may be due to lower reporting rate and indoor/household activities making them less exposed to risk of vector-borne infection. Almost two-third (62.0%) of suspected cases and significantly confirmed dengue cases (65.7%) were from urban areas (P < 0.05) as also reported by other studies. Dengue is a disease of urban areas where solid wastes, air conditioners, air coolers, flower pots, and so forth are the major contributors in the growth of *A. aegypti* mosquito, the principal urban vector of dengue.

Delay in diagnosis after onset of fever of dengue cases may be because the patients were not seeking immediate treatment for symptoms or the treating physician not suspecting dengue in the first few days of fever. Majority (63.9%) of suspected cases were tested after 7 days of illness by IgM antibody. The present study reported that majority (66.8%) of dengue cases tested after 7 days of onset of fever. Awareness about the dengue disease by use of mass media may improve the patients’ treatment-seeking behavior and early detection of dengue. In contrast to the present study, other studies have reported that the majority of dengue cases were detected by the presence of viral NS1 antigen compare to IgM antibodies in patient’s sera. Therefore, it is known that early detection of dengue cases by NS1 assay helps in diagnostic detection and confirmation of cases. Viral antigen detection is particularly useful during the first 5 days of illness with NS1 assays.

The blood samples of suspected dengue cases were received throughout the year. The present study reports the continuous occurrence of dengue cases with varying severity in Saurashtra region. Samples received from Rajkot district more in number than the other districts throughout the year. Number of positive cases reported with varying positivity rate from January to July 2015. The rainy season starts by the end of June month, and the present study reported increase from July to November 2013 with significantly highest positive cases reported during October (P < 0.01) and November 2015 (P < 0.01). The present study reported seasonal occurrence of dengue cases during monsoon and postmonsoon season. Similar seasonal findings reported by various other studies. To reduce the occurrence of dengue in the community, effective preventive and control measures should be taken before monsoon and also during monsoon.

### Conclusion

The present study reported that dengue mainly affected males and urban population. Perennial occurrence with seasonal increase during monsoon and postmonsoon months was reported. Effective implementation of vector control measures through efforts toward vector breeding source reduction and with the use of personal prophylactic measures against mosquito bites will help in reducing the dengue prevalence in the community.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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