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Seroprevalence Of Dengue Infection In A Tertiary Care Hospital From Southern Rajasthan

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ABSTRACT

Introduction: Dengue continues to be a significant vector-borne viral infection in tropical and subtropical regions, accounting for considerable morbidity and mortality. With repeated outbreaks in India, particularly among males and young adults, prompt diagnosis and surveillance are vital.

Materials & Methods: A hospital-based cross-sectional study was conducted at Pacific Medical College and Hospital, Udaipur, from April 2023 to March 2024. Febrile patients (n = 2315) had 3–5 mL of blood drawn. Serum was analyzed using rapid SD BIOLINE immunochromatographic assays for dengue NS1 antigen and IgM/IgG antibodies. Data were entered into Microsoft Excel and reported using descriptive statistics.

Results: Of the total samples, 260 (11.23%) were seropositive. Among these, 143 (55%) were male and 117 (45%) female. Age distribution indicated that the majority were 21–30 years (65; 25%), followed by 11–20 years (54; 20.8%). Serological results: NS1 antigen only in 110 (42.4%), IgM only in 108 (41.5%), IgG only in 5 (1.9%), NS1 + IgM in 25 (9.6%), NS1 + IgG in 2 (0.8%), IgM + IgG in 5 (1.9%), and NS1 + IgM + IgG in 5 (1.9%).

Conclusions: The 11.23% seroprevalence underscores dengue's public health impact in Central India, disproportionately affecting males and young adults. Deployment of NS1- and IgM-based rapid diagnostics is crucial for early case identification. Continued seroepidemiological surveillance and vector control measures are warranted to mitigate dengue-related morbidity and mortality.

Keywords: *Dengue, NS1 antigen, IgM antibody, Seroprevalence, Acute febrile illness, Udaipur, India.*

1. INTRODUCTION

Dengue is a vector-borne illness that makes up between 17 to 20 percent of all infectious diseases in the world. (1) A single Mosquito bites transmit the most common vector-borne diseases, such as dengue, chikungunya, Japanese encephalitis, malaria, rift valley sickness, yellow fever, and the Zika virus. Arthropod-transmitted viral infections are endemic in many regions (2). Arthropod-borne infections affect between 25 to 80 million people globally in tropical and subtropical regions, resulting in 30,000 deaths and 5 lakh cases of DHF each year (3,4). Since 2009, India has experienced concurrent infections with these arthropod-borne viral diseases, namely chikungunya and dengue. A high death and morbidity rate has been caused by persistent epidemics in India, especially dengue. (5) A flaviviral disease spread by mosquitoes, dengue is also referred to as break bone fever due to its painful symptoms, which include body, back, and joint problems. (6) The Dengue virus is a ss RNA virus that is encapsulated and has an 11 kb genome that includes core and membrane proteins. (6) The dengue virus is classified into four different serotypes, which are known as serotypes -1 (DENV-1), -2 (DENV-2), -3 (DENV-3), and -4 (DENV-4). (6, 7)

An infection with a single serotype confers lifetime immunity, but concurrent or subsequent infections with a second serotype offer either no protection or only partial protection and can result in antibody-dependent immune enhancement, which can lead to severe outcomes like DHF or DSS. (8) From simple cases like dengue fever to more catastrophic ones like DSS or DHF, dengue infections can take many different forms. DF is characterized by abrupt onset of fever, headache, arthralgia, myalgia, retro-orbital pain, and maculapapular rash. (8) Aedes aegypti persists in spreading the disease globally in spite of multiple efforts to eradicate the insects, especially in endemic regions. (9)

Trials are still being conducted, and there isn't a licensed dengue virus vaccine at this time. As of right now, there is no particular treatment for dengue virus infections. (10) There are other laboratory diagnostic methods for DF in addition to clinical indicators, which are crucial for verifying a Dengue viral infection. These consist of virus isolation, genome amplification, and serological antigen and antibody detection. (11) Due to the fact that virus isolation is a time-consuming and difficult procedure that calls for a laboratory and skilled workers. (12) The genome detection method, which is used for serotype identification and sequencing, uses amplification techniques including NASBA and polymerase chain reaction (PCR). (13)

Antigen and antibody detection is done in every laboratory, especially to detect acute infections. The identification of the NS-1 antigen and IgM antibodies is a widely used test for diagnosing dengue infection. It is also possible to detect the early NS-1 antigen. NS-1, a nonstructural protein of the Dengue virus, is present in the bloodstream throughout the acute phase, detectable in serum or plasma, and helpful in the early identification of the illness, unlike IgM, which may only appear three to five days after infection. While ELISA is more specific but takes longer, there are many commercial kits available for the quick and simple detection of NS-1, IgM, and IgG in a patient's serum. (14) The present study was undertaken to determine the seropositivity of NS1 antigen and IgM antibody among patients with acute febrile illness.

2. MATERIALS AND METHODS

STUDY PERIOD: This hospital based cross section study was conducted for a period of 1 years from April 2023 to march 2024.

ETHICAL CLEARANCE: Consent were taken from all the patients. Study was approved by the institution ethical committee of Pacific Medical College and Hospital, Udaipur, Rajasthan, India.

Blood samples from the clinically suspected cases of Dengue were collected from outpatient department as well as patients admitted in different clinical wards of Pacific College and Hospital Udaipur. Processing of samples was done at Department of Microbiology, Pacific Medical College and Hospital, Udaipur, Rajasthan, India.

3-5 ml of blood was collected from each patient using strict aseptic precautions and serum was separated using standard methods. Serum collected was tested for NS1 antigen and IgM/IgG antibodies using one-step immune-chromatographic assay (Dengue Rapid IgM/IgG test and NS1 test by SD BIOLINE) as per the manual provided with the test kit.

STATISTICAL ANALYSIS: Data were entered into Microsoft Excel. Descriptive statistics such as percentages were used.

3. RESULTS

From april 2023 to march 2024, A total of 2315 samples were collected from febrile patients. Of these, 260 (11.23%) samples were found to be positive for one or more parameters. Among them, 143 (55%) were males and 117 (45%) were females (Table 1). The most affected age group was 21–30 years (25%) followed by 11–20 years (20.8%), (Table 2).

Of 260 seropositive cases, 110 (42.4%) individuals were positive only for NS1 antigen, 108 (41.5%) were positive for only IgM antibody, 5 (1.9%) were positive for only IgG. 25 (9.6%) were positive for NS1 and IgM, 2 (0.8%) were positive for NS1 and IgG, 5 (1.9%) were positive for IgM and IgG. 5 (1.9%) individuals were positive for all the three markers. (Table 3).

Table 1: Gender wise seropositivity of dengue virus infection

Sex	Number of positive samples	% of positive samples
Male	143	55
Female	117	45
Total	260	100

Table 2: Age wise seropositivity of dengue virus infection

AGE GROUP (YEARS)	Number of positive samples	Percentage
0-10	13	5
11-20	54	20.8
21-30	65	25
31-40	44	16.9

41-50	26	10
51-60	19	7.3
61-70	28	10.8
>70	11	4.2
TOTAL	260	100

Table 3: Results of various dengue diagnostic parameters

Dengue diagnostic parameters	**Number of positive samples**	**Percentage**
NS1	110	42.4
IGM	108	41.5
NS1+IGM	25	9.6
NS1+IGG	2	0.8
NS1+IGM+IGG	5	1.9
IGM+IGG	5	1.9
IGG	5	1.9
TOTAL	260	100

4. DISCUSSION

In tropical and subtropical areas of the world, dengue fever, an acute febrile viral infection, has grown to be a serious public health concern. 200 persons died from dengue fever in Calcutta (Kolkata) in 1963–1964, the first virologically confirmed outbreak of the disease in India. The first epidemic of clinical dengue-like sickness was documented in Madras (Chennai) in 1780. In 1996, Delhi saw the first significant dengue fever/DHF outbreak, with 10,252 cases and 423 fatalities reported. Despite being an urban illness, dengue has evolved over time. The quick spread of disease to new locations may be caused by an increase in people traveling to neighboring states for work and business.

Table 4: Comparison of Sero-prevalence of dengue infection

S.NO.	AUTHOR	
1.	Bharat Singh *et al* (15)	18.4%
2.	Chitkara *et al.* (16)	20.4%
3.	Garg *et al.* (17)	19.7%
4.	Sood *et al* (18)	18.9%
5.	Ghosh *et al.* (19)	17.9%
6.	Patel and Bhatnagar *et al* (20)	9.68%
7.	Low *et al.* (21)	11.7%
8.	Turbadkar *et al.* (22)	13.6%
9.	Lakshmi *et al.* (23)	33.64%
10.	Rathore *et al.* (24)	44.4%
11.	Malik *et al.* (25)	52%
12.	Ukey *et al.* (26)	31.3%

13.	Bhat *et al.* (27)	32.1%
14.	Gopal *et al.* (28)	50%
15.	Gupta *et al.* (29)	29.09%
16.	Gupta *et al.* (30)	44.5%
17.	Kalaivani *et al.* (31)	62%
18.	Darshan BB *et al* (32)	23.94%
19.	Present study	11.23%

In present study seroprevalence of dengue was 11.23% which was similar to study by Low *et al.* (21), Turbadkar *et al.* (22). Higher prevalence was seen in study by Bharat Singh *et al* (15), Chitkara *et al.* (16), Garg *et al.* (17), Sood *et al* (18), Ghosh *et al.* (19), Lakshmi *et al.* (23), Rathore *et al.* (24), Malik *et al.* (25), Ukey *et al.* (26), Bhat *et al.* (27), Gopal *et al.* (28), Gupta *et al.* (29), Gupta *et al.* (30), Kalaivani *et al.* (31), Darshan BB *et al* (32).

Differences in the prevalence rates reported in different studies may be attributed to different geographical regions with varying climatic conditions usually affecting the distribution of vector responsible for transmitting dengue virus infection.

Table 5: Comparison of gender distribution of dengue infection

S.NO.	AUTHOR	MALE	FEMALE
1.	Bharat Singh *et al* (15)	59.66%	40.34%
2.	Patel and Bhatnagar *et al* (20)	61.2%	38.7%
3.	Vijayakarthikeyan *et al* (33)	74.5%	25.5%
4.	Garg *et al.* (17)	67%	33%
5.	Rathore *et al.* (24)	70.9%	29.9%
6.	Malik *et al.* (25)	62%	38%
7.	Mishra *et al.* (34)	77.3%	23.7%
8.	Kumar *et al.* (35)	62.6%	37.3%
9.	Sujatha *et al*. (36)	61%	39%
10.	Patankar *et al.* (37)	65%	39%
11.	Madan *et al*. (38)	61.7%	38.23%
12.	Lakshmi *et al.* (23)	50.8%	49.2%
13.	Kalaivani *et al*. (31)	50%	50%
14.	Present study	55%	45%

In present study, male were affected more than females. Similar findings were reported from other studies also as shown in table 5.Our results can be supported by the fact that males are more prone to dengue infection at work sites, especially because they are involved in more outdoor activities as compared with females, and this increases the chances of their exposure to day-biting mosquitoes.

Table 6: Comparison of age distribution of dengue infection

S.NO.	AUTHOR	Most affected age group
1.	Rajeshwari K G *et al* (39)	21-30 years (26.6 %) followed by 31-

		40 years (21.2 %)
2.	Raji T.K *et al* (40)	20-29 years (34.4%) followed by 30-39 years (32.5%)
3.	Samina Kausar Tabassum *et al* (41)	21-40 years (64.3%) followed by the age group of 0-20 years (25%)
4.	Bharaj et al (42)	20-40 years (35.4%), followed by 0-20 years group (20.8%)
5.	Sarah Hassan *et al* (43)	20-30 years (33.33%)
6.	T. Begum et al (44)	Age group of 15-30 years (43%)
7.	Sumita Rajeevan *et al* (45)	21 to 30 yrs age (22.39%) followed by 11-20 years (18.32%).
8.	Present study	21–30 years (25%) followed by 11–20 years (20.8%)

In present study, the productive working class aged 21–30 years was the most affected age group followed by 11–20years. Owing to the declining rate of incidence with advancing age, it could be said that infants, adolescents and young adults are at higher risk of developing dengue. Similar trend has been observed in other studies wherein they found that dengue is a disease that primarily affects the children and the young adults (39-45).

5. CONCLUSIONS

According to the current prospective study, dengue has been identified as a significant public health issue in Central India. The report highlights the male and young adult demographic. To prevent future dengue epidemics and reduce complications, outbreaks, and death, a continuous seroepidemiological monitoring control program is required.

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