Original Article

Prevalence and Changing Trend of Dengue in a Tertiary Care Hospital in Southeastern Rajasthan

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ABSTRACT

Background: Dengue is a major mosquito-borne viral disease with increasing incidence in India, showing marked seasonal and year-to-year variation. Southeastern Rajasthan has experienced recurrent outbreaks, highlighting the need for continuous surveillance. **Aim:** 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 November2021 to April 2024 with blood samples tested from clinically suspected cases of dengue virus infection. **Results:** Out of 652 samples tested, 215 (32.97%) were positive. Seropositivity was highest in 2021–22 (47.0%), declined in 2022–23 (13.37%), and resurged in 2023–24 (36.77%). The most affected age group was 16–30 years, with predominance during the post-monsoon season and higher positivity in rural areas. **Conclusion:** Prevalence of dengue seropositive cases was 55 (47.00%) in 2021- 2022 it was 22 (13.37%) in 2022-2023, in 2023-2024 was 138(36.77%) indicating fluctuating trends of dengue transmission, with an initial peak, a significant decline, and a subsequent resurgence.

Key words: Dengue; NS1 antigen; IgM antibody; Seroprevalence; Epidemiological trend; Rajasthan

Dengue fever is one of the most important emerging mosquito-borne viral diseases worldwide, with confirmed transmission in more than 120 tropical and subtropical countries [1]. The disease is caused by four distinct serotypes of dengue virus (DENV-1 to DENV-4) and is transmitted primarily by Aedes aegypti and secondarily by Aedes albopictus [2]. Globalization, urbanization, climate change, and increased human mobility have contributed to the rapid expansion and rising incidence of dengue, making it a major public health concern [3].

Clinically, dengue infection presents with a wide spectrum ranging from asymptomatic or mild febrile illness to severe forms such as dengue hemorrhagic fever and dengue shock syndrome [4]. Infection with one serotype provides lifelong immunity to that serotype but only transient cross-protection against others, predisposing individuals to severe disease during secondary infections [5]. Transmission dynamics are strongly influenced by environmental factors such as rainfall, humidity, and temperature, which favor mosquito breeding and seasonal outbreaks [6].

In India, dengue epidemiology has become increasingly complex, with outbreaks reported from almost all regions of the country [7]. Rajasthan, particularly the southeastern Hadoti region, has experienced recurrent dengue outbreaks in recent years due to favorable climatic conditions, rapid urbanization, and water storage practices [8]. Laboratory diagnosis using NS1 antigen detection and IgM antibody ELISA plays a crucial role in early case confirmation and surveillance [9, 10]. The present study was undertaken to assess dengue seroprevalence and changing epidemiological trends in a tertiary care hospital of southeastern Rajasthan.

MATERIALS AND METHODS

This cross -sectional study was conducted over a period of three 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.

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requisition format duly signed by the respective attending physicians on duty. 3mL 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

Out of 652 suspected cases tested during the study period, 215 (32.97%) were confirmed dengue positive. Year-wise distribution showed marked variation, with highest positivity in 2021–22 (47.0%), lowest in 2022–23 (13.37%), and resurgence in 2023–24 (36.77%) (Table 1).

The most affected age group was 16–30 years, accounting for 38.86% of positive cases (Table 2). Males showed slightly higher positivity compared to females (Table 3). Dengue positivity was predominantly observed during the post-monsoon months, and a higher proportion of cases were reported from rural areas (Tables 4 and 5).

(Detailed demographic and seasonal distributions are presented in Tables 1–5)

Table 1. Year Wise distribution of Positive Dengue Case

Year	Total sample tested	NS1 positive	IgM positive	Samples common positive for Ns1 and IgM	Total
2021-22	117	45(38.4%)	24(20.5%)	14(11.9%)	55(47%)
2022-23	157	07(4.4%)	17(10.8%)	02(1.2%)	22(14.1%)
2023-24	378	125(33.6%)	33(8.7%)	20(5.2%)	138(36.5%)
Total	652	177(27.1%)	74(11.3%)	36(5.5%)	215(32.9%)

Table 2. Age Wise distribution of Dengue Positive Cases

Age Group	Total Cases	Positive Cases	Percentage
0-15	53	18	33.96%
16-30	247	96	38.86%
31-45	164	46	28.04%
46-60	86	22	25.58%
>60	102	33	32.35%
Total	**652**	**215**	**32.9%**

Table 3. Gender Wise distribution of Dengue Positive Cases

Sex	Total Cases	Positive Cases	Percentage
Male	359	123	34.26%
Female	293	92	31.39%
Total	652	215	32.97 %

TABLE 4. Area wise distribution

Area	Total	Positive cases	Percentage %
Urban	263	79	36.74 %
Rural	389	136	63.25 %

TABLE 5. Seasonal distribution of Dengue Virus

Months	2021-22		2022-23		2023-24	
	Total Samples	Dengue Positive	Total Samples	Dengue positive	Total Samples	Dengue Positive
July	00	00(0%)	06	01(16.6%)	28	05(17.8%)
August	00	00(0%)	40	04(10%)	37	08(21.6%)
September	00	00(0%)	61	14(22.9%)	54	23(42.5%)
October	00	00(0%)	13	00(0%)	61	25(40.9%)
November	70	45(64.2%)	18	00(0%)	69	29(42.02%_
December	14	10(71.4%)	13	00(0%)	37	21(56.7%)
January	02	00(0%)	06	03(50%)	21	09(42.8%)
February	02	00(0%)	00	00(0%)	10	02(20%)
March	02	00(0%)	00	00(0%)	40	12(30%)
April	11	00(0%)	00	00(0%)	21	04(19.04%)
May	08	00(0%)	00	00(0%)	00	00(0%)
June	08	00(0%)	00	00(0%)	00	00(0%)
Total	**117**	**55(47%)**	**157**	**22(14.01%)**	**378**	**138(36.5%)**

DISCUSSION

Dengue continues to pose a major public health challenge in India, with periodic outbreaks and changing transmission patterns [11,12]. In the present study, an overall seropositivity rate of 32.97% was observed, with considerable year-to-year variation. Similar fluctuating trends have been reported from other parts of the country and are influenced by climatic factors, vector density, herd immunity, and effectiveness of control measures [13–15].

NS1 antigen detection contributed significantly to early diagnosis, particularly during outbreak years, while IgM ELISA aided detection in later stages of infection. The complementary role of these assays has been documented in earlier studies [16–18]. Young adults (16–30 years) were the most affected, consistent with previous reports suggesting increased exposure due to outdoor activities and occupational factors [19,20].

The post-monsoon predominance of cases observed in this study aligns with established evidence linking rainfall and temperature to increased *Aedes* breeding and dengue transmission [21–23]. The observed resurgence in 2023–24 underscores the need for continuous surveillance and strengthened vector control strategies in southeastern Rajasthan.

CONCLUSION

The study demonstrates significant year-to-year variation in dengue seroprevalence in Jhalawar district, with evidence of decline followed by resurgence over the study period. Dengue predominantly affected young adults and showed strong post-monsoon seasonality. Continuous surveillance, early laboratory diagnosis using NS1 antigen and IgM ELISA, and sustained vector control measures are essential to reduce the burden of dengue in this region.

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