Original Article

Prevalence and changing trend of dengue in a tertiary care hospital in southeastern Rajasthan

Jyoti Rana[1], Yogendra Kumar Tiwari[2], Deepti Dashora[3]

From, Department of Microbiology, Jhalawar Medical College, Jhalawar, Rajasthan, India

ABSTRACT

Background: Dengue fever, an endemic mosquito-borne illness in Rajasthan, India, has shown a rising incidence and seasonal pattern in recent years. Its clinical spectrum ranges from mild self-limiting illness to severe manifestations such as dengue hemorrhagic fever and shock syndrome. In India, the disease has spread widely over the past two decades, now affecting nearly all regions, including the Hadoti area of Rajasthan. **Objective:** To determine dengue seropositivity by NS1 antigen and anti- dengue IgM antibody detection through ELISA, and to correlate the results with evolving epidemiological trends. **Materials and methods**: A cross -sectional study done from November 2021 to April 2024 with blood samples tested from clinically suspected cases of dengue virus infection. **Results**: Between November 2021 and April 2024, 652 blood samples were tested (84 in 2021, 184 in 2022, and 92 in 2024). Total number of positive cases was: 55 (65.47%) in 2021 (45 NS1, 24 IgM), 19 (10.32%) in 2022 (4NS1, 17 IgM), 106 (57.06%) in 2023 (95 NS1, 28IgM), and 35 (38.04%) in 2024 (34 NS1, 5 IgM). The age group 15-30 years accounted for the maximum positive cases in all the years: 39 (46.42%) in 2021, 66 (35.86%) in 2022, 114 (39.04%) in 2023, and 29 (31.52%) in 2024. Highest number of cases was observed during the post-monsoon season in rural areas. **Conclusion:** Prevalence of dengue seropositive cases was 55 (65.47%) in 2021, in 2022 it was 19 (0.10%), in 2023 was 106(57.06%) and in 2024 was 35(38.04%). indicating a rapid decline in dengue infection, which may be attributable to the collective efforts taken by the healthcare workers and by the people during the timely delivery of preventive and control measures besides having increased awareness among the people.

Key words: Dengue fever, ELISA, Epidemiology, IgM antibody, NS1 antigen, Seropositivity

Dengue fever is one of the most important emerging infectious diseases worldwide, with transmission confirmed in over 120 tropical and subtropical countries [1]. Originating in Africa and later spreading to Asia, dengue epidemics have been recorded since the 18th century [2]. The virus is primarily transmitted by *Aedes aegypti*, with *Aedes albopictus* acting as a secondary vector, and occurs in four distinct serotypes (DENV-1 to DENV-4) [3]. Today, dengue ranks second only to malaria among mosquito-borne diseases, causing 50–100 million infections, around half a million hospitalizations, and more than 20,000 deaths annually [1]. Transmission dynamics are strongly influenced by climatic factors such as rainfall, humidity, and temperature, while clinical presentation ranges from asymptomatic infection to severe forms such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) [4, 5].

In India, the first probable outbreak was documented in Chennai in 1780, with virologically confirmed epidemics emerging in the 1960s [6]. The nationwide outbreak of 1996 marked a turning point in dengue epidemiology, which has since become increasingly complex, with recurrent outbreaks, shifting serotype predominance, and regional variation in disease severity [7, 8]. Rajasthan, particularly its southeastern districts, has witnessed a steady rise in cases. Jhalawar, in the Hadoti region, provides a favorable environment for *Aedes* breeding due to its subtropical climate, monsoon rains, and urbanization-related factors, leading to recurrent outbreaks and circulation of multiple serotypes [9].

Diagnostic confirmation of dengue relies on several laboratory methods. Although virus isolation is considered the reference standard, it is impractical for routine use due to high cost and technical demands [1]. Serological assays, particularly ELISA, are widely used for their sensitivity, specificity, and cost-effectiveness [10]. IgM antibodies typically appear by the fifth day of illness in primary infections, while IgG dominates early in secondary infections [11].

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Correspondence to: Dr. Jyoti Rana, Department of Microbiology, Jhalawar Medical College, Jhalawar (Rajasthan), India.
Email: jyotirana154@gmail.com

NS1 antigen detection, possible during the acute phase from day 1 to day 9, has become a valuable tool for early diagnosis and epidemiological monitoring [12]. Against this background, the present study was undertaken to assess the seroprevalence of dengue virus infection in Jhalawar district using NS1 antigen and IgM antibody detection, and to evaluate evolving epidemiological trends to support local surveillance and control strategies.

MATERIALS AND METHODS

This cross -sectional study was conducted over a period of four years from November 2021 to April 2024 at the VRDL Department of Microbiology, Jhalawar Medical College Jhalawar & SRG Hospital, a tertiary care teaching hospital in Jhalawar, Rajasthan, India where the Microbiology Department operates viral diagnostic laboratory, and it serves as sentinel surveillance unit of dengue, JE and chikungunya under National Vector Borne Disease Control Programmed (NVBDCP) guidelines. The testing formality during the study was done just like other daily routine laboratory tests, i.e. requisition format duly signed by the respective attending physicians on duty.

Three mL of blood sample taken from patients having clinical suspicion of dengue viral infection with a history and duration of fever on the day of presentation in the hospital was submitted to VRDL unit of the Microbiology Dept. JMC. Non -repetitive blood samples of 652 in number were collected during the study period. Hemolyzed and lipemic samples were excluded in the study. Serum Collection and Processing Blood samples received were stored at fridge and processed for serum separation within 24 hrs. The separated serum samples were subjected for serological test. Samples were respectively chosen to be processed for NS1 antigen detection and IgM antibody detection.

Inclusion Criteria: Patients of all age groups with febrile illness accompanied by clinical features such as headache, myalgia, arthralgia, rash, Hemorrhagic manifestations or leukopenia are included for the study.

Serological ELISA Test: NS1 antigen was done by ELISA using dengue NS1 antigen micro-ELISA kit (J. Mitra) and IgM detection by MAC -ELISA using NIV DEN MAC ELISA kit provided by NIV Pune. Procedures for both the tests were followed as per manufacturer's instruction.

Statistical Analysis: All the data was collected through pre-designed Proforma and entered in MS Excel. We analyze the data by using SPSS 20.0 (trial version) software and all applicable tests were used for data analysis. P value < 0.05 was consider as significant.

RESULTS

During the study period from November 2021 to April 2024, a total of 652 blood samples were tested (Table 1). The maximum number of positive cases, 40 (47.61%) belonged to age group 15-30 years in 2021, 69 (37.5%) in 2022, 117 (40.06%) in 2023 and 31 (33.69%) in the age group of 15-30 years in 2024 also (Table 2). Infection was more common in males 8.33% (49/84) as compared to females, 41.66% (35/84) in the year 2021, in 2022 it was 53.26% (98/184) in males and 46.73% (86/184) in females while in 2023, 52.05% (152/292) in males and 47.94% (140/292) in females. In 2024 also, infection was more common in males 54.34% (50/92) as compared to females (Table 3). Maximum cases were seen in November in 2021, September in 2022, October and November in 2023 (Table 4). Positivity was maximum in rural areas (Table 5).

Table 1: Year Wise distribution of Positive Dengue Cases

Year	Total sample tested	NS1 positive	IgM positive	Total
2021	84	45 (53.57%)	24 (28.57%)	55 (65.47%)
2022	184	04 (2.17%)	17 (9.23 %)	19 (10.32%)
2023	292	95 (32.53%)	28 (9.58%)	106 (36.30%)
2024	92	34 (36.9%)	05 (5.43%)	35 (38.04%)
Total	652	178 (27.3%)	74 (11.34%)	252 (38.6%)

Table 2: Age Wise distribution of Dengue Positive Cases

Age	2021	2022	2023	2024
<15	7 (8.33%)	11 (5.97%)	17 (5.82%)	09 (9.78%)
15-30	40 (47.61%)	69 (37.5%)	117 (40.06%)	31 (33.69%)
31-45	19 (22.61%)	59 (32.06%)	65 (22.26%)	23 (25%)
46-60	10 (11.90%)	24 (13.04%)	46 (15.75%)	10 (10.86%)
>60	08 (9.52%)	21 (11.41%)	47 (16.09%)	19 (20.65%)
	84	184	292	92

Table 3: Gender wise distribution of Dengue Positive Cases

Gender	2021	2022	2023	2024
Male	49 (58.33%)	98 (53.26%)	152 (52.05%)	50 (54.34%)
Female	35 (41.66%)	86 (46.73%)	140 (47.94%)	42 (45.65%)
Total	84 (99.99%)	184 (99.99%)	292 (99.99%)	92 (99.99%)

Table 4: Seasonal distribution of Dengue Virus

Month	2021	2022	2023	2024
January	Nil	02 (1.08%)	06 (2.05%)	21 (22.82%)
February	Nil	02 (1.08%)	28 (9.58%)	10 (10.86%)
March	Nil	02 (1.08%)	Nil	40 (43.47%)
April	Nil	11 (5.97%)	Nil	21 (22.82%)
May	Nil	08 (4.34%)	Nil	Nil
June	Nil	08 (4.34%)	Nil	Nil
July	Nil	06 (3.26%)	Nil	Nil
August	Nil	40 (21.73%)	37 (12.67%)	Nil
September	Nil	61 (33.15%)	54 (18.49%)	Nil
October	Nil	13 (7.06%)	61 (20.89%)	Nil
November	70 (83.33%)	18 (9.78%)	69 (23.63%)	Nil
December	14 (16.66%)	13 (7.06%)	37 (12.67%)	Nil
Total	84	184	292	92

Table 5: Area wise distribution

Area	2021	2022	2023	2024
Rural	52 (61.9%)	99 (53.80%)	185 (63.35%)	49 (53.26%)
Urban	32 (38.05%)	85 (46.19%)	107 (36.64%)	43 (46.73%)

DISCUSSION

Dengue has re-emerged worldwide in recent decades as a major public health concern, particularly in tropical and subtropical regions [13, 14]. In India, the infection is showing dynamic epidemiological changes, with periodic outbreaks being reported from different states [15]. Early and accurate diagnosis is essential, as clinical features of dengue range from mild febrile illness to life-threatening DHF and DSS [16]. Although viral culture and molecular assays such as RT-PCR are highly specific, they are costly and require advanced laboratory facilities [17]. Serological methods like NS1 antigen and IgM antibody detection remain the most practical and widely used diagnostic tools in resource-limited settings [10, 17].

In the present study conducted in Jhalawar district between November 2021 and April 2024, a total of 652 blood samples were analyzed. The overall positivity showed year-to-year variations. The highest positivity was observed in 2021 (65.47%) and 2023 (57.06%), while the lowest positivity was noted in 2022 (10.32%). In 2024, 38.04% of samples tested positive. This variation could be attributed to seasonal changes, vector density, rainfall, and other ecological factors [18, 19].

Age-wise analysis revealed that the most affected group was 15–30 years across all four years of the study (46.42% in 2021, 35.86% in 2022, 39.04% in 2023, and 31.52% in 2024) [Table 2]. This finding aligns with previous research showing that young adults are more vulnerable, possibly due to greater outdoor activity, occupational exposure, and mobility [20,21]. Gender distribution in our study also showed a consistent male predominance. Males accounted for 58.33% of cases in 2021, 53.26% in 2022, 52.05% in 2023, and 54.34% in 2024, consistent with socio-behavioral exposure patterns observed elsewhere in India [21, 22].

Seasonal trends observed in the study revealed maximum cases during post-monsoon months. In 2021, peak cases were seen in November; in 2022, September recorded the maximum cases; in 2023, November showed the highest incidence. These findings confirm the established correlation between monsoon rainfall, vector proliferation, and dengue transmission [18–22]. The study emphasizes the importance of continuous surveillance and year-round monitoring of dengue cases in Jhalawar. Strengthening vector control measures, public awareness programs, and early laboratory-based diagnosis, particularly before and during monsoon seasons, are crucial to reducing morbidity and preventing outbreaks [23].

Further studies incorporating serotyping and differentiation of primary versus secondary dengue infections will provide better insights into circulating strains and immune status of the population, guiding targeted interventions and reducing dengue-related morbidity and mortality in accordance with WHO recommendations [1]. Future efforts should focus on strengthening continuous surveillance for early outbreak detection, promoting community engagement through awareness and source-reduction initiatives, and incorporating serotyping along with differentiation of primary and secondary infections to anticipate severe cases such as dengue hemorrhagic fever and shock syndrome. Additionally, the implementation of effective dengue vaccination programs in India should be prioritized.

CONCLUSION

The study highlights the evolving epidemiology of dengue virus infection in Jhalawar district, southeastern Rajasthan, with fluctuating positivity rates over three and a half years, reflecting seasonal and ecological influences. Despite periodic declines in incidence, the persistence and resurgence of dengue underscore its endemic nature in the region, highlighting the ongoing need for sustained vector control, vigilant surveillance, and early laboratory-based diagnosis using NS1 antigen and IgM antibody detection. In conclusion, dengue remains a significant public health threat in Jhalawar district. The study's changing year-wise incidences highlight the need for a comprehensive strategy - including early diagnosis, vector control, public education, and advanced research on circulating strains to effectively dengue related morbidity and mortality.

REFERENCES

1. World Health Organization. Dengue and severe dengue. WHO Fact sheet. Geneva: WHO; 2023.
2. Gubler DJ. Epidemic dengue/dengue hemorrhagic fever as a public health, social and economic problem in the 21st century. Trends Microbiol. 1998; 6:305–9.
3. Halstead SB. Dengue. Lancet. 2007; 370:1644–52.
4. Messina JP, Brady OJ, Golding N, et al. Global spread of dengue virus types: Mapping the 70-year history. Trends Microbial. 2019;27(3):209–21.
5. Brady OJ, Gething PW, Bhatt S, et al. Refining the global spatial limits of dengue virus transmission by evidence-based consensus. PLoS Negl Trop Dis. 2012;6: e1760.
6. Chaturvedi UC, Nagar R. Dengue and dengue hemorrhagic fever: Indian perspective. J Biosci. 2008; 33:429–41.
7. Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in India. Indian J Med Res. 2012;136(3):373–90.
8. National Vector Borne Disease Control Programme (NVBDCP), India. Annual Report. 2022.
9. National Vector Borne Disease Control Programme (NVBDCP), India. Annual Report. 2023.
10. Peeling RW, Artsob H, Pelegrino JL, et al. Evaluation of diagnostic tests: dengue. Nat Rev Microbiol. 2010;8: S30–8.

11. Innis BL, Nisalak A, Nimmannitya S, et al. An enzyme-linked immunosorbent assay to characterize dengue infections. J Clin Microbiol. 1989; 27:875–81.
12. Dussart P, Labeau B, Lagathu G, et al. Evaluation of an ELISA for detection of dengue virus NS1 antigen in human serum. Clin Vaccine Immunol. 2006; 13:1185–9.
13. Guzman MG, Harris E. Dengue. Lancet. 2015;385(9966):453–65.
14. Bhatt S, Gething PW, Brady OJ, et al. The global distribution and burden of dengue. Nature. 2013; 496:504–7.
15. Chakravarti A, Arora R, Luxemburger C. Fifty years of dengue in India. Trans R Soc Trop Med Hyg. 2012; 106:273–82.
16. Simmons CP, Farrar JJ, van Vinh Chau N, Wills B. Dengue. N Engl J Med. 2012; 366:1423–32.
17. Yadav SP, Gupta N, Jamwal A, et al. Utility of NS1 antigen and IgM antibody in early diagnosis of dengue virus infection: experience from a tertiary care hospital in North India. Int J Res Med Sci. 2018; 6:236–40.
18. Halstead SB. Dengue virus–mosquito interactions. Annu Rev Entomol. 2008; 53:273–91.
19. Gubler DJ. The global emergence/resurgence of arboviral diseases as public health problems. Arch Med Res. 2002; 33:330–42.
20. Sharma SK, Bhasin A, Agarwal N, Srivastava S. Seroprevalence and seasonal trend of dengue virus infection in a tertiary care hospital of Rajasthan, India. Int J Health Sci Res. 2020; 10:81–7.
21. Singh H, Kaur H, Kaur P, Aggarwal A. Epidemiology and seropositivity of dengue virus in a tertiary care hospital of North India. J Clin Diagn Res. 2016;10: DC08–10.
22. Kulkarni RD, Patil SS, Ajantha GS, et al. Association of platelet count and serological markers of dengue infection—importance of NS1 antigen. Indian J Med Microbiol. 2011; 29:359–62.
23. Shepard DS, Undurraga EA, Halasa YA, Stanaway JD. The global economic burden of dengue: a systematic analysis. Lancet Infect Dis. 2016; 16:935–41.

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