

# SEROPREVALENCE OF DENGUE IN GUJARAT, WESTERN INDIA: A STUDY AT A TERTIARY CARE HOSPITAL

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## ABSTRACT

**Background:** Dengue is one of the most serious mosquito borne viral infection mainly affecting tropical and subtropical countries of the world. In absence of specific treatment and vaccine for dengue fever (DF); vector control is the only method by which the spread of dengue can be prevented.

**Aims & Objective:** This study was conducted to report the prevalence of Dengue virus infection in Gujarat, Western India.

**Material and Methods:** Study was performed at a tertiary care hospital in Ahmedabad, Gujarat in year 2012. Patients attending various hospitals across Gujarat for suspected dengue were tested. Blood samples collected in plain tubes were tested for dengue IgM antibodies, NS1 antigen and viral nucleic acid detection by Dengue IgM capture enzyme linked immune sorbent assay, Dengue Early ELISA and real time reverse transcriptase PCR, respectively. The laboratory records were analyzed for demographic features and seasonal variations. Descriptive statistics were used. Data were expressed in proportions.

**Results:** Out of total 4401 serum samples tested, 927 were found positive for dengue virus infection. 65% positive samples were of male patients and 58% positive samples were from 18 to 35 years age group (Adult population) (58%). Seasonal trend showed a gradual increase in dengue positives started from August with a peak in October (34.5%). The most common presentation was fever (97%) while only 1% cases presented haemorrhagic manifestations.

**Conclusion:** Dengue has established its transmission in urban and semi-urban areas of Gujarat with predominantly affecting males and active adult population. Virus activity is high during monsoon and post monsoon period which coincides with increased vector breeding. This study thus emphasizes the need for continuous sero epidemiological surveillance for the timely formulation and implementation of effective dengue control programme.

**Key-Words:** Dengue; Dengue Early ELISA; IgM Antibody Capture Enzyme Linked Immunosorbent Assay; Real Time Reverse Transcriptase Polymerase Chain Reaction; Vector

## Introduction

Dengue is a mosquito-borne viral infection found in tropical and sub-tropical regions around the world. In recent years, transmission has increased predominantly in urban and semi-urban areas and has become a major international public health concern. Dengue is believed to infect 50 to 100 million people worldwide a year with half a million life-threatening infections requiring hospitalization, resulting in approximately 2.5% deaths.<sup>[1]</sup> In India, a dengue virus infection has been frequently encountered in epidemic proportions in several states.<sup>[2-6]</sup>

Dengue virus infection produces a spectrum of clinical illness, ranging from an asymptomatic or mild febrile illness to classic dengue fever (DF) to the most severe form of illness, dengue hemorrhagic fever (DHF).<sup>[7]</sup> There is no specific treatment for dengue/ severe dengue, but early detection and access to proper medical care lowers fatality rates below 1%.<sup>[1]</sup> As effective control and preventive programmes for dengue infection are based upon improved surveillance data, this study was done to report

the prevalence of dengue virus infection at Ahmedabad, Gujarat, a major industrial city of Western India and its surrounding districts. It also intended to detect the epidemiological and clinical profile of dengue infection.

## Materials and Methods

This study was undertaken at a tertiary care teaching hospital at Ahmedabad from January 2012 to December 2012. Blood samples were received from patients of all age groups (1 month to 95 years) suspected of dengue, DHF and Dengue Shock Syndrome. As this institute provides speciality health care to neighbouring districts, blood samples were also received from various districts in Gujarat. Demographic details and clinical history were obtained and recorded in Laboratory Request forms.

Sera were separated and preserved at 4°C till the time of testing. Sera of patients with illness 5 days or less were tested by real time reverse transcriptase Polymerase Chain Reaction (rRT-PCR) for viral nucleic acid detection or Dengue Early ELISA (Enzyme Linked Immunosorbent

Assay) (Panbio) for non-structural 1 (NS1) antigen, while sera of patients with illness more than 5 days were tested by dengue IgM antibody capture ELISA (MAC ELISA) (received from NIV, Pune) for IgM antibody detection as per kit insert.

Dengue rRT PCR: RNA from 140 µl of serum samples was extracted using QIAgen Mini RNA extraction kit as per the manufacturer’s protocol. The RNA was eluted in 60 µl of elution buffer and 5 µl of extracted RNA was used for rRT PCR. All samples were tested using a forward primer (nt 10635-10658), a reverse primer (nt 10708-10682) and the probe (nt 10663-10679) (Invitrogen) [Table 1].

Based on duration of illness, 1734 samples were tested by rRTPCR, 833 were tested by Dengue Early ELISA and 1931 were tested by MAC ELISA amongst which 97 samples were tested by both rRTPCR and MAC ELISA or Dengue Early ELISA and MAC ELISA.

**Table-1:** Nucleotide Sequence of Primers and Probe used in the rRT PCR Assay

Primers and Probe	Sequence	Nucleotide Position
Forward Primer	5'-GARAGACCAGAGATCCTGCTGTCT-3'	10635-10658
Reverse Primer	5'- ACCATTCCATTTTCTGGCGTT-3'	10708-10682
TaqMan MGB Probe	5'-AGCATCATTCCAGGCAC -3'	10663-10679

**Results**

During the study period, a total of 4401 blood samples were tested for dengue. Of the total samples tested, 21% (n=927) were found to be positive for dengue virus. Out of total positives, 251 were tested positive by rRTPCR, 144 by NS1 antigen Early ELISA and 536 by MAC ELISA. Three samples were tested positive by both rRT PCR and MAC ELISA while one tested positive by both NS1 antigen Early ELISA and MAC ELISA.

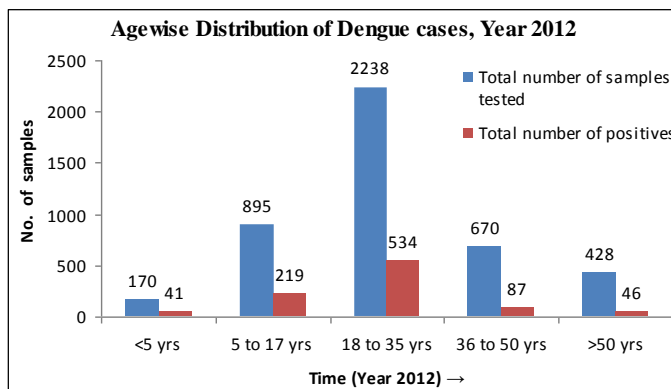
Of all the patients tested, 2561 were males and 1840 females. From the total positives for dengue, 65% (n=600) were males and 35% (n=327) females. So, it was observed that dengue affected males and females in a ratio of 1.9:1.

During this study, a majority of patients tested for dengue cases were of 18 to 35 yrs age group (n=2238, 51%) followed by the age group 5 to 17 yrs (n=895, 20%). Out of the total positive for dengue, positivity was highest (n=534, 58%) in the adult age group of 18 to 35 yrs followed by the younger age group of 5 to 17 yrs (n=219, 24%) [Figure-1].

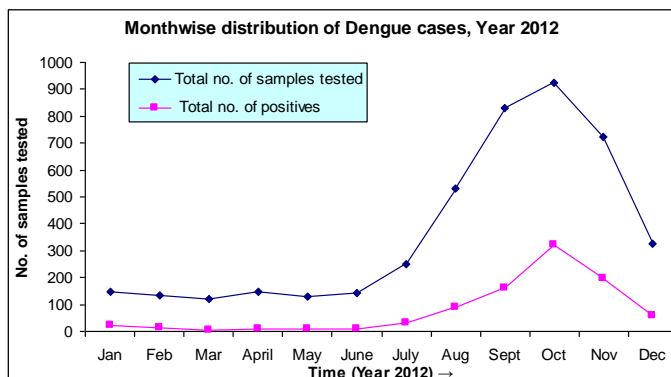
In the study population, highest numbers of patients were tested for dengue in the month of October (n=922)

followed by September (n=829) and November (n=725). A gradual increase in dengue positive cases was noticed from August (n=89) with a highest peak in October (n=320) followed by November (n=197) and September (n=159) [Figure-2].

As analyzed from table no.2, fever was present in almost all cases (n=901) followed by myalgia (n=67), headache (n=55), joint pain (n=52), skin rash (n=38), abdominal pain (n=20) and vomiting (n=19). Hemorrhagic manifestations were present in only 9 cases.



**Figure-1:** Age wise Distribution of Dengue Cases during 2012



**Figure-2:** Month wise Distribution of Dengue Cases during 2012

**Table-2:** Symptoms and Complications of Confirmed Dengue Cases (n=927)

Symptoms	No. (%) of cases
Fever	901 (97)
Myalgia	67 (7)
Headache	55 (6)
Joint pain	52 (6)
Skin rash	38 (4)
Abdominal pain	20 (2)
Vomiting	19 (2)
Haemorrhagic manifestations	9 (1)

**Discussion**

In this study, 21% patients were positive for dengue infection. These findings are in accordance with other studies conducted in India by Garg A<sup>[2]</sup> and Paramasivan R<sup>[5]</sup>. Ahmedabad is situated in West India on the bank of Sabarmati River. So there are lots of marshy places which

provide excellent mosquito breeding places. Further, it has been recently declared a megacity and as a result, rapid unplanned urbanization with unchecked construction activities and poor sanitation facilities contribute to fertile breeding grounds for mosquitoes. It is also true that an increase in the alertness among medical fraternity following the initial epidemic and the availability of diagnostic tools in the hospital have contributed to the increased detection of cases.

The higher prevalence of dengue infection was noted among males than females. The male to female ratio was 1.9:1 which correlates well with other studies undertaken in North India<sup>[2,6]</sup> and South India<sup>[4]</sup>. High prevalence amongst males is probably due to more outdoor activities by males in comparison to females which results in more exposure to day biting mosquitoes.

Majority of infection occurred in active adults in the age group of 18 to 35 years. These findings are consistent with other Indian studies.<sup>[4,6,8]</sup> Active adults are doing more outdoor work so there are more chances for them to get infected. However, in studies conducted in North India<sup>[2]</sup>, in Chennai<sup>[9]</sup> and in several international studies<sup>[10,11]</sup>, dengue has been reported to mainly a paediatric public health problem. True endemicity will be reached when the adult infection declines and only the new entrants into the population, that is, the children, are affected more by the disease.

To identify the seasonal variation of the disease, analysis of the data on monthly basis was done. The infection started spreading in August, peaked in October and slowly tapered by December. The seasonality of transmission of dengue with increased activity in monsoon and post monsoon season was seen in the present study; in accordance with the reported patterns of dengue transmission.<sup>[6]</sup> This seasonal outbreak of disease transmission is very important at local level for effective control measures and that preventive measures should come into full swing during water stagnation periods after the initial bouts of rainfall and at the end of monsoon. The clinical profile of dengue revealed that fever was the most common presenting symptom, 901 (97%). Similar studies in and around India have also reported the same pattern.<sup>[4]</sup>

## Conclusion

Definitive diagnosis is needed to detect early infection and initiate treatment which otherwise may result in life

threatening complications. Dengue affected predominantly males and active adult population. A seasonal trend was observed for dengue infections with maximum cases in post monsoon and late monsoon months which coincides with increased breeding of mosquitoes during these seasons. Therefore, vector control measures should be started before monsoon to prevent the outbreaks of dengue. This will simultaneously solve the problem of other mosquito borne diseases like malaria, chikungunya, Japanese encephalitis and filaria.

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