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RESEARCH ARTICLE
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A STUDY ON TRENDING THE SEROPREVALENCE AND ANALYZING THE CHANGES IN SEROMARKERS OF DENGUE VIRUS INFECTION IN RECENT OUTBREAK BETWEEN APRIL TO SEPTEMBER,2024 FROM A TERTIARY CARE HOSPITAL IN BANGALORE

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Abstract:
Introduction: Dengue virus is a single stranded positive sense RNA virus belonging to the genus flavivirus family Flaviviridae.[3] Dengue fever is a seasonal and emerging acute mosquito borne arbo-viral illness affecting tropical and sub-tropical countries. [4]This illness ranges from a mild asymptomatic form to severe dengue hemorrhagic fever (DHF) with or without dengue shock syndrome (DSS). [5]
Objective : This study was conducted to know the seroprevalence trend and changes in seromarkers of Dengue virus in a tertiary care hospital, Bangalore, Karnataka, India.
Materials and Methods: Over a period of six months from April 2024 to September2024, a total of 5250 blood samples from clinically suspected dengue patients were received in department of Microbiology laboratory. Serum was separated and subjected to enzyme immunoassay for detection of both Non Structural (NS1) antigen and IgM antibody.
Results: During this study period, a total of 5500 blood samples were processed from suspected dengue cases. 250 hemolysed samples were excluded. Out of 5250 samples, 2750(52.38%) samples were found to be positive by different serological markers like NS1 Antigen (Ag), IgM antibody(Ab), or both NS1 Ag & IgM Ab. The overall seroprevalence rate was found to be 52.38%. Higher incidence was found in 9 to 17 years of age group and males were more affected than females. In this study period of six months, the month-wise seroprevalence rate was found to be 12% (153) in the month of April and May 2024 and was 26% (350) in the month of June and July 2024 and was 40% (522) in the month of August and September 2024. It clearly shows that there is an increase in the dengue cases.

Keyword: NS1 antigen (Nonstructural antigen), Flaviviridae, DSS(Dengue shock syndrome), ELISA(Enzyme linked immunosorbent assay).

Introduction:

Dengue is the most rapidly spreading vector-borne disease globally. The Global Burden of Disease study[1] estimated that dengue accounted for 1·14 million (0·73 million–1·98 million) disability-adjusted life-years in 2013, with the southeast Asia region contributing 52% of the disease burden. India contributed to 34% of the 96 million apparent dengue virus (DENV) infections estimated to have occurred globally in 2010. [2] Most Indian states have been classified as having frequent or continuous risk of dengue transmission. Dengue virus is a single stranded positive sense RNA virus belonging to the genus flavivirus family flaviviridae. [3]Dengue fever is a seasonal and emerging acute mosquito borne arbo-viral illness affecting tropical and sub-tropical countries. [4]This illness ranges from a mild asymptomatic form to severe dengue hemorrhagic fever (DHF) with or without dengue shock syndrome (DSS) [5] Dengue virus has four different serotypes(DENV1-DENV4), indicating that immunity is serotype-specific. A fifth serotype (DENV-5) was proposed in 2013 but is not widely accepted or prevalent. All the four serotypes are prevalent, causing epidemics in India now and then. The virus is transmitted from humans to humans through the vector, the Aedes aegypti mosquitoes, and sporadically by Aedes albopictus.[7] Each serotype of the virus produces specific, lifelong immunity but only short-term cross-immunity[6]. However, epidemic outbreaks are more common during the rainy season, when the vector population is higher. The two factors associated with the increased severity of dengue infection are secondary dengue infection and infection with a virulent viral strain. [8]Early diagnosis of dengue infection remains the cornerstone for treatment and prevention of dreadful complications such as DHF and DSS. For any virus infection, the standard serological test, hemagglutination inhibition, neutralization test, indirect immunofluorescence antibody test, enzyme-linked immunosorbent assay (ELISA), complement fixation test, or rapid immunochromatography test can be used. Out of these tests, ELISA is the most widely used method for routine diagnosis of dengue infection for its high sensitivity, specificity, and its simplicity and cost-effectiveness. [10] Detection of non-structural, highly conserved glycoprotein-1 (NS1) antigen is a novel approach for the diagnosis of acute dengue, as it was found to be circulating in the blood during the acute phase of the disease from the first to the ninth day of fever. The incidence of dengue is heightened in Bangalore over the summer monsoon season when pools of stagnant water emerge, relative humidity rises, and temperatures increase, forming the ideal breeding ground for Aedes aegypti mosquitoes. [9] Climate change has only worsened seasonal outbreaks, as longer rainy seasons and more frequent flooding have allowed mosquitos to thrive. [11]In 2024, Karnataka State recorded its highest number of dengue cases in a decade, with health officials looking for ways to better anticipate, monitor, and manage these cases.

Objective:

To know the trend of seroprevalence and analyzing the changes in seromarkers of Dengue virus from April to September 2024

Materials and Methods:

This study was a retrospective and observational study conducted in the department of Microbiology at Vydehi Institute of medical sciences and research centre in Bangalore after obtaining Institutional Ethics Committee approval .The data were collected from medical records at the Department of Microbiology of the hospital for a period of six months from April 2024 to September2024. The study included patients who were clinically suspected of dengue. The World Health Organization criteria for the diagnosis of dengue was followed. Universal safety precautions were followed while collecting and processing blood samples from patients. Blood samples (3 mL) taken from patients under clinical suspicion of dengue viral infection with a short history and duration of fever on the day of presentation in the hospital was submitted to the Microbiology Department. A total of 5500 non-repetitive blood samples were collected during the study period and sent to the microbiology laboratory to test for dengue virus infection. 250 Hemolysed samples were excluded from the study. A total number of 5250 samples were included in this study. Blood samples were stored in the

refrigerator at 4°C-8°C and processed for serum separation within 24 h. Serum was separated by centrifuging blood at 3,000 rpm for 5 min. The separated serum samples were subjected to serological testing, depending on the duration of fever at the time of presentation of the patient to the hospital (less than/more than five days). Samples were respectively chosen to be processed for NS1 antigen detection and IgM antibody detection. NS1Ag and IgM antibodies were detected using Dengue NS1Ag capture ELISA and IgM capture ELISA (J Mitra Dengue Microlisa kit) The positive control and Negative Control from the test kit were put up. The ELISA microtiter plates were read with a Bio-rad ELISA reader. Optical density values were recorded and analyzed, and the results were read according to the manufacturer's instructions. Relevant sociodemographic and clinical data of patients with dengue were obtained from medical records and analyzed.

Result:

During this study period (April 2024 to September 2024), a total of 5250 blood samples(out of 5500 samples) were processed from suspected dengue cases, out of which 2750(52.38%) samples were found to be positive by different serological markers like NS1 Antigen(Ag), IgM Antibody(Ab) or both NS1 Ag & IgM Ab

Out of 2750 positive dengue cases, NS1 (Ag) was positive for 44% (1200 cases), IgM (Ab) was positive for 16% (450cases), and both NS1 and IgM Ab was positive for 40% (1100cases) and Males(1800) were more affected than females(950) and higher incidence was found in 9 to 17 years of age group.

Chart 1: Distribution of Dengue seromarkers

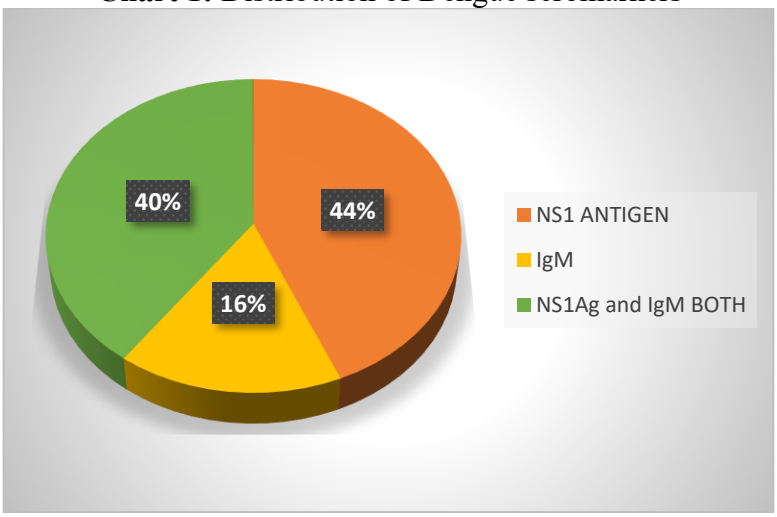


Chart 2: Sex distribution

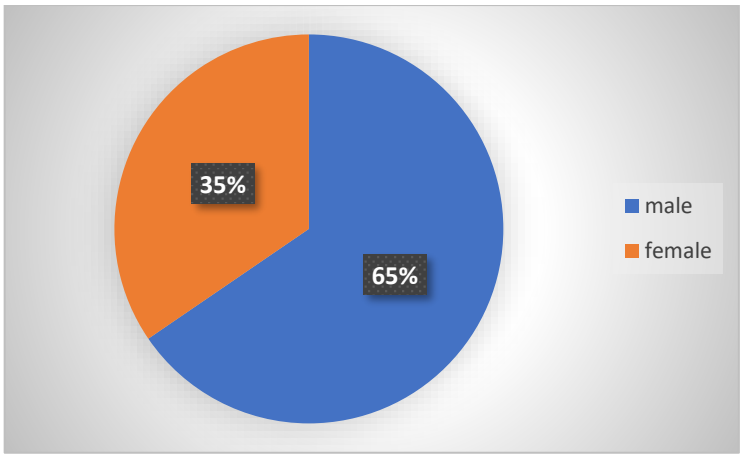


Chart 3: Monthly seroprevalence of dengue from April to September

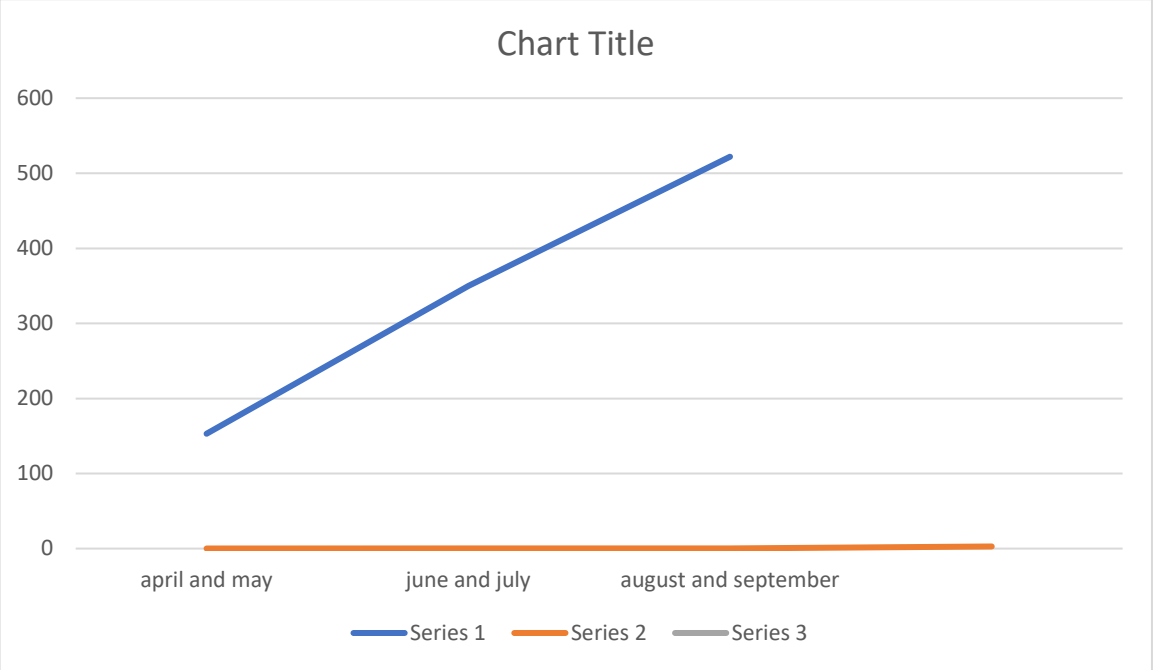
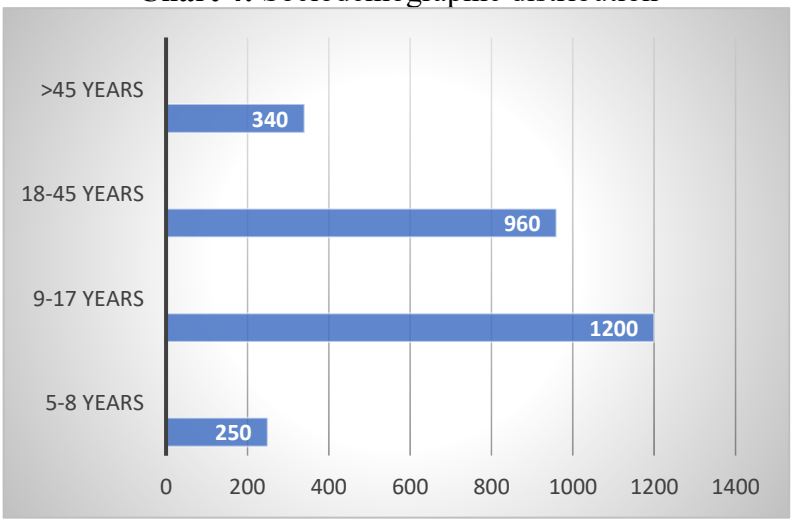


Chart 4: Sociodemographic distribution



The overall seroprevalence rate was found to be 52.38%. Higher incidence was found in 9 to 17 years of age group and males were more affected than females. In this study period of six months, the month-wise seroprevalence rate was found to be 12% (153) in the month of April and May 2024 and was 26% (350) in the month of June and July 2024 and was 40% (522) in the month of August and September 2024. It clearly shows that there is an increase in the dengue cases after June and July, and also, there is the highest peak in the cases following the rainy seasons (July -September). During the May to June months, there is a drop in the reported cases.

Discussion:

Dengue fever is an acute febrile viral infection, which has become a significant public health problem in tropical and subtropical regions of the world. [14] In India, the first epidemic of clinical dengue-like illness was recorded in Madras (Chennai) in 1780, and the first virologically proven epidemic of dengue fever occurred in Calcutta (Kolkata) in 1963-1964, wherein 200 people died of it. [17] The first major outbreak of dengue fever/DHF occurred in Delhi in 1996, where 10,252 cases were recorded, and 423 deaths were reported. Dengue is an urban disease, but it has changed

character over time. Increased travel among people to neighbouring states for jobs and business might be responsible for the rapid spread of disease to new areas. [15]
Furthermore, unplanned urbanization and poor sanitation facilities create fertile breeding grounds for mosquitoes. Laboratory diagnosis of dengue infection is crucial, as the varied presentation of the disease can make accurate clinical diagnosis difficult. [16]Assays based on the detection of NS1Ag or IgM Ab are commonly used in most the laboratories. [12]
52.38% of patients had serologically confirmed dengue infection in the present study. A similar surveillance study done by Sood[7]reported 18.99%, whereas Garg et al. reported the seroprevalence of dengue infection in their study area to be 19.7%.
For early diagnosis of dengue, our laboratory uses ELISA for NS1Ag and IgM Abs detection. Testing for these two factors would increase the rate of detection of dengue fever at an early stage. A study by Gupta et al. also showed similar findings. [10]The present study showed that the post-monsoon season (July -September) is the peak season for dengue cases to occur. This should be considered to create a preventive strategy to minimize dengue infection. Testing for NS1Ag and IgM could significantly improve diagnostic sensitivity, which helps in the timely management of dengue infections. Further studies should be done to determine the prevalence of serotypes and genotypes in this area to prevent impending outbreaks due to DHF.We found that men were more affected than women, constituting nearly two-thirds of the total cases. This was confirmed by Jk Sarkar et al. (60.70%), Garg et al. (67%), and Kumar et al. (64.6%),[18] although Padhi et al. reported a female preponderance in the cases, they analyzed. [14]This trend could be because males are more likely to travel and work than females in India. This finding indirectly indicates the importance of workplaces and travel on dengue incidence, which needs further exploration. An increase in dengue cases was observed after June and peaked following the rainy seasons (July- September). This indicates an increase in the breeding places for the vectors during the post-monsoon period. The limitation of the present study was that we were unable to perform serotyping to determine the prevalent serotypes due to economic constraints and limited resources.

Conclusion:
Regular epidemiological studies are necessary to monitor the dengue situation in an area, help early detection of an outbreak, and initiate effective control measures. The study results indicate the need for the proper education of the public through various available media and awareness campaigns. Most cases were reported during the post-monsoon period, which warrants coordinated action toward vector control measures. Active participation from the public is an essential component to curb down the problem. There is also an urgent need to develop a vaccine that is effective against all five dengue virus serotypes. In conclusion, our study indicates younger children had higher force of infection corresponding to suboptimal immunity in this age group, Males were more affected than females, Dengue NS1 Ag seromarker were positive for maximum number of positive cases followed by ns1 Ag and Ig M antibody both. The findings of our survey will be useful in making informed decisions about the introduction of newer dengue vaccines in the country.

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onflict of Interest:
No conflict of interest.

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