



SEROPREVALENCE OF DENGUE IN A TERTIARY CARE HOSPITAL: CROSS SECTIONAL STUDY

Microbiology

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ABSTRACT

Background: Dengue is endemic and an important emerging public health problem in India. Dengue illness is major concern causing increased morbidity and mortality. Disease burden is highly variable between different places within a country. This study was conducted to determine the age wise seroprevalence of dengue and seasonal variation of dengue infection in tertiary care hospital in Mumbai. **Materials And Methods:** The present cross sectional study was conducted from January 2021 to March 2022 for a period of 15 months. Total 1550 serum samples were collected from suspected dengue cases. All the samples were subjected to ELISA for detection of dengue NS1 antigen and IgM antibody. **Results:** Out of 1550 suspected dengue patients 187 (12.06%) were seropositive for NS1 antigen or IgM antibody or both NS1 antigen & IgM antibody. Of 187 seropositive dengue cases 121 (64.71%) were male and 66 (35.29%) were female. The maximum dengue cases (31.55%) were from 31-40 years age group, followed by 21-30 (23.52%) years. Most dengue positive cases were seen in monsoon period. The monsoon peak was observed in September (22.00%) followed by August (17.11%). However, in May (dry season) few cases were reported. **Conclusion:** Dengue illness is a major public health concern. With early diagnosis and treatment, morbidity and mortality can be reduced. Knowledge of prior infection is also very important if vaccination strategy by WHO is implemented in future. Maximum cases were observed in monsoon period but dengue cases were seen throughout the year. Hence continuous surveillance of cases is required for early diagnosis and treatment, to know the prevalence throughout the year, for vector control measures & administration of dengue vaccine as per WHO strategy if implemented in future in our country.

KEYWORDS

Dengue, Dengue positivity, ELISA.

INTRODUCTION

Dengue is an emerging public health problem in tropical and subtropical countries^{1,2}. It is an arthropod borne viral illness³ caused by single stranded positive sense RNA virus which belongs to family Flaviviridae, genus Flavivirus⁴. It is transmitted, mainly by Aedes aegypti and sometimes by Aedes albopictus^{5,6}. It has four serotypes DEN-1, DEN-2, DEN-3 and DEN-4 and a new serotype DEN-5, has been identified in the year 2013⁴.

The WHO 2009 classification divides dengue fever into two groups: dengue with or without warning signs and severe Dengue^{7,8}. Characteristic manifestations of dengue illness are continuous high fever lasting 2-7 days, hemorrhagic tendency, thrombocytopenia. The most critical form of illness is dengue shock syndrome (DSS)^{8,9}.

Annual global burden of disease is reported as 390 million dengue infections¹⁰. According to recent estimates, 2.9 million dengue episodes and 5906 deaths, occur annually in Southeast Asia (SEA) alone¹¹.

In India, dengue virus was first isolated in the year 1945⁷ and first outbreak of dengue was reported in Kolkata in 1963-64^{10,12}. In the 1996, approximately 16 000 dengue cases and 545 deaths occurred throughout India¹². In 2003 and 2005, 12754 dengue cases, 215 deaths and 10824 dengue cases, 87 deaths were recorded respectively¹³. In 2006 more than 12,000 cases and nearly 184 deaths were reported¹³. In 2009, in India 15535 cases were recorded with 96 deaths while in 2010, 28292 cases with 110 deaths occurred¹³. Since 2010, the incidence of dengue has increased to about 15 per million people annually in different states. Every year more than 100 000 infections and 200-400 deaths occur throughout India¹⁴. Current estimates in the year 2022 (till oct 2022), national vector borne disease control Programme (NVBDCP) reported 110,473 dengue cases and 86 deaths in India¹⁵.

As per national vector borne disease control Programme (NVBDCP), Maharashtra reports 7829 dengue cases and 65 deaths in 2017, 11011 dengue cases and 55 deaths in 2018, 14907 dengue cases and 29 deaths in 2019, 3356 dengue cases and 10 deaths in 2020, 12720 dengue cases and 42 deaths in 2021 respectively¹⁵. In the year 2022 (till oct 2022) reported 6330 dengue cases and 5 deaths in Maharashtra¹⁵.

High index of clinical suspicion is of utmost importance for diagnosis

of dengue infection but most of the time presenting symptoms are not enough for diagnosis. hence early laboratory diagnosis with reliability is important for patient management and implementation of control measures. Literature review shows paucity of data on dengue prevalence in and around western region of Maharashtra so we conducted the study to find out age wise seroprevalence, presenting clinical manifestations and seasonal variation from our region.

MATERIALS AND METHODS

The present cross sectional study was conducted from January 2021 to March 2022 in the serology division, Microbiology Department of a tertiary care hospital in Mumbai, India. The study was approved by institutional ethics committee. Informed consent was taken from all the study participants.

3-5ml of venous blood sample was collected aseptically in plain vacutainer from clinically suspected dengue cases. Study participants were distributed sex-wise and age wise into age groups 0-10 years, 11-20 yrs, 21-30 yrs., 31-40 yrs., 41-50 yrs., 51-60 yrs and more than 61 years of age.

Serum was separated by centrifugation of blood samples at 2000 rpm for 2 minutes and refrigerated at 2-8°C. All the serum samples were subjected to ELISA for detection of NS1 antigen by using Microlisa ELISA kit manufactured by J. Mitra and Co. Pvt. Ltd and IgM antibody by using NIV MAC ELISA- version 2.4 kit manufactured by National Institute Virology, Pune. The procedure and interpretation of results was done as per the criteria mentioned in the kit literature.

RESULTS

During the study period from January 2021 to March 2022, a total of 1550 serum samples were tested. Of the total serum samples tested, 187 (12.06%) were positive for dengue (Graph.1).

Out of 187 positive cases 84 (45%) were NS1 antigen positive, 79 were IgM (43%) antibody positive, 24 (13%) were both NS1 and IgM positive by ELISA (Table.1).

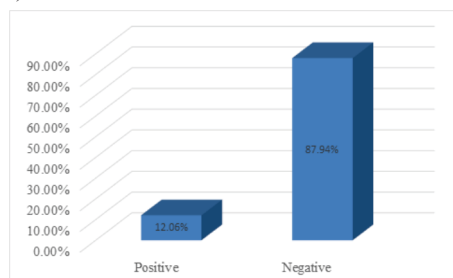
Of all dengue positive cases, 121 (64.71%) were males and 66 (35.29%) were females. Male to female ratio was 2:1 (Table.2).

The most affected age group was 31-40yrs (31.55%) followed by 21-

30yrs (23.52%)(Table.3)

Dengue seropositivity ranges from 0.5% to 1.5% in the month of January to March & December and 3% to 7% from April to June. However, increase in no. of cases was observed in the month May (dry season). Seropositivity gradually increased from July to September. (Graph.2)

Fever was the major presenting symptom in almost all cases (100%) followed by headache (70%), myalgia (61%), retro orbital pain (58%), abdominal pain (43%), vomiting (34%), rash (9%), petechiae (2%). (Graph.3)



Graph 1. Dengue Elisa Positive Case

Table.1 Test-wise Positivity Of Dengue

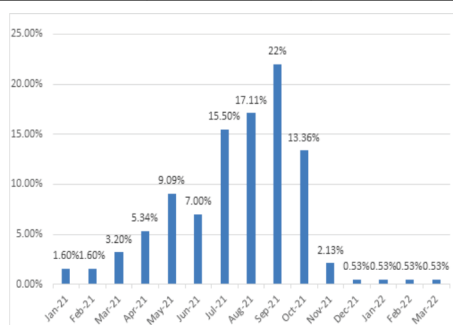
Test	No. of samples positive	Percentage
NS1 ELISA	84	45%
IgM ELISA	79	43%
NS1 & IgM ELISA	24	13%
TOTAL	187	100%

Table 2. Sex Wise Distribution Of Dengue Cases

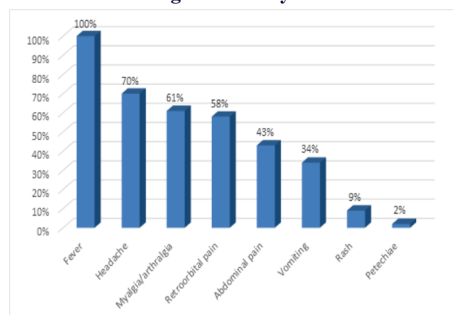
Sex	Dengue positive	(%)
Male	121	64.71%
Female	66	35.29%
Total	187	100%

Table 3. Age-wise Distribution Of Dengue Cases

Age group	Positive cases	Percentage (%)
0-10	10	9.62%
11-20	16	15.0%
21-30	25	23.52%
31-40	33	31.55%
41-50	12	11.76%
51-60	5	4.81%
>61	4	3.74%



Graph 2. Month-wise Dengue Positivity



Graph 3. Clinical Presentation Of Dengue Cases

DISCUSSION

Literature review shows outbreaks of dengue fever were reported every year in India. NVBDCP states that since 2010, the incidence of dengue has increased to about 15 per million people annually in India¹⁴. For control of epidemics and outbreaks, management of cases and implementation of WHO vaccination strategy in future necessitates knowledge of seropositivity in the population. Also variation in seroprevalence is reported from time to time & place to place. Hence this study was carried out to determine age wise seroprevalence, predominant presenting manifestations and seasonal variation from the western region of Maharashtra.

The present cross sectional study comprising of 1550 clinically suspected dengue cases was done in a tertiary care hospital. Most of the cases presented with fever (100%), followed by headache (70%), myalgia (61%), arthralgia (61%), retro-orbital pain (58%), abdominal pain (43%) and vomiting (34%). Rash and petechiae was observed in 9% and 2% of the cases. In the present study fever was the predominant presenting symptom which is in accordance with studies done by Min-Shen Lee et al. in 2006¹⁶, Shahid Ahamed et al. in 2008¹⁷, Turbadkar D. et al. in 2012¹⁸ & Mahesh Kumar et al. in 2015¹⁹. Our study found 61% of seropositive cases presented with myalgia which is in correlation with studies done by Min-Shen Lee et al. in 2006¹⁶ (68%) and Shahid Ahamed et al. in 2008¹⁷ (67%).

Mahesh Kumar et al. in 2015¹⁹ reported arthralgia in 64% cases this is agreement with our study 61%. However, our study showed 70% cases presented with headache which is in discordance with studies done by Min-Shen Lee et al. in 2006¹⁶ (55.4%) and Shahid Ahamed et al. in 2008¹⁷ (54%). Studies conducted by Min-Shen Lee et al. in 2006¹⁶, Shahid Ahamed et al. in 2008¹⁷, Mahesh Kumar et al. in 2015¹⁹ reported rash in 53.7%, 28%, 21% respectively, we found rash only in 9% of the cases.

Other febrile illnesses like leptospirosis, chikungunya and malaria may also manifest with these signs and symptoms. Confirmation of cases merely on the basis of clinical presentation is not possible. Therefore, laboratory diagnosis is of utmost necessity for confirmation & management of suspected case.

Dengue seropositivity in the present study (2022) was 12.06%. While, different studies in Mumbai region show seropositivity 12% in 2007, 32.8% in 2008, 7.2% in 2009, 12.4% in 2010, 17.1% in 2011, 13-19% in 2012, 29.5% in 2013, 25.8% in 2014, and 29.8% in 2015, 7.8 % in 2018²⁰. This shows variation in seropositivity from time to time in this region which may be due to variability of rainfall, varying climatic conditions, population migration or ongoing construction. Seropositivity in our study was in concordance with Turbadkar D. et al. in 2012 (13.6%)¹⁸. Our study reported lesser seropositivity than that reported by Garg et al. in 2011²¹, Sood S. et al. in 2013²², Chitkara et al. in 2018²³, Trupti Bajpai et al. in 2021²⁴, were 19.7%, 18.9%, 20.4%, 18.4% respectively. Whereas, higher than that recorded by Mahesh Kumar et al. in 2015¹⁹ and Patel and Bhatnagar et al. in 2018²⁵ reported 3.55% and 9.68% seropositivity.

Sex wise distribution of dengue positive cases in the present study shows that males (64.71%) were more affected than the females (35.29%), which is in accordance with studies done by Kumar et al.¹⁹, Gupta et al.²⁶, Ukey et al.²⁷. Male preponderance may be due to more involvement in outdoor activities as compared to females increases their chances of exposure to day-biting mosquitoes^{23,25,28,29}. Also as per their socioeconomic status females may neglect seeking care from health care center.

Dengue seropositivity most predominantly seen in 31-40 years age group (31.55%). Second most affected age group was 21 to 30 yrs. (23.52%), this is in accordance with most of the other studies conducted by Ekta Gupta et al.²⁶, Laxmi et al.²⁸, Gargi Gosh et al.³⁰, R. N. Makroo et al.³¹. The high incidence of seropositivity among young adults shows, they were increasingly exposed to mosquito bites due to their habits of involving in brisk outdoor activities

One of the significant finding in our study was that, the disease was constantly present all the year around and other important finding was that, cases were seen in May (summer). Maximum dengue positive cases were seen during monsoon period from July (13.3%) to September (21.9%). The month of October post monsoon period had 12.3% dengue positive cases. The number of dengue positive cases

reduced from November (2.9%).

Correlation between occurrence of dengue and monsoon season is noticed clearly in our study and further assisted by the similar findings of Rathore et al.²⁹ and Lal et al.³², Shilpi Hora et al. in 2018³³ and Gunasekaran P et al. in 2011³⁴. Monsoon & post monsoon period is beneficial for breeding of *Aedes aegypti* along with increased lifespan. Increased number of breeding sites due accumulation of stagnant water which favors increased transmission of disease.

CONCLUSION

Dengue illness is a major public health concern. With early diagnosis and treatment, morbidity and mortality can be reduced. Knowledge of prior infection is also very important if vaccination strategy by WHO is implemented in future. Dengue cases were seen throughout the year but maximum cases were observed in monsoon period. Hence continuous surveillance of cases is required for early diagnosis and treatment, to know the prevalence throughout the year, vector control measures & administration of dengue vaccine as per WHO strategy.

Limitation

Dengue IgG ELISA couldn't performed due to unavailability of dengue IgG ELISA kit,

Statements & Declarations

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