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Seroprevalence of Dengue in a tertiary care hospital in Karnataka

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ABSTRACT

Background: Dengue fever is an acute arboviral disease caused by Dengue virus that belongs to family Flaviviridae and it is transmitted by bite of infected female aedes aegypti mosquito. Dengue infection causes significant morbidity and mortality causing major financial and economic burden on the country. There are 4 Dengue serotypes DEN1, DEN2, DEN3 and DEN4. Dengue fever causes complications such as Dengue Haemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS)
Aim: To determine the Seroprevalence of Dengue fever from the cases referred to Chikkamagaluru Institute of Medical Sciences.
Materials And Methods: This is a retrospective study conducted in the Department of Microbiology , CIMS , Chikkamagaluru for a period of two years from January 2023 to December 2024
Serum samples were collected from suspected Dengue fever cases and tested for NS1 antigen (Non -structural Proteins) using standard ELISA kits and IgM capture ELISA to detect IgM antibodies against Dengue virus.
Statistical analysis was done using SPSS 26.0 version.
Results: A total of 13450 samples were screened for 2 years from January 2023 to December 2024 for Dengue NS1Ag and IgM. Among the total number of cases, 2943 were positive for NS1Ag, 808 were positive for anti Dengue IgM antibodies, 2672 were positive for anti Dengue IgG antibodies.
Conclusion: This study provides baseline data to assess the sero-prevalance of Dengue in high risk areas. This study emphasis the need for early diagnosis of Dengue to prevent fatal complications like Dengue Haemorrhagic Fever and Dengue Shock Syndrome.
*Most affected age group was between 26-50 years . Males (3305) were affected more than females(3118), least affected age group was elderly population (> 70 years old). Most cases were reported during monsoon season, which warrants co-ordinated action towards vector control measures.

Keywords: Dengue, DHF, DSS, NS1Ag, IgG.

INTRODUCTION

Dengue fever is an acute arboviral disease caused by Dengue virus that belongs to family Flaviviridae and it is transmitted by bite of infected female aedes aegypti mosquito.

In recent decades, dengue virus infection has become a significant public health issue due to the related death and morbidity causing major financial and economic burden on the country. Dengue is prevalent in many regions of India, and reports of

epidemics from both India and abroad are common . Patients with dengue shock syndrome (DSS) and dengue hemorrhagic fever (DHF) may have a case fatality rate of up to 44%. Hence a quick and accurate laboratory diagnosis of dengue is essential[1].

There are 4 Dengue serotypes DEN1, DEN2, DEN3 and DEN4. Dengue fever causes complications such as Dengue Haemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS)

Infection with a heterologous serotype during secondary infection is a risk factor for the development of severe disease because of the antigenic relationship between the four serotypes, which results in imbalanced immunological response and antibody waning[2].

In 2009, the World Health Organization reclassified dengue into three categories based on severity: dengue without warning signs, dengue with warning signs such as abdominal pain, persistent vomiting, fluid accumulation, mucosal bleeding, lethargy, liver enlargement, increasing hematocrit with decreasing platelets, and severe dengue, which included dengue with severe bleeding, severe plasma leakage, or organ failure. Early detection of dengue infection is essential since it can avert deadly cases[3].

The highly conserved glycoprotein known as nonstructural protein (NS1) antigen is present in the Flavivirus group, which includes viruses that cause dengue, zika, and Japanese encephalitis. Primary and secondary dengue infections are tested by simultaneously detecting NS1 antigen, IgM, and IgG antibodies in a single cassette[4].

The primary methods for preventing and controlling dengue in India are integrated vector control, case detection, and case management. A number of potential dengue vaccines are in various stages of development. Sanofi Pasteur's CYD-TDV (Dengvaxia), the first dengue vaccine, is advised for use in people between the ages of 9 and 45. In 2016, the World Health Organization advised introducing this vaccine in areas where dengue seroprevalence was 70% or greater, indicating a significant disease burden. In 2018, this advice was updated to include prevaccination screening and vaccination of those who had previously shown signs of illness as the recommended course of action. In regions where the seroprevalence is 80% or greater by the age of nine, vaccination without individual screening may be considered if this approach is not practical[5].

This work aims to provide a comprehensive review of seroprevalence of dengue virus infection. Understanding the regional dengue prevalence and clinical severity is the aim of this study[6].

MATERIALS AND METHODS

This study was a retrospective type of cross-sectional study conducted over a period of two years from January 2023 to December 2024 in the Department of Microbiology at Chikkamagaluru Institute of Medical Sciences, Chikkamagaluru, Karnataka state.

- The data were collected from the medical recordship in the Department of Microbiology.
- Inclusion criteria of the study was patients who were clinically suspected of Dengue. WHO criteria was followed for the diagnosis of Dengue and Universal safety precautions were followed while collecting and processing of blood samples.
- Dengue NS1Ag and IgM antibodies were detected using NS1Ag and IgM capture ELISA.
- Positive control and negative control from test kit were put up.
- ELISA microtiter plates were read with a ELISA reader. Optical Density values were recorded and analysed and the results were read according to manufacturers instructions
- A total of 13,450 non- repetitive blood samples were sent to microbiology laboratory after collection during the study period of 2 years to test from Dengue virus infection. Exclusion criteria was Hemolysed and Lipemic samples.
- Serum was separated from blood sample within 24 hours by centrifugation at 3000rpm for 10 minutes. Serum samples were subjected to serological testing based on the duration of fever at the time of presentation of patient to the hospital . Accordingly samples were subjected for NS1 antigen ,IgM and IgG antibody detection.

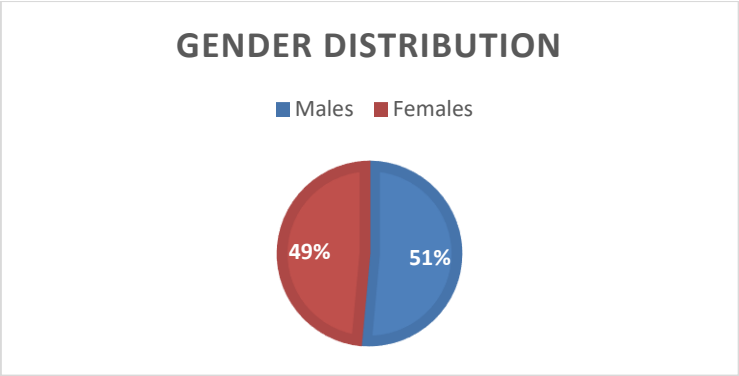
Statistical analysis:

Statistical analysis was done with SPSS 26.0 version and it was presented in the form of tables and graphs.

RESULTS:

A total of 13,450 serum samples of suspected Dengue patients were screened over the time period of two years from January 2023 to December 2024. The age group of patients included from 1 month to more than 70 years.
Most affected age group was between 26-50 years. Males were slightly more affected than females.

Number of males affected were 3305 and females were 3118



Majority of the cases were observed during monsoon season owing to increased vector multiplication during the season. A total of 6423 cases were positive for Dengue during monsoon season.
Highest cases were seen during 2024 i.e 9641

Table 1: Positivity of Dengue IgG with Age and Gender (1st January 2023-31stDecember 2024)

Sl No.	Age groups in years	Gender		Total (%)
		Male	Female	
1.	0-15 years	408	332	740(27.7%)
2.	16-25years	248	272	520(19.4%)
3.	26-50 years	472	498	970(36.3%)
4.	51-70yeas	164	196	360(13.5%)
5.	>70 years	35	47	82(3.06%)
	Total	**1327**	**1345**	**2672**

Table 2: Positivity of Dengue IgM with Age and Gender (1st January 2023-31stDecember 2024)

Sl No.	Age groups in years	Gender		Total (%)
		Male	Female	
1.	0-15 years	146	95	241(29.8%)
2.	16-25years	68	55	123(15.2%)
3.	26-50 years	166	128	294(36.3%)
4.	51-70yeas	62	54	116(14.3%)
5.	>70 years	14	20	34(4.2%)
	Total	**456**	**352**	**808**

Table 3: Positivity of Dengue NS1 Antigen with Age and Gender (1st January 2023-31stDecember 2024)

Sl No.	Age groups in years	Gender		Total (%)
		Male	Female	
1.	0-15 years	435	341	776(26.4%)
2.	16-25years	353	297	650(22.08%)
3.	26-50 years	562	569	1131(38.4%)
4.	51-70yeas	144	177	321(10.9%)
5.	>70 years	28	37	65(2.2%)
	Total	**1522**	**1421**	**2943**

Among the total number of cases, 2943 were positive for NS1Ag ,808 were positive for anti Dengue IgM antibodies and 2672 were positive for IgG.

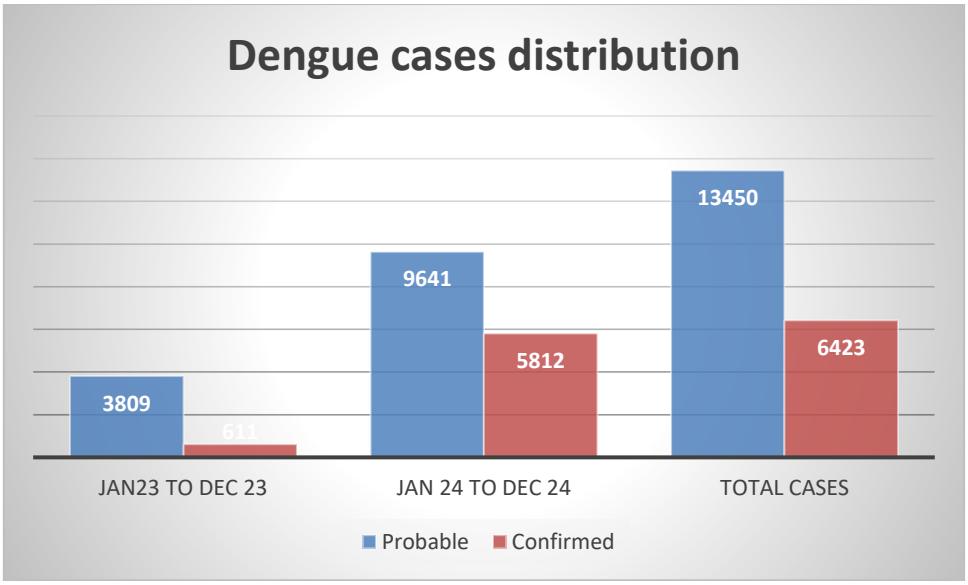


Table 2: Seropositivity of Dengue cases

Sl no	Positivity	No of Dengue cases	Percentage(%)
1.	NS1Ag antigen	2943	21.8%
2.	Anti- Dengue IgM antibodies	808	6%
3.	Anti- Dengue IgG antibodies	2672	19.8%
4.	Total	6423	47.7%

DISCUSSION

Dengue fever is the most rapidly spreading arboviral infection across various states of our country.
It is spread by bite of Aedes Aegypti mosquito which harbours Dengue virus, which is a RNA virus belonging to family Flaviviridae.

The patient affected by Dengue presents with asymptomatic infection to complications like Dengue haemorrhagic fever and Dengue Shock Syndrome.

In North central and South America and in Carribean island more than 11 million cases of Dengue have been reported in 2024. In United States, public health authorities declared an outbreak in March 2024. In India first reported case of Dengue like illness was in 1780 in Madras.

First major outbreak of Dengue/Dengue Haemorrhagic fever occurred in Delhi in 1996, where 10,252 cases were recorded and 423 deaths were reported. India has been declared as hyperendemic for Dengue by WHO and frequency of cyclical Dengue epidemics are found to be increasing here.

A total of 13,450 samples were tested over a period of 2 years. Out of which 6423 cases were positive for Dengue infection. Previous Trends in seroprevalence of Dengue infection.

Sl no	Study conducted by	Duration of study	Place	Seroprevalence
1.	Present study	January 2023 to December 2024(2 years)	Chikkamagaluru, Karnataka	47.7%
2.	Nikam AP et al[7]	January 2014 to December 2014,	Amravati, Maharashtra	32.47%
3.	Suganthi P et al[8]	July 2021 to December 2021,	Thiruvannamalai, Chennai	11.4%
4.	PSP et al[9]	July 2022 to June 2024	Nagpur, Maharashtra	25.41%.
5.	Mohan K et al[10]	January 2022 to January 2023	Kanchipuram, Chennai	25%

The variation in results observed in different studies can be due to variation in the type of serum sample tested whether in acute or convalescent phase.

Most affected age group was between 26-50 years which can be attributed to the working population of this age -group due to which there is more outside exposure. The elderly populations (>70 years) were least affected. It may be because of restricted exposure and sheltered living.

The lesser gender difference could be due to equality in working outdoors by both the genders.
Most of the studies conducted showed high prevalence of Dengue cases during monsoon season reflecting the breeding season for Dengue vector Aedes aegypti mosquito.

Study results were in good correlation with other studies conducted across the country. The limitation of this study includes shorter duration of study , other co-morbidities were not analysed in relation to Dengue.

CONCLUSION:

This study forms the baseline data to monitor the dengue situation in high risk areas.
Regular epidemiological studies and study on seroprevalence of dengue infection is critical as it signifies the importance of detection of both NS1Ag and IgM antibodies for diagnosis of dengue infection to prevent fatal complications like Dengue Haemorrhagic Fever and Dengue Shock Syndrome.

The study reports younger population of productive age group at high risk. Also the infection is at its peak during monsoon season that directs us towards co-ordinated vector control.

Active participation from public is essential and development of vaccine effective against all 4 types is the need of the hour to curb this problem.

Due to variations in location, period, and study techniques, many studies on the prevalence of DENV in India have produced varying results.The kinds of viruses that are circulating are changing even in areas where DENV is prevalent.18. This work aims to provide a comprehensive review and meta-analysis of India's high seroprevalence of dengue virus infection. Understanding the country's dengue prevalence and clinical severity is the aim of this study.

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