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Original Research Article

Prevalence of Dengue Fever and its Seasonal Trend in Tertiary Care Hospital in Western Maharashtra

Dhirendra Kumar Pandey[1], Nishat Khan[2], Nirjhar Chatterjee[3], Reena Set[4]

[1]Junior Resident, Department of Microbiology, Topiwala National Medical College & BYL Nair Ch. Hospital, Mumbai

[2]Additional Professor, Department of Microbiology, Topiwala National Medical College & BYL Nair Ch. Hospital, Mumbai

[3]Assistant Professor, Department of Microbiology, Topiwala National Medical College & BYL Nair Ch. Hospital, Mumbai

[4]Professor & Head, Department of Microbiology, Topiwala National Medical College & BYL Nair Ch. Hospital, Mumbai

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Corresponding Author: Dr. Dhirendra Kumar Pandey

Conflict of interest: Nil

Abstract:

Background: Dengue is an acute febrile illness caused by Dengue virus. The main vector is the female mosquito Aedes albopictus. Dengue fever ranges from a mild asymptomatic form to severe dengue haemorrhagic fever (DHF) with or without dengue shock syndrome (DSS). The aim of the study was to know the prevalence of dengue and its seasonal trend in western Maharashtra.

Materials and Methods: The present study is a retrospective analytical study conducted at Tertiary care Hospital, from January 2019 to December 2022. Descriptive analysis was done and data was presented as numbers and percentages. Total 53302 blood samples were analysed during the study period. Rapid positive serum samples (2621) samples were subjected to ELISA for detection of NS1Ag and IgM Ab.

Result: A total of 53302 blood samples were analyzed during this study period, of which 2621 samples were positive for dengue fever by immunochromatographic rapid test out of which 1763 samples were positive for Dengue by ELISA for different serological markers like NS1 and IgM antibody. Overall prevalence was 67.26%. In the present study, prevalence of dengue positive cases was 1134 (77.24%) in 2019, 75 (32.90%) in 2020, 263 (52.90%) in 2021, 291 (67.99%) in 2022.Out of 1763 samples prevalence of NS1 (Ag) was 71.25% and IgM was 61.57%. Most number of dengue cases were in the month of September & October.

Conclusion: The overall prevalence was 67.26%. The period of COVID-19 pandemic was associated with the decline in Dengue cases and prevalence probably due to decreased testing or similarities in presentation of both diseases leading to delayed testing. The seasonal variation matches with breeding time of mosquitos, which shows an increased prevalence of dengue cases in monsoon.

Keywords: Dengue Fever, ELISA, Prevalance, Seasonal Trends.

Introduction

Dengue the break bone fever is a flaviviral infection found in large areas of tropical and subtropical regions [1]. The serotypes of this virus are DENV-1, DENV-2, DENV-3 and DENV-4. The main vector for transmission of dengue is female Aedes aegypti mosquito followed by Aedes albopictus [2].The incidence of dengue has grown dramatically around the world in recent decades, with the cases reported to WHO increased from 505 430 cases in 2000 to 5.2 million in 2019. One modelling study estimate indicates 390 million dengue virus infections per year of which 96 million manifest clinically [3]. Though most of dengue fever cases are mild and self-resolving, it can lead to fatal complications like Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) [4]. Probable Dengue Fever (DF) is defined as an acute febrile illness with two or more of the following manifestations: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations and leucopenia. Confirmed dengue fever is a case confirmed by laboratory criterion [5]. The diagnostic modalities commonly used for dengue infection are detection of specific antigen and antibodies by ELISA (Enzyme linked immunosorbent assay) and immunochromatographic test [6]. The present study was done in a tertiary care hospital in Western

Maharashtra (Mumbai) and gives an insight into the prevalence of dengue fever and its relation to seasonal variations.

Aims and Objective

1. To study the prevalence of Dengue fever in tertiary care hospital in western Maharashtra.
2. To study the seasonal trends associated with Dengue fever in tertiary care hospital in western Maharashtra.

Materials and Method

A retrospective analysis of the records was conducted at the Microbiology laboratory of a tertiary care hospital in Western Maharashtra (Mumbai) between January 2019 to December 2022 for a period of 4 years. Of All samples received in Department of Microbiology for clinically suspected Dengue fever testing from various outpatient, inpatient departments and emergency services. Routinely in the hospital Dengue is screened using NS1 antigen and Anti-dengue IgM-IgG rapid test and positive serum samples are subjected to NS1 and IgM ELISA for confirmation.

Total 53302 blood samples were analyzed during the study period of which 2621 samples were positive by rapid tests. Of the 2621 samples which were positive for dengue serological markers (NS1and IgM) by immunochromatographic rapid test, only 1763 samples were positive by ELISA. ELISA kit used were Standard E Dengue IgM Capture ELISA (Sensitivity 98.18% and specificity 95.38%) for Dengue IgM ELISA and QUALISA Dengue NS1 (Sensitivity 100% and specificity 99%) ELISA for detection of NS1 Antigen. The tests were performed following the manufacturer's instruction.

Result

A total of 53302 blood samples were analyzed during this study period, of which 2621 samples were positive for by rapid test of which 1763 samples were positive by ELISA. Overall prevalence was 67.26% (Figure 3). Out of 1763 samples seroprevalence of NS1 (Ag) was 71.25% and IgM was 61.57%. (Table 1 and Figure 1) Most number of dengue cases was in the month of September & October. (Figure 4)

Table 1: Positivity of Dengue IgM and NS1 by ELISA from 2019-2022

Year	Dengue NS1 Tested	Dengue NS1 Positive	Dengue IgM Tested	Dengue IgM Positive
2019	1053	834	415	300
2020	140	43	88	32
2021	227	133	270	130
2022	121	88	307	203

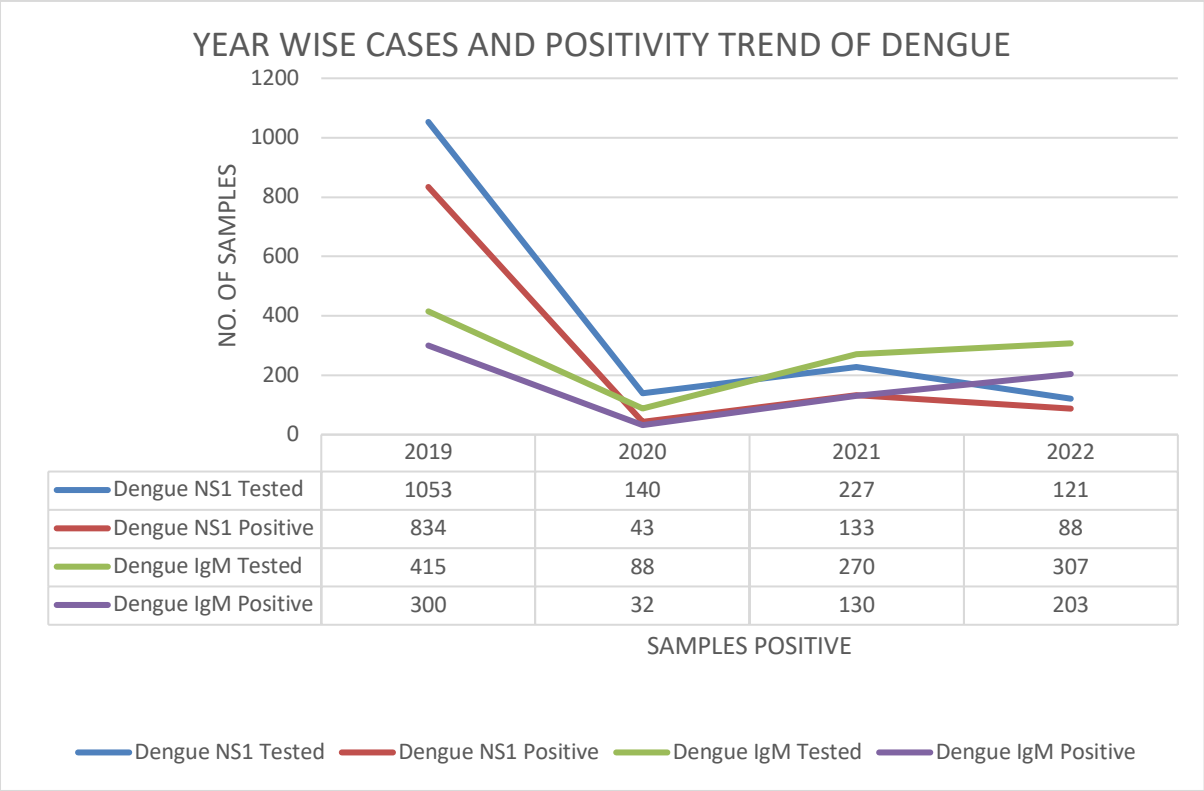
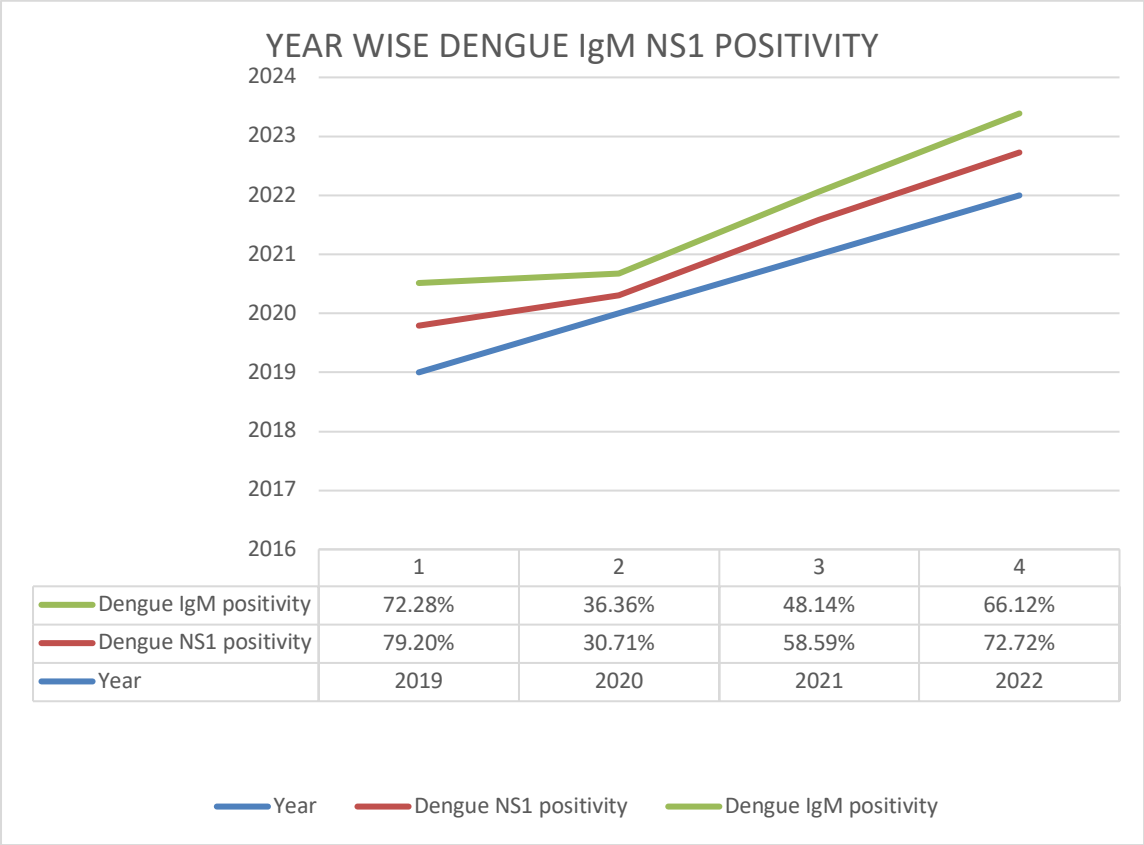
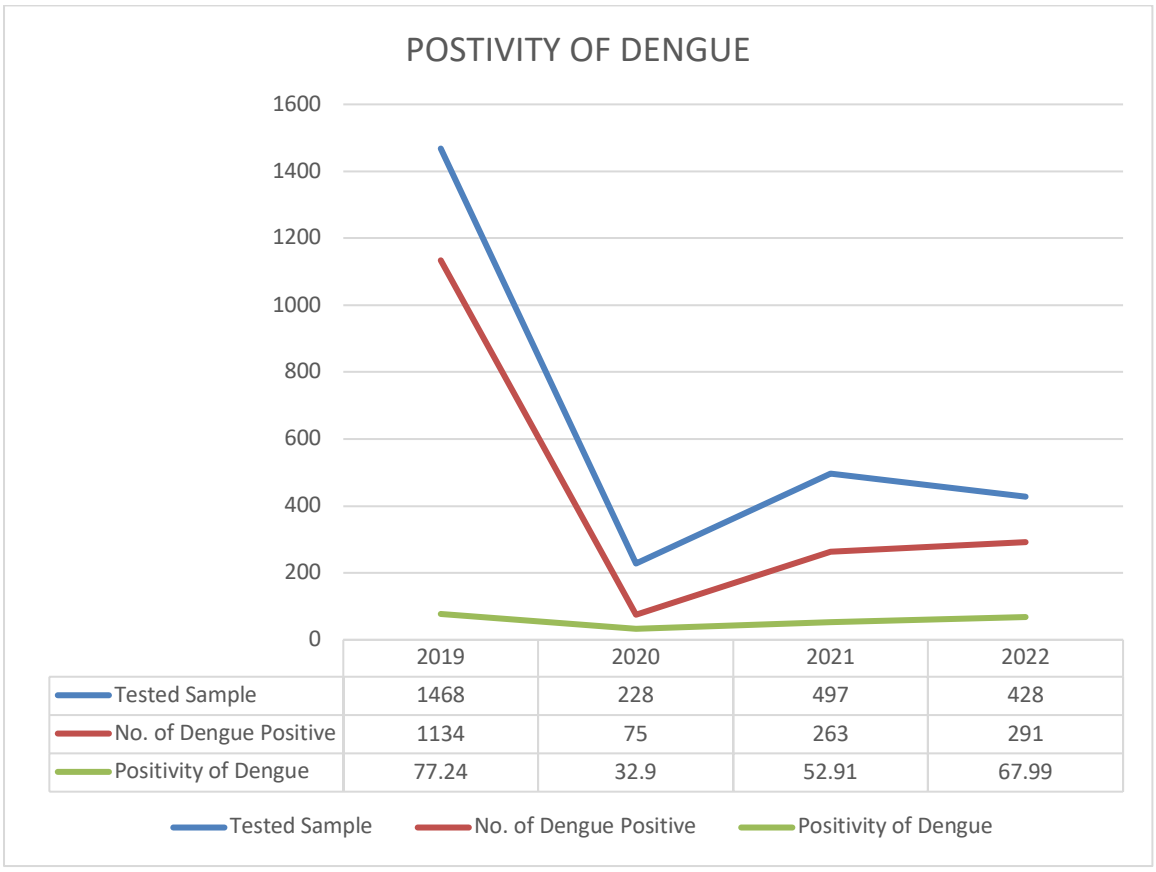


Figure 1: Positivity of Dengue IgM and NS1 by ELISA from 2019-2022



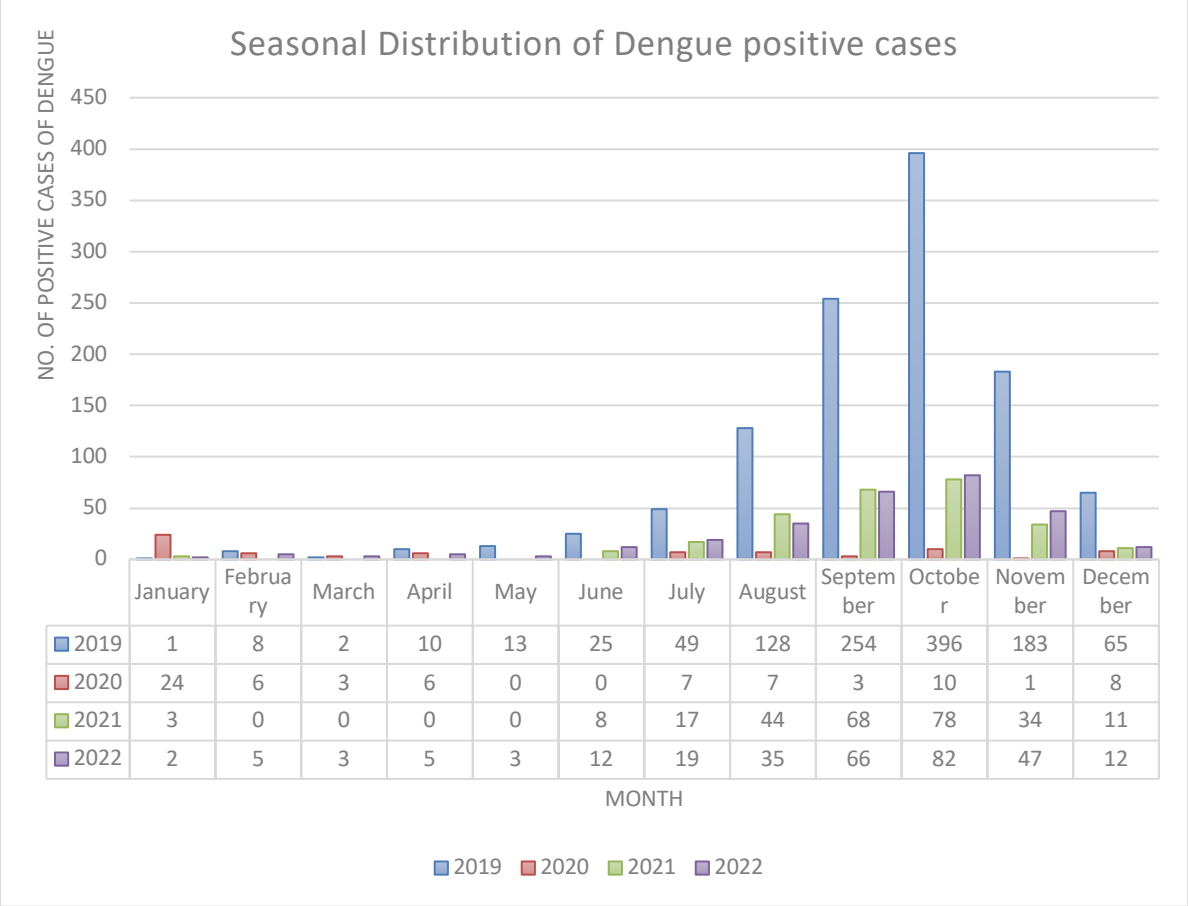
	1	2	3	4
Dengue IgM positivity	72.28%	36.36%	48.14%	66.12%
Dengue NS1 positivity	79.20%	30.71%	58.59%	72.72%
Year	2019	2020	2021	2022

Figure 2: Positivity of Dengue IgM and NS1 by ELISA from 2019-2022



	2019	2020	2021	2022
Tested Sample	1468	228	497	428
No. of Dengue Positive	1134	75	263	291
Positivity of Dengue	77.24	32.9	52.91	67.99

Figure 3: Positivity of Dengue (both IgM and NS1) by ELISA from 2019-2022



	January	February	March	April	May	June	July	August	September	October	November	December
2019	1	8	2	10	13	25	49	128	254	396	183	65
2020	24	6	3	6	0	0	7	7	3	10	1	8
2021	3	0	0	0	0	8	17	44	68	78	34	11
2022	2	5	3	5	3	12	19	35	66	82	47	12

Figure 4: Seasonal Distribution of Dengue positive cases

Discussion

Worldwide large-scale reappearance of dengue in the past few decades has turned this into a serious public health problem, especially in tropical and subtropical countries. Even in India, dengue infection with rapidly changing epidemiology is evolving into an emerging viral disease. Increase in the number of dengue cases over the past few years has been attributed to rapid unplanned urbanization with unchecked construction activities and poor sanitation facilities contributing to fertile breeding areas for mosquitoes. It is also seen that increase in alertness among medical personnel following the epidemics and availability of diagnostic tools in the hospitals have contributed to the increased detection of cases [7].

As the initial symptoms of dengue mimic those of malaria, typhoid and leptospirosis which are endemic in Maharashtra, coastal Karnataka, diagnosis gets delayed in the initial stages of illness. Diagnosis of dengue by viral culture and RT-PCR are time consuming, very costly and also it needs experienced laboratory personnel. Detecting antigen and antibody of dengue virus by serology, which is quick and relatively inexpensive and most feasible method can help in early detection and prevent further complications [8]. Out of 1763 samples prevalence of NS1 was 71.25% and IgM was 61.57% which shows similarity with the study of Vidyasagar K and Venkatesha D [9] i.e. 73% were positive for NS1Ag and 18% for IgM Ab which might be due to NS1 Ag detected early in the patient when the patient is in early active phase of dengue and patient come for the diagnosis early .The variation in the results observed in different studies can be attributed to the type of serum samples tested whether they are acute or convalescent phase samples and the results of present study signify the importance of testing both IgM antibodies and NS1 Ag to diagnose Dengue infection.

In the present study, prevalence of dengue seropositive cases was 1134 (77.24%) in 2019, 75 (32.90%) in 2020, 263 (52.90%) in 2021, 291 (67.99%) in 2022(TABLE 1 FIGURE 1) which shows similar trend with the data of prevalence of Dengue in Maharashtra state which shows variable graph as per NVBDCP data [10].

A decline in dengue infection, this declining trend in 2020 could be due to preventive and control measures provided by the health care workers stringently besides having increased awareness

among the people about the disease. It may also may be due to outbreak of SARS –CoV-2 in December 2019, causing disrupted healthcare services during lockdown resulting in under reporting of dengue cases in 2020 and 2021. Dengue prevalence of 67.13% observed by the study of Palewar M S et al shows concordant with the present study [11]. The study conducted by Madkey MV et al shows similar findings of decline in the positive cases of dengue in 2020 with present study [12].

The presence of stagnating water after rainfall favors breeding of the mosquito resulting in an increased incidence of dengue. For assessing the seasonal variations of the disease, analysis of data was done on a monthly basis. Worldwide studies have proposed that ecological and climatic factors influence the seasonal prevalence of both Ae. aegypti mosquito and dengue virus [13]. During this study period, the peak of dengue cases from July to September was followed by successive decline in the number of cases by November. This corresponds with the monsoon trend in this part of the country, thus showing clear relationship between monsoon and dengue occurrence (outbreak). This is supported by studies conducted in Goa and other parts of India and Study conducted by Palewar MS et al correlates with the seasonal trend with present study [11,14,15].

On the other hand, in the summer season, due to high temperature and negligible rainfall, very low density of dengue vectors was observed. Temperature can influence the adult and immature survival of Aedes population. The scope of the present study was to highlight the prevalence and seasonal trends of dengue virus infection in Maharashtra.

The present study has its shortcomings in terms of further serotyping of prevalent strains of virus was not done in the study that helps in differentiating primary and secondary infection in these particular geographical areas and to reduce the morbidity and mortality due to DHF/ DSS. Also being a laboratory-based study clinical correlation was not feasible.

Conclusion

The study shows the prevalence of dengue viral infection from 2019 to 2022 during monsoon and post monsoons, followed by rapid decline in the year 2020. SARS CoV-2 pandemic led to disrupted health care services amidst lockdown in many parts of India as collective health care efforts were diverted towards containment of COVID-19 infection. This must have led to under-reporting of dengue infection due to restriction in mobility of patients. Currently no specific antiviral therapy or vaccines are available. Precise epidemiological and contact history-taking combined with due attention to false-positive dengue serology and the chance of co- infections are key devices for front line doctors to overcome this almost insurmountable challenge.

Reliable, rapid point- of-care testing for dengue infection needs to be made accessible to screen patients with undifferentiated acute febrile illness to help segregate those who are covid positive, and those with dengue, despite their occasional deceptive clinical presentation. Despite several preventive measures by WHO, new outbreaks of dengue infection have been reported in several parts of the world during the post-monsoon season to prevent such outbreaks, newer and rapid diagnostic techniques, public awareness programs, better education, and proper monitoring of vector control are required.

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