

Original Research Article

SEROPREVALENCE AND SEASONAL VARIATION OF DENGUE AT TERTIARY CARE HOSPITAL IN WESTERN MAHARASHTRA -5 YEAR RETROSPECTIVE STUDY

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ABSTRACT

Background: The growing effect of dengue infection on health and its mortality is an essential global issue. Therefore, it is of interest to study the current trends of dengue infection in India. Population explosion, poor waste management and drainage systems, migration, globalization, rapid urbanization, smart city work and diseases spread by the day-biting mosquito are the few reasons that dengue has made its place as one of the fastest emerging viral infections. In India case detection, case management, and integrated vector control are the main strategies for dengue prevention and control. Prevention of new incidence of dengue can be done by timely instituting the vector control measures.

Materials and Methods: A retrospective study was conducted at a tertiary care centre for a period of 5 years. Samples from patients suggestive of dengue like illness were received at the department of Microbiology. The serum samples were tested for NS1 antigen detection, IgM and IgG antibody detection by Dengue Day1 test (immune chromatography method).

Results & Conclusion: It was observed that Dengue cases start to rise in July and peaks in October and November and falls in December. The cases are seen more in monsoon and post monsoon season due to the favourable climate for the vector to breed and multiply. In the last 5 years it was also observed that the incidence of Dengue showed a decreasing trend after 2022. This may be due to the measures taken to control vector and promoting use of personal protection to get rid of mosquito bite.

Keywords: dengue, seasonal variation, Immunochromatographic dengue test.

INTRODUCTION

Dengue is one of the top emerging viral diseases. For the past 20-30 years it was restricted to only a few states of South and Northern India but in the last decade it has affected almost all the states of India.^[1] According to a study, an estimated 105 million infections occur worldwide every year, only 51 million of which are symptomatic, making it a major public health issue.^[2] The first case of dengue was reported by Benjamin Rush in 1789. Even though the first epidemic of dengue was reported from Chennai in India, the virologically proven epidemic occurred in Kolkata in the 1950s.^[1,3] Dengue is caused by arboviruses of the family Flaviviridae, a

vector borne disease spread by the day-biting endophilic Aedes mosquito. Its clinical features tend to be vague and nonspecific, ranging from fever to hemorrhage and shock. In some cases, the symptoms worsen to life threatening situations such as "Severe Dengue," "Dengue Hemorrhagic Fever (DHF)," or "Dengue Shock Syndrome (DSS)" and even Death due to DENV infection.^[4-6]

Population explosion, poor waste management, lack of proper drainage systems, migration, globalization, rapid urbanization, deforestation are some of the reasons for migration of people from rural to urban areas in search of livelihood. This leads to failure of the city's sanitary system resulting in open drainage, water logging and improper waste disposal which

causes the vector breeding areas to thrive.^[7] The vector is active throughout the year and so is the disease. The maximum transmission and disease incidence is seen in months of monsoon and post monsoon season as it favours the collection of water at various sites e.g. old tires, coolers, old earthenware pots, coconut shells etc. which acts as a good mosquito breeding site.^[8] Dengue control in India is based on vector control practices such as indoor space spraying, fogging, environmental management and promotion of personal protection.^[9] Climate changes favour the survival of vector mosquitoes and contribute to increased DENV transmission. Several studies were conducted worldwide to demonstrate that climatic factors, such as temperature, rainfall, and humidity are the most important correlates of dengue transmission and changes in these factors act as determinants of the intensity and period of transmission.^[10-12] Dengue incidence exhibits seasonal variation. The incidence starts in June, reaches its peak in post monsoon season of September, October and slowly falls thereafter.^[7]

Immunochromatographic test is used to detect the NS1 antigen, IgM and IgG antibody in serum samples of patient as early as day one for presumptive diagnosis. These Rapid ICT tests are easy to use and cost effective. This study was conducted to know the seroprevalence, seasonal variation, and recent trends of dengue in last 5 years (2021-2025).

MATERIALS AND METHODS

This retrospective observational study was conducted in department of Microbiology at tertiary care hospital in western Maharashtra from January 2021-December 2025. Samples were obtained from patients suggestive of dengue like illness. Fresh blood samples were received in plain vacutainer in serology section. The serum samples were tested for NS1 antigen, IgM and IgG antibody by Dengue Day1 test. (immunochromatography method)

Table 1: Serological tests and their possible interpretations [7,19]

Test results	Interpretations
NS1, IgM and IgG all non-reactive	Not dengue case
NS1, IgM and IgG all reactive	dengue case
NS1 reactive	Early primary case
IgM reactive	Late primary case
NS1+ IgM reactive	Early secondary case
NS1+ IgG reactive	Late secondary case
IgG	Old case

RESULTS

Total 10051 samples were collected in the period of 5 years. Out of which 859 (8.54%) were positive for NS1 antigen, 454 (4.51%) were positive for antibodies and 194 (1.93%) were positive for both antigen and antibody.

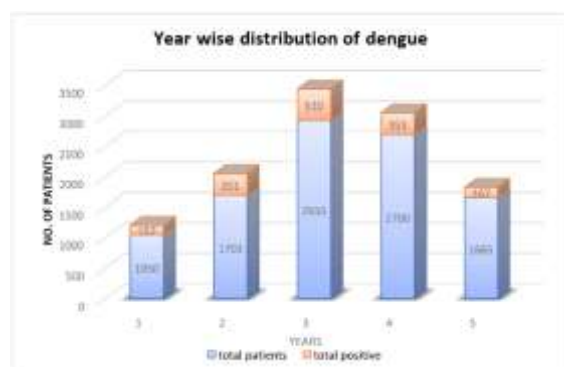
In 2021, total 1058 samples were collected out of which 159 (15.02%) samples were positive dengue cases, 75 (7.08%) were positive for NS1 antigen, 62 (5.8%) were positive for antibodies and 22 (2.07%) were positive for both antigen and antibody. In this year most of the cases were seen in the month of August to November.

In 2022 total 1703 samples were collected out of which 333 (15.55%) samples were positive dengue cases, 186 (10.92%) were positive for NS1 antigen, 77 (4.52%) were positive for antibodies and 70 (4.11%) were positive for both antigen and antibody. In this year most of the cases were seen between August and November.

In 2023 total 2933 samples were collected out of which 496 (16.91%) samples were positive dengue cases, 316 (10.77%) were positive for NS1 antigen, 134 (4.56%) were positive for antibodies and 46 (1.56%) were positive for both antigen and antibody. In this year most of the cases is seen between the months of August to November.

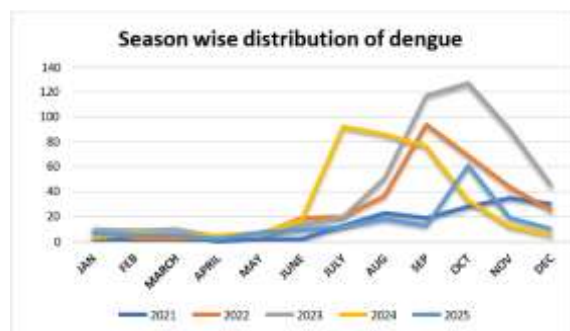
In 2024 total 2700 samples were collected out of which 348 (12.88%) samples were positive dengue cases, 200 (7.40%) were positive for NS1 antigen, 112 (4.14%) were positive for antibodies and 34 (1.25%) were positive for both antigen and antibody. In this year most of the cases is seen between the months of July to October.

In 2025 total 1665 samples were collected out of which 167 (10.03%) samples were positive dengue cases, 82 (8.92%) were positive for NS1 antigen, 69 (4.14%) were positive for antibodies and 17 (1.02%) were positive for both antigen and antibody. In this year most of the cases were seen in the month of October.



It last 5 years it was observed that maximum cases were seen in 2023, there after the cases started to

decrease. The cases were detected throughout the year but maximum cases were witnessed in the monsoon and post monsoon seasons.



In the year 2021 most of the cases were seen in the month of August to December. In the year 2022 most of the cases were seen in between July to December. In the year 2023 most of the cases were seen between the months of August to November. In the year 2024 most of the cases were seen between the months of July to October. In the year 2025 most of the cases were seen between the months of July to November. Dengue is seen throughout the year, but number of cases rise in the monsoon and post monsoon season, there after number of cases falls. This region receives the rainfall from June to September hence the maximum cases is seen in these months.

DISCUSSION

Population explosion, poor waste management, lack of proper drainage systems are some of the causes for the spread of Dengue infection. The cases were seen throughout the year, but high in monsoon and post monsoon season. This is due to water logging areas which becomes the breeding area for the vector. Western part of Maharashtra receives monsoon in between June and September. So the cases start increasing in the month of June and reach maximum in the month of September and October.

In India, case detection, case management, and integrated vector control are the main strategies for dengue prevention and control.^[3]

In the present study, total 10051 sample were collected in a period of 5 years, which showed that 1538 (15.30%) were positive for dengue virus infection. Similar study done by Prabhu Prakash et al,^[13] in western India and Nirmala Poddar et al,^[14] in eastern India showed 54% and 25% dengue cases, which is high compared to this study. Another study conducted by Kalita et al,^[15] reported seropositivity of 14.85 % which is similar to the present study.

Patient's with fever & clinically suspected Dengue like symptoms were tested, for NS1, IgM and IgG. We found that 8.55% were seen positive for NS1 antigen, 4.51% were positive for antibodies and 1.94% were positive for both antigen and antibody. Similar study was done Nirmala Poddar et al.^[14] In study period of 5 years number of positive Dengue cases seen in 2021 was 14.95%, in 2022 was 20.61%,

in 2023 was 17.38%, in 2024 was 13.07% and in 2025 it was 9.90%.

The rate of dengue cases remains same in 2021 and 2022 slightly increased in 2023 there after started decline in 2024 and 2025. This may be due to the awareness created in the public about the spread of Dengue.

Western part of Maharashtra receives rainfall from June to August and the cases also spikes in these months. The Dengue cases are seen more in the monsoon and post monsoon season. Similar results were reported by several other authors.^[5,14,16] The association between the rainfall and rise in Dengue cases is observed in other studies also. In Thailand, significant positive association was found between two months' cumulated rainfall and dengue virus infection at a temperature more than 23.2°C¹⁷. In Singapore, cumulative rainfall has been found to increase dengue incidence linearly, at a lag ranging from 5–20 weeks.^[18]

Test for NS1 antigen does not show any cross reaction with Japanese encephalitis virus, yellow fever virus or any other related viruses of Flaviviridae family. This makes NS1 detection a reliable and key test to diagnose early dengue infection. Levels of sero-markers with respect to duration of dengue are as follows, NS1 antigen is detectable up to 9 days from the onset of infection. IgM antibodies start rising by 3-5 days and peak in 2 weeks and decrease to undetectable levels by another 3 months. By the end of the first week of infection the last sero-marker IgG antibodies start rising and are detectable for life.^[7] In this study we can see there is increase in the NS1 rate 7.08% in 2021, 10.92% in 2022, 10.77% in 2023 then started to decrease to 7.40% in 2024 and 4.98% in 2025. Total 81.25% of cases were primary dengue cases, which include early as well as late infection which is similar to study done by Sneha et al,^[7] (81.5%), and in contrast to in a study by Bhattacharya et al,^[18] (26%). In the present study secondary dengue infection was 12.35%, while it was 5.9% in study by Bhattacharya et al¹⁸ and 0.6% in study by Sneha et al.^[7] A total of 2.99% of cases in the present study were IgG positive (old dengue cases) which is much lower than 34.2%¹⁸ and 17.8%⁷ as reported by other studies. In this study cases increased in the monsoon season (June) and reached maximum in the post monsoon season (October and November); this is supported by studies done by Atul Garg et al,^[20] Sneha et al.^[7] As this tertiary care centre is in high-burden urban zone, the municipal corporation, under the State's National Vector Borne Disease Control Programme is taking several measures to eliminate the breeding site of mosquito by removal of water hyacinth from river bed, spraying of insecticides to lessen the mosquito breeding in ponds and pits near the beds of river and fogging of insecticides to control the mosquito.^[21] This has led to gradual decrease in cases over the last 5 years.

Dengue being a vector born disease, educating the people about using the protective measures to avoid

the mosquito bite and keeping the surrounding free from water log play a major role in preventing Dengue. Insect control department of Municipal Corporation do periodic visits and take measures to eliminate the breeding site of mosquito and fogging especially during monsoon and post monsoon, prevent the incidence of dengue.

CONCLUSION

Dengue is a major public health problem. More cases are reported in the monsoon and post monsoon season, this shows there is a need to strictly implement the control measures to cut down the vector breeding site. As Dengue fever can range from mild disease to very severe dengue shock syndrome, there is a need to increase the awareness among the people to take proper care of their surroundings, use proper protective measures to avoid mosquito bite. A coordinated action of the local authorities and the people is required to decrease the incidence of Dengue.

REFERENCES

1. Darshan BB, Holla R, Unnikrishnan B, Achappa B, Poovattil R, Sharma A, Simmy S, Prateek S. Clinical and seasonal pattern of dengue in a tertiary care hospital of South West India. *F1000Research*. 2024 Mar 11;12:817.
2. Mane D, Kakade SV, Patil SS. Dengue infections in India: A meta-analysis. *Bioinformation*. 2024 Oct 31;20(10):1221.
3. Murhekar MV, Kamaraj P, Kumar MS, Khan SA, Allam RR, Barde P, Dwivedi B, Kanungo S, Mohan U, Mohanty SS, Roy S. Burden of dengue infection in India, 2017: a cross-sectional population based serosurvey. *The Lancet Global Health*. 2019 Aug 1;7(8):e1065-73.
4. Akbar SM, Khan S, Mahtab M, Al Mahtab M, Yahiro T, Arafat SM, Sarker MA, Podder PK, Hossain MS, Khandokar FA, Hassan MR. Recent dengue infection in Bangladesh: A seasonal endemic progressing to year-long serious health concern. *Euroasian journal of hepato-gastroenterology*. 2023 Jul;13(2):145.
5. Singh PS, Chaturvedi HK. A retrospective study of environmental predictors of dengue in Delhi from 2015 to 2018 using the generalized linear model. *Sci Rep* 12(1): 8109 [Internet]. 2022
6. Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in india. *Indian Journal of Medical Research*. 2012 Sep 1;136(3):373-90.
7. Kukanur FS, Naveen G, Chitrabanu NA, Prashant BM, Meghana R, Venkatesh VN. Magnitude, Seasonal-variation, Serological and Hematological Profile of Dengue in a Tertiary Teaching Hospital, Karwar, India. *Journal of Pure & Applied Microbiology*. 2021 Dec 1;15(4).
8. Biradar A, Kauser Y, Itagi I, Jamadar NA. Dengue infection: its prevalence with seasonal variations. *Indian J Microbiol Res*. 2016;3(2):89-92.
9. Hussain SS, Dhiman RC. Distribution expansion of dengue vectors and climate change in India. *Geohealth*. 2022 Jun;6(6):e2021GH000477.
10. Singh PS, Chaturvedi HK. Temporal variation and geospatial clustering of dengue in Delhi, India 2015–2018. *BMJ open*. 2021 Feb 1;11(2):e043848.
11. Ebi KL, Nealon J. Dengue in a changing climate. *Environmental research*. 2016 Nov 1;151:115-23.
12. Samal RR, Gupta S, Kumar S. An overview of factors affecting dengue transmission in Asian region and its predictive models. *Journal of Applied and Natural Science*. 2020;12(3):460.
13. Prakash P, Gupta E, Nareda P, Gupta E, Agarwal R, Ashopa V, Beelwal A. Seroprevalence and incidence of primary dengue infection and its correlation with fetomaternal prognosis in Western Rajasthan. *Journal of Family Medicine and Primary Care*. 2023 Aug 1;12(8):1525-30.
14. Poddar N, Pathi BK, Panigrahi K, Pattnaik D, Jena J. Seroprevalence and changing trend of dengue in a tertiary care hospital, Bhubaneswar, Odisha: Four-year retrospective study. *Indian J Microbiol Res*. 2022;9(1):50-4.
15. Kalita JM, Aggarwal A, Yedale K, Gadepalli R, Nag VL. A 5-year study of dengue seropositivity among suspected cases attending a teaching hospital of North-Western region of India. *Journal of Medical Virology*. 2021 Jun;93 (6):3338-43.
16. Ramachandran VG, Roy P, Das S, Mogha NS, Bansal AK. Empirical model for estimating dengue incidence using temperature, rainfall, and relative humidity: a 19-year retrospective analysis in East Delhi. *Epidemiology and health*. 2016 Nov 27;38:e2016052.
17. Sriprom M, Chalvet-Monfray K, Chaimane T, Vongsawat K, Bicout DJ. Monthly district level risk of dengue occurrences in Sakon Nakhon Province, Thailand. *Science of the total environment*. 2010 Oct 15;408 (22):5521-8.
18. Hii YL, Rocklöv J, Ng N, Tang CS, Pang FY, Sauerborn R. Climate variability and increase in intensity and magnitude of dengue incidence in Singapore. *Global health action*. 2009 Nov 11;2(1):2036.
19. Bhattacharya N, Mukherjee H, Naskar R, Talukdar S, Das G, Pramanik N, Hati AK. Serological diagnosis of dengue in laboratory practice in Kolkata. *Indian journal of medical microbiology*. 2014 Jul 1;32 (3):277-80.
20. Garg A, Garg J, Rao YK, Upadhyay GC, Sakhuja S. Prevalence of dengue among clinically suspected febrile episodes at a teaching hospital in North India. *J Infect Dis Immun*. 2011 May 31;3(5):85-9.
21. <https://www.pmc.gov.in>.