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Original Article

Seroprevalance of dengue and chikungunya in tertiary care hospital in Maharashtra

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ABSTRACT

Background: : Arboviral infections like Dengue fever and Chikungunya are the most common infections that share the same vector of Aedes mosquito, predominately Aedes aegypti followed by Aedes albopictus. Clinical presentation of these two infections are also similar, especially in initial stages characterized by fever, rash, myalgia and arthralgia. Nonstructural antigen (NS1) rapid detection for dengue and detection of IgM antibodies by capture ELISA for dengue and chikungunya infection helps in early diagnosis. Early diagnosis is essential for the early and appropriate treatment and also for implementation of control measures.
Aim: To Assess Seroprevalance of dengue and chikungunya in tertiary care hospital in Maharashtra.
Methodology: The study was conducted from July 2023 to June 2024 in a tertiary care hospital in Maharashtra. Blood samples of amount 2-3 ml from clinically suspected patients of dengue and chikungunya were received in the Microbiology laboratory. The separated serum from sample was subjected to NS1 rapid test, dengue IgM ELISA test (provided by ICMR-NIV) and chikungunya IgM ELISA (provided by ICMR-NIV). The results were recorded and the data was analyzed using MS Excel.
Results: A total of 2029 samples were tested for dengue IgM antibodies of which 498 (24.5%) were found to be positive and 563 samples tested for chikungunya IgM antibodies out of which 79(21.6%) were positive. During the study period 245 Samples were tested for dengue NS1 antigen of which 25(10%) were positive. Age group commonly affected for dengue infection was 21-30 years with 125 (25%) positives and for chikungunya was 31-40 years with 31(39%) positives. Males (269) were affected more than females (229) in dengue infection while in chikungunya, females (289) were more affected than males (239). Maximum cases of dengue and chikungunya were detected in months of July to September.
Conclusion: Dengue & Chikungunya can prove fatal to human population. These arboviral infections have re-emerged as important diseases of global concern in public health. Detection of NS1 antigen and IgM antibodies by capture ELISA helps to know the etiology and also early and rapid diagnosis which helps in appropriate treatment of patients. Early diagnosis of infections is important for early preventions and control measure.

Keywords: *Dengue, Chikungunya, NS1antigen, IgM Antibody, Capture ELISA.*

INTRODUCTION

Dengue, a flavivirus and Chikungunya, an Alphavirus transmitted by Aedes mosquitos are a cause of great concern to public health in India.1 Dengue and Chikungunya are mainly transmitted by Aedes aegypti followed by Aedes albopictus, which bite during day time.2,3

There are four serotypes of dengue virus: DEN-1, DEN-2, DEN-3, and DEN-4. Recently, DEN-5 was found in Bangkok.3 It is common all over India, with the majority of instances reported from Tamil Nadu, Kerala, Karnataka, Orissa, Delhi, Maharashtra, and Gujarat.4 A person who contracts one serotype of the dengue virus for the first time has a primary infection. Contracting one serotype of the virus only results in lifetime immunity to that serotype. Due to immune system stimulation, a person infected with a second serotype of dengue virus—which differs from the first serotype—will experience a secondary dengue infection and may experience severe symptoms including dengue hemorrhagic fever.4,5

The name dengue originated from the Swahili word for "bone-breaking fever" and Spanish word for "the walk of a dandie". The first probable case of dengue fever was recorded during Jin dynasty in China. The first recognized epidemics occurred almost simultaneously in Asia, Africa and North America in the1780.6,7

The name chikungunya comes from the Swahili word kungunyala, which refers to a patient's posture caused by severe joint discomfort. The disease was first identified in 1952 in Makonde, United Republic of Tanzania.8 Over the past ten years, the chikungunya virus has spread over the world, causing outbreaks in the American continent, African nations, and the Indian Ocean region.9

Abrupt fever, chills, headache, excruciating joint pain with or without swelling, low back discomfort, and rash are some of the symptoms of this infection. These symptoms are similar to those seen in patients' suffering from Chikungunya. Hence differentiating whether a person is suffering from Dengue or Chikungunya becomes indistinguishable at times.10

Compared to chikungunya, dengue fever has a higher death rate and severity. There have been reports of dengue and chikungunya being isolated simultaneously from the sera of the same patients. As a result, clinically differentiating dengue from chikungunya virus illness is crucial.11 Dengue and chikungunya are difficult to diagnose based only on clinical presentation. Even though the majority of infections are self-limiting, prompt diagnosis aids in adequate management in situations of severe dengue. The diagnosis of these infections is aided by ELISA and virus isolation.12 IgM capture ELISA detects immunoglobulin IgM antibodies from blood samples. Detection of dengue non-structural antigen may help in early diagnosis and treatment of dengue.13,14

Dengue virus belongs to the genus Flavivirus and consists of four serotypes (DENV-1 to DENV-4), whereas chikungunya virus belongs to the genus Alphavirus of the family Togaviridae. Clinical manifestations of both diseases overlap significantly and include fever, headache, rash, myalgia, and arthralgia, making clinical differentiation difficult.

Maharashtra is one of the states with a substantial burden of mosquito-borne diseases. Seasonal surges have been observed during monsoon and post-monsoon periods. Recent epidemiological observations continue to indicate substantial circulation of both viruses in Maharashtra.

Serological investigations provide valuable information regarding disease burden and transmission patterns. Hospital-based seroprevalence studies assist public health authorities in strengthening surveillance systems and developing preventive interventions. Previous studies from tertiary care centers in Maharashtra have demonstrated varying prevalence patterns over different years and geographical regions.

Hence, the present study was conducted to determine the seroprevalence of dengue and chikungunya among clinically suspected cases attending a tertiary care hospital in Maharashtra.

MATERIALS & METHODS:

The present Hospital-based cross-sectional observational study was conducted among patients presenting with acute febrile illness clinically suspected of dengue/chikungunya at Department of Microbiology, tertiary care teaching hospital, Maharashtra. The study was approved by the ethical committee of GMC Miraj vide letter no.255/2024.

Inclusion Criteria

- All the patients above the 18 years of age.
- Patients admitted to IPD for fever > 5 days.
- Patients coming to OPD with fever > 5 days
- Blood samples from patients, received in the laboratory for Dengue/Chikungunya IgM ELISA testing.

Exclusion criteria -

1. Patients having fever less than < 5 days.
2. Pediatric age group

Method: This is observational study which was conducted from July 2023 to June 2024 in tertiary care hospital. Blood samples (2-3ml) from patients of clinically suspected of dengue (fever > 5days) and chikungunya were received in VRDL laboratory of Department of Microbiology. The serum was separated from submitted blood samples. The serum was subjected to dengue NS1 antigen rapid test and dengue/ chikungunya IgM ELISA test as advised by the clinicians. Details regarding date of testing, the test report, gender of patient and age of patient were taken from patient record in laboratory. Patients under age of 18 and patient with history of fever less than 5 days were excluded from the study.
MS excel was be used to prepare and analyze the data.

Data collection

- Detailed demographic and clinical information was recorded:
- age
- sex
- duration of fever
- symptoms
- hospitalization details
- Approximately 3–5 mL venous blood was collected under aseptic conditions.
- Laboratory investigations Serum was separated by centrifugation.

Tests performed:

- Dengue NS1 antigen ELISA
- Dengue IgM capture ELISA
- Chikungunya IgM ELISA

Positive and negative controls were included according to manufacturer recommendations.
Statistical analysis: Data were entered into Microsoft Excel and analyzed using SPSS version 26. Frequencies and percentages calculated AND Chi-square test applied . $P<0.05$ considered statistically significant.

RESULTS:

Samples received for dengue NS1 antigen testing were 245 of which 25 (10%) were positive. Out of 2029 samples received for IgM antibody ELISA for dengue,498 (24%) were positive. Similarly 563 sample received for IgM antibody ELISA for chikungunya,79 (14%) were positive. Table 1 shows seropositivity of dengue by NS1 antigen and IgM antibody ELISA and for chikungunya by IgM antibody ELISA. (Table1)

Positive cases for dengue were found to be more common in females than in males. However, In Chikungunya females were found to be affected more as comparative males. (Table no. 2 & Fig no.1, 2) Age group commonly affected for dengue infection was 21-30 years 125 (24%) followed by 31-40 years (19%) and for chikungunya was 31-40 years 31 (39%) than any other age group which is shown in (Fig no.3)

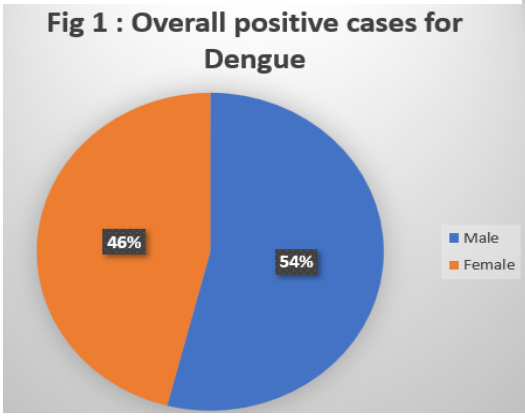
Maximum cases of dengue and chikungunya were detected in month of July to sept i.e. 36% by dengue NS1 antigen,39.7% by IgM antibody for Dengue and 41% by IgM anribody for Chikungunya respectively.(fig no.4) Urban population showed more number of cases for dengue and chikungunya (56%) as compared to rural due to increased and unplanned urbanization, environmental change. (Fig no. 5)

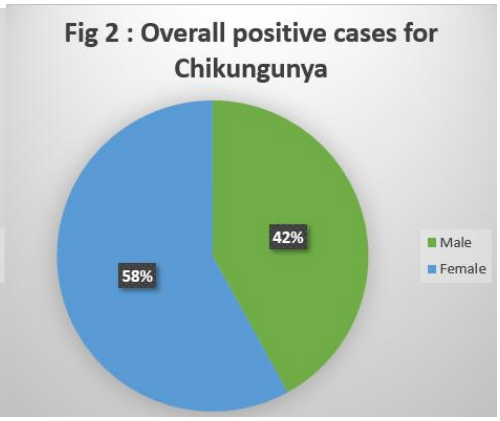
Table 1: Results of NS1, Dengue IgM, Chikungunya IgM ELISA Test

Sl. No.	Test performed	Total samples	Positive	Negative
1.	NS1 Antigen	245	25 (10%)	220 (90%)
2.	Dengue IgM ELISA	2029	498 (24%)	1531 (76%)
3.	Chikungunya IgM ELISA	563	79 (14%)	484 (86%)

Table 2: Gender wise distribution of Dengue & Chikungunya cases

SL. No.	Gender	Dengue NS1 Positive cases	Dengue IgM ELISA Positive cases	Chikungunya IgM ELISA Positive cases
1.	Male	13	282	33
2.	Female	12	241	46





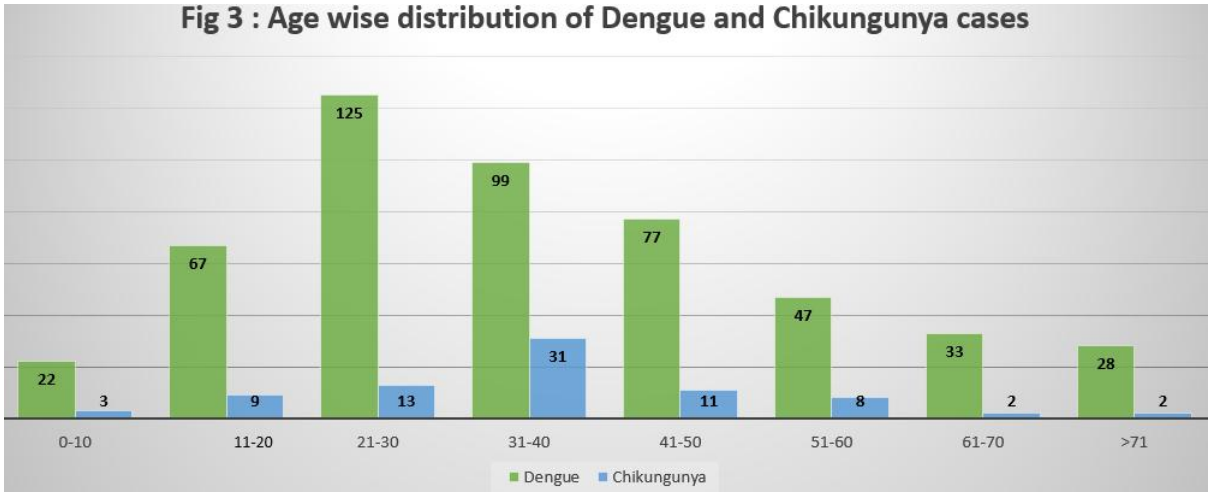
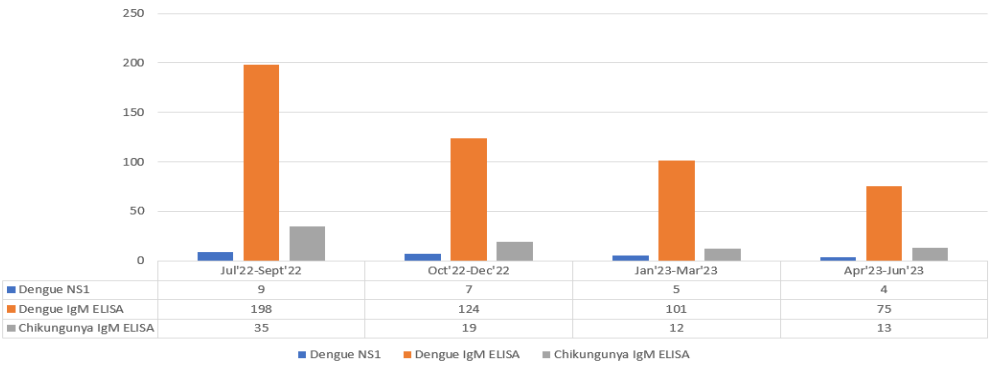
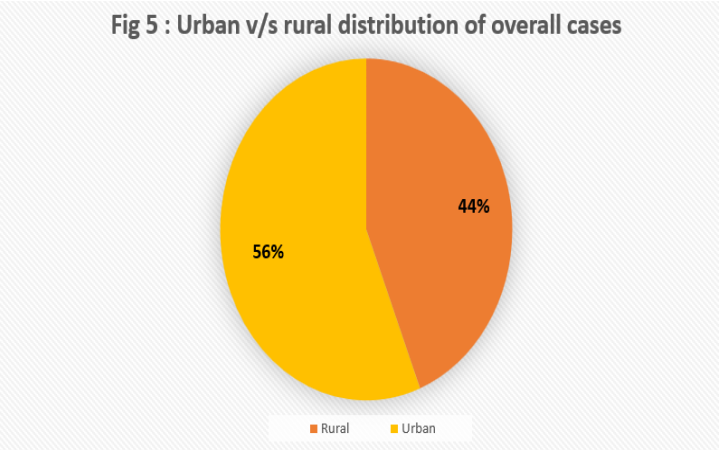


Fig 4 : Month wise distribution of Dengue NS1, Dengue IgM ELISA and Chikungunya IgM ELISA positive cases





DISCUSSION

Dengue virus is a member of the Flavivirus genus, while chikungunya virus is an Alphavirus. These viruses are transmitted by aedes mosquitoes and have potential to spread and cocirculate.13 These is cause of major concern. Both the dengue and chikungunya viruses have been shown to have genotype alterations and genome mutations.14 An accurate and timely diagnosis of the infection is necessary for the patient's appropriate manegement.15

In present study, dengue seropositivity was 10% by NS1 antigen detection which is similar to study done by J.V. Sathish, Mita.D.Wadekar et al.2 which showed 11%,2 prevalence. Seropositivity of dengue infection by detection of IgM antibody in our study was 24% and study done by Praful.S.Patil et al showed 25%.1 Our study showed seropositivity of chikungunya as 14% and study done by Deeba F, Islam A et al showed 15%. NS1 antigen detection aids in the early and quick detection of infection before antibodies show up.15

Dengue can result in serious problems and to avoid complication it must be diagnose as soon as possible. Although chikungunya is typically linked to mild to moderate infections, it is difficult to differentiate it from clinically from dengue infection. The serological test like NS1 antigen detection and IgM antibody detection for dengue and chikungunya helps in early and accurate diagnosis of the infection.

In dengue infection, detection of serotype causing the infection is important, as the subsequent infection by a different serotype in same individual is more likely to cause haemorrhagic complications. However serological test are not useful in determining the serotypes . Polymerase chain reaction (PCR) is emerging as a quick detection technique that can be used to identify serotypes and quantify viral load 9. Nevertheless serological investigation are required to determine the prevalence of certain illnesses in specific regions, to stop the disease from spreading, and to put in place efficient control measures.

Recent surveillance reports indicate persistent disease burden in Maharashtra with continuing outbreaks, emphasizing the need for enhanced vector control and dual diagnostic screening.

Clinical Implications

Routine simultaneous screening for dengue and chikungunya among acute febrile illness cases can improve early diagnosis and reduce complications. Strengthened vector surveillance and seasonal preparedness programs are essential.

Conclusion

Dengue is a public health concern in tropical and subtropical areas, particularly during the rainy and post-monsoon seasons. An increase in dengue cases might also be attributed to changes in vector behaviour and increased urbanization. Early acute phase detection of IgM and NS1 Ag may be useful for diagnosis.

In locations where Dengue and Chikungunya are prevalent, screening for these illnesses is necessary due to the common vector, Aedes aegypti And should be performed for all cases presenting with fever.

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Conflict Of Interest The authors declare that there is no conflict of interest.

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