



## Trends of Dengue Cases Reported at Tertiary Care Hospital of Metropolitan City of Maharashtra: A Record Based Study

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## ABSTRACT

**Background & Objectives:** Recent national data showed increasing trends of dengue prevalence but significant decrease in death rates.<sup>1</sup> Understanding trends and epidemiology of dengue outbreaks would help in effective control of dengue in city. Therefore, the research was planned to study & compare the trends of dengue cases reported at Tertiary hospital, state & district levels during 2009 to 2015.

**Methods:** Six years data on 'Dengue cases admitted in a tertiary care hospital' was obtained from the Satellite Disease Surveillance Unit of Tertiary care hospital. District and state level data on dengue was mobilised from Public Health department authorities and websites. Tables and graphs were prepared. Data analysis and compilation was done with Microsoft Excel 2013.

**Result:** A total of 56,981 patients with fever were screened for dengue at tertiary hospital during the study period. Of these, 5082 patients (8.91%) were tested positive. There was tenfold increase in the Dengue cases in six years. Rise of confirmed dengue cases was seen at District and state level. 'Males' and 'Patients between 13-30 years age group' were more affected. There was declining trend of dengue case fatality rate.

**Conclusion:** Increasing trend of dengue indicates an alarming situation in the city and stresses more preparedness during monsoon season.

**Keywords:** Trends of Dengue, Seasonal distribution, Seropositivity

## INTRODUCTION

Dengue is the most rapidly spreading mosquito-borne viral disease in the world. There is no specific treatment for dengue fever. Besides, the dengue vaccine has a long way to go. In the last 50 years, incidence has increased 30-fold with increasing geographic expansion to new countries and in the present decade, from urban to rural settings. An estimated 50 million dengue infections occur annually and approximately 2.5 billion people live in dengue endemic countries.<sup>2</sup> Over 40% of the world's population is currently at risk of dengue. WHO SEARO when declared the Global strategy for dengue prevention and control' commented

that the south asia region is hyperendemic for dengue since the year 2000.<sup>3</sup> Likewise, some 1.8 billion (more than 70%) of the population at risk for dengue worldwide live in member states of the WHO South-East Asia Region and Western Pacific Region, which bear nearly 75% of the current global disease burden due to dengue.<sup>4</sup>

From the Indian perspective, dengue, which was previously presenting as a classic epidemic pattern has now changed the pattern causing large scale outbreaks involving both urban and rural areas.<sup>5</sup> In 1996, the country had experienced an outbreak recording a total number of 16517 cases (suspected) and 545 deaths. During 2003 as well, large number

of cases and deaths had been reported (12754 and 215, respectively). In the year 2006, there was again upsurge in DF/DHF cases in the country, with a total 11638 cases and 174 deaths reported by 21 states of the country.<sup>6</sup>

Foremost aim of present research is to study the trends of dengue over year 2009 to 2015 and to compare it with the city and state level data.

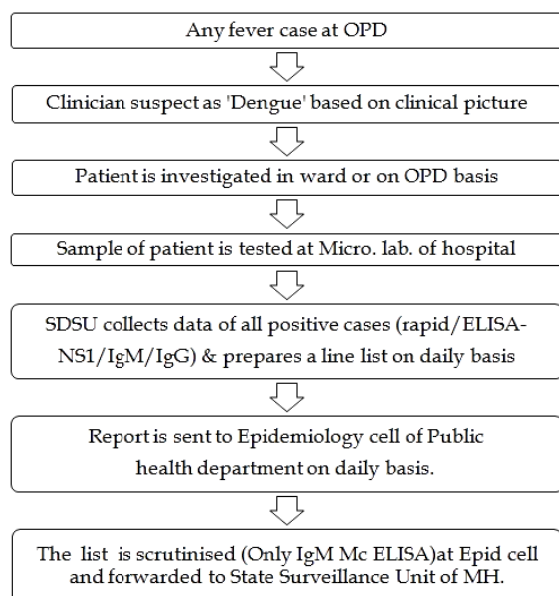
The true incidence and impact of dengue is likely significantly higher than that which is currently reported due to low case fatality rate, difficulties in diagnosis, and inconsistent comparative analyses. As far as diagnostics tests for dengue are concerned, National guidelines of India have recommended McELISA as a reliable tests for dengue diagnosis.<sup>7</sup> There are many national and international studies which have compared, evaluated rapid tests versus ELISA tests.<sup>8-10</sup> Thus, a study was planned to determine the case fatality rate, epidemiology & trends of diagnostic tests of dengue cases in the tertiary care hospital.

## METHODOLOGY

A retrospective study design was employed using data from Satellite Disease Surveillance Unit (SDSU) of tertiary care hospital.

**Dengue Epidemiological Data:** Both probable and confirmed cases are registered in dengue line listing proforma of SDSU at health care level on daily, weekly and monthly basis. All cases of dengue fever and Dengue hemorrhagic fever reported from Jan 2009 to December 2015 were collected from SDSU of tertiary care hospital of city. The trend of screening for dengue at hospital is by using Rapid tests. All rapid positive for IgM are re-evaluated with McELISA tests.

### Flow of information:



The present study included all dengue records (line lists) of tertiary care hospital between years 2009 to 2015. The data of dengue cases in all over Mumbai was collected from Epidemiology Cell of Mumbai after getting official approvals. State level data of dengue was mobilised from the official website of National Vector Borne Disease Control Program (NVBDCP).<sup>1</sup>

**Data Management and Processing:** The data on dengue case records were entered into excel spread sheet, checked for completeness (patient age, address, test result, date of diagnosis etc.). Rates and proportions were calculated wherever appropriate.

**Operational definition: As per recent Dengue Notification<sup>11</sup>**

**Suspected case of Dengue fever:** An acute febrile illness of 2-7 days duration with 2 or more of the following: Headache, Retro-orbital pain, Myalgia, Arthralgia, Rash, Hemorrhagic manifestations, Leucopenia.

**Probable case of Dengue fever:** A case diagnosed by medical officer as Dengue fever based on the clinical case definition or A case with fever with blood negative for malaria and not responding to anti-malarials WITH Supportive serology -either NS1/ IgM/IgG +ve cases (Rapid).

**Confirmed case of Dengue fever:** NS1/ IgM/IgG +ve cases (McELISA)

**Dengue Death:** A person died and who was positive for any of dengue serological tests like ELISA/Rapid/RT PCR and was declared by physician as dengue death (clinical judgments) at tertiary hospital.

**Case fatality rate due to dengue:** No. of Deaths per 100 dengue cases (confirmed and probable) for hospital and only confirmed for MCGM.

## RESULTS

A total of 56981 fever patients were suspected as a case of dengue at the tertiary hospital during the years of 2009 to 2015 and they were screened for dengue with Rapid and McELISA tests. Of these, 5082 patients were admitted to the hospital during as a probable or confirmed case of dengue on the basis of NS1/IgM/IgG positivity. Out of these, 57 patients died due to dengue. (Table 1)

The year wise data of tertiary hospital shows sharp increasing trend of suspected dengue cases. It was almost 10 times higher in the year of 2015 as compared to 2009. There were no ELISA positive cases in 2009 and 2011. The number of probable cases was more than confirmed dengue during all the years.

**Table 1: Year wise Data of Dengue Cases Reported in A Tertiary Hospital in Mumbai**

Year	No. of Dengue cases			No. of dengue deaths	Case fatality rate of dengue
	Suspected	Probable	Confirmed		
2009	2033	93	0	7	7.52
2010	2668	103	2	5	4.76
2011	5500	398	0	14	3.51
2012	3662	84	57	5	3.54
2013	9721	592	549	13	1.13
2014	13899	1104	512	5	0.3
2015	19498	1346	242	8	0.5
<b>Total</b>	<b>56981</b>	<b>3720</b>	<b>1362</b>	<b>57</b>	<b>Average=1.12</b>

**Table 2: Epidemiological Details of Patients Treated for Dengue at Tertiary Hospital (N=5082)**

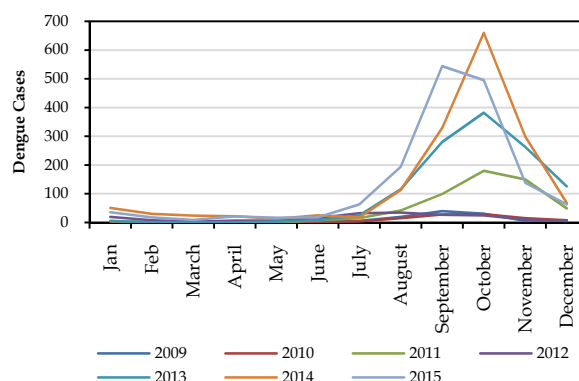
Details	Cases (%)	Deaths (%)
<b>Sex Wise Distribution</b>		
Male	3281(65.29)	29 (50.8)
Female	1744(34.71)	28(49.1)
<b>Age Wise Distribution (in years)</b>		
0-5	363(7.22)	7(12.2)
06-Dec	519(10.33)	7(12.2)
13-30	3083(61.35)	21(36.8)
31-59	906(18.03)	16(28.0)
60 and above	54(1.07)	6(10.5)
<b>Geographical Distribution</b>		
Mumbai	4322(86.1)	40(70.1)
Non-Mumbai	703(13.9)	17(29.8)
<b>Duration between onset of symptoms and Date of Admission (in days)</b>		
0-3	3897(77.5)	22(10.5)
4-6	1006(20.0)	29(47.3)
7-10	121(2.4)	2(33.3)
>10	1(0.01)	4(8.7)

**Table 3: Pattern of test positivity of dengue at Tertiary Hospital (N=1362)**

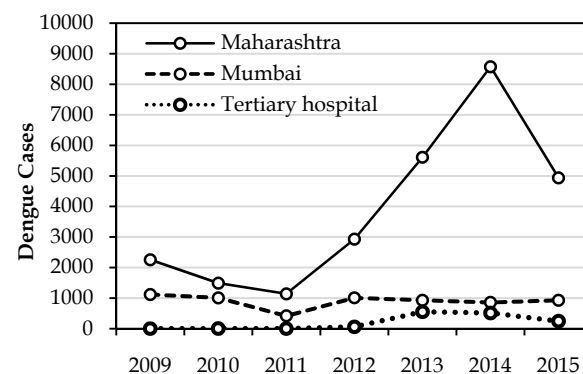
Type of Test	Dengue Cases (%)
NS1	789 (57.9)
IgM	408 (29.9)
IgG	95 (7)
IgG & IgM	68 (5)

Maximum number of confirmed cases was reported in the year 2013, but deaths were high during the year 2011. The CFR ranged from 0.5% to 7.5% in last seven years. There was 93.3% reduction in the case fatality rate of dengue from 2009 to 2015 with minimum CFR in the year 2014. The seropositivity for dengue (positive for Rapid and Mc ELISA) in the present study was calculated to be 8.91%. The proportion of confirmed dengue (Mc ELISA IgM +ve) cases was 2.39% out of suspected cases.

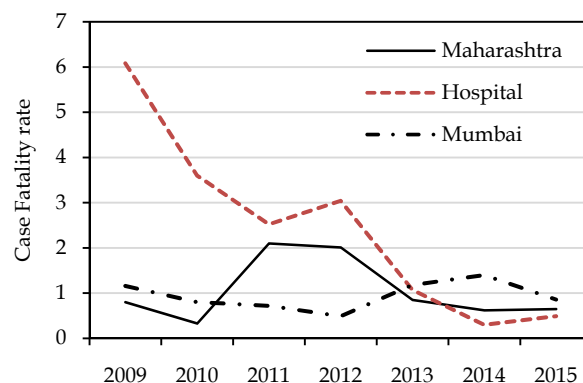
The male to female ratio in this study was 1.8:1. Maximum number (61.3%) of dengue cases were in the age group of 13 to 30 years. Most of the patients (86.1%) were from Mumbai region. Most of the patients (77.5%) reported to hospital within first three days of their symptoms (Table 2).



**Fig 1: Seasonal trends of Dengue cases reported at Tertiary Hospital during 2009-2015**



**Fig 2: Dengue trends at Tertiary hospital, Mumbai and Maharashtra during 2009-2015**



**Fig 3: Comparison of Case fatality rate of tertiary hospital with District and State Data**

Leptospirosis was the most common co-infection of dengue followed by typhoid. On analysis of death record, it was found that 50.1% dengue deaths were of female and 49.9% were of male. DHF (24.6%) and DSS (26.3%) were the most common mode of deaths in the dengue cases. The range of duration between 'onset of symptoms' to 'deaths' was from one day to 20 days with average of four days. Most of the patients (90%) who could not reach the hospital within 3 days of their illness died. (Table 2).

Most of the McELISA tests were based on NS1 detection (58%) as compared to IgM detection. (Table 3)

The maximum cases occurred in month of October in the year 2011, 2013, 2014. In 2015, the peak of cases occurred in September. There was no such peak in the year 2009, 2010 and 2012. (Fig. 1)

The graph (Fig. 2) depicts drop in cases from Maharashtra and Mumbai in the years 2011. The dengue cases rose from the year 2012 at all level. There was 50 % reduction of dengue in the year 2015 at state level and tertiary hospital. In Mumbai, the cases were stable in last four years.

The graph (Fig.3) exhibits a decline in the case fatality rate of Dengue for Maharashtra and Hospital from the year 2012 onwards however such decrease in Mumbai is observed after 2014.

## DISCUSSION

The study demonstrated, 2012, as a remarkable year from which there was a clear rise of dengue at hospital, district and state level. In 2012, many of the Indian states faced dengue outbreak.<sup>12</sup>

The sero-positivity indicated by present study was very low (8.91%) whereas it was high at New Delhi, Karnataka, Kolkata, Pune and Delhi (30%, 35.2 %, 58%, 65%, and 81%) in the year 2005-2006<sup>13</sup> and at Oddisha (21.05%) in the year 2012.<sup>14</sup> Low seropositivity in the present study may be due to high number of fever patients screened out for dengue which is nothing but denominator. 'Increase in the alertness among medical fraternity following the initial epidemic' and the 'availability of diagnostic tools in the hospital' may have contributed to the massive increased screening activity and relatively low sero-positivity.

A steady but massive increase in the number of suspected dengue patients over the past seven years (2009-2015) was noted that suggest increase in screening activity. A similar huge spike in suspected cases was observed at Philippines (64.8%) and other ASEAN countries like Malaysia, Thailand and Singapore.<sup>15</sup>

There was an alarming situation with increasing trend of dengue at state and district level. However, in the year 2015, there was drastic reduction of cases at Maharashtra and Tertiary hospital. In 2015, there was 27% deficit in rainfall that may be a key factor for 50% reduction of dengue cases all over state of Maharashtra.

The case fatality rate at tertiary hospital showed the declining trend in recent years (0.5%). The findings are in contrast with other studies done at Karnataka (11%) and Srilanka (3.7%) but comparable with study at Pakistan (0.86%).<sup>16-18</sup>. There was increased load of dengue admission at the hospital in recent years, but the improved clinical practices and better clinical preparedness of the hospital might have reduced the case fatality rate of dengue from 2009 to 2015. In addition, enormous control measures are implemented by Public health Department, Mumbai like frequent circulation of CIF (Case Investigation Form)<sup>19</sup> and recent treatment strategies to all the city hospitals, mass awareness with media use and huge IEC material that helps patients to get prompt treatment. Low CFR in Maharashtra point to adequate implementation of NVBDCP guidelines by health care systems.

Many studies at India indicated gradual increase in Dengue cases from June with a peak in September and October has been as in present study<sup>14,18,20,21</sup> except C. Jhansi at Tamilnadu observed the rise in November.<sup>22</sup> In September, the rains are light, short and infrequent, which in turn creates number of pools serving the Aedes mosquito for breeding. In addition, these months are festival seasons of city with lots of overcrowding that may have contributed to high transmission of infection.

Males and cases in the age group of 13 to 30 years of age were predominantly (65.12 %) affected due to dengue which is similar to the findings of other national and international studies.<sup>13,14,18,20,23</sup>.

Rapid tests are not be used as a stand-alone test.<sup>9</sup> Increased use of rapid tests was observed in the present study. Adequate supplementation of Rapid test kits by Public Health Dept. of Mumbai to all hospitals ensures the extensive screening for dengue. In addition, every positive rapid test is again tested by McELISA tests for confirmation at tertiary hospital. It was surprising to notice almost 2/3<sup>rd</sup> of patients reporting at tertiary hospital at early stage (within first 5 days of illness) and so was the most of the McELISA tests were based on NS1-antigen detection as compared to IgM detection as those are only sensitive in the early phase of infection.<sup>8</sup> Most of patients who died due to dengue reached late to hospital. Reaching the tertiary hospital at early stage of illness may have prevented deaths among dengue patients.

## LIMITATION

The present study does not exhibit the community-based picture as the data is hospital derived. The clinical profile of patients could not be determined as data is retrieved from line list merely.

## CONCLUSION

The study represents a growing challenge to Public Health officials of Mumbai city. Death risk due to dengue is certainly low in well-equipped hospitals of Mumbai however more preparedness is required in view of frequent Dengue outbreaks at different wards of city during monsoon season. It is hoped that this evaluation of contemporary dengue risk distribution and burden will help to progress that goal. High-rise of cases in September demands vigorous breeding control activities in month of August. The findings propose that internal transport and prompt referral system may play a role in provision of timely management to dengue patients.

The alarming situation of growing dengue incidence in the country stresses extensive screening at different health care levels. The present study though not focussed on serotypes would like to recommend serotyping based surveillance in Mumbai to detect future outbreaks.

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