

Type of Article : **Original Article**

## **Seroprevalence of Chikungunya virus infection in Western Rajasthan in year 2023**

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Source(s) of support: Nil

Presentation at meeting: Nil

Conflict of Interest: None declared

### **A B S T R A C T**

**Background:** Chikungunya virus (CHIKV) infection has similar clinical presentations to malaria. Hence, febrile illnesses are often misdiagnosed as malaria. Therefore, this study aimed to generate baseline data on CHIKV infection in northwest Ethiopia where malaria is endemic.

**Methods:** A hospital-based cross-sectional study was conducted among febrile patients presenting at the tertiary care hospitals in the year 2023. Data on socio-demographic, clinical presentations, and possible risk factors were collected using a structured questionnaire. Serum samples were screened for **immunoglobulin-M (IgM)** antibodies to CHIKV infections using enzyme-linked immunosorbent assay. Logistic regression analysis was used to determine the strength of association.

**Results:** Of 102 samples screened, the overall seroprevalence of CHIKV infection was 39.21 %. Of the total study participants, **40 patients** had CHIKV-specific IgM, indicating recent CHIKV infection. During monsoon and post-monsoon periods, increased prevalence of anti-CHIKV IgM seropositivity was found. The most common clinical presentation observed was fever, followed by headache and joint pain. Men had twice the likelihood of CHIKV infection. The presence of stagnant water near the residence almost doubled the risk for CHIKV infection.

**Conclusions:** Most of the study participants had recent infection with CHIKV, suggesting the need to design disease prevention and intervention strategies.

**Keywords :** CHIKV, Chikungunya IgM, seroprevalence.

### **Introduction**

Chikungunya is an emerging viral disease caused by the chikungunya virus (CHIKV), a single-stranded RNA virus belonging to the genus alphavirus under the Togaviridae family. The CHIKV is transmitted to humans through the bite of infected mosquitoes of the genus *Aedes*; mainly by *Aedes aegypti* and *Aedes albopictus*<sup>1</sup>. These mosquitoes tend to bite during the daytime, most commonly in the early morning and late afternoon. The virus is also maintained in sylvatic cycles involving primates and forest-dwelling *Aedes* species<sup>2</sup>.

Infection with CHIKV often leads to an acute febrile illness associated with arthromyalgia syndrome. The clinical signs of chikungunya are non-specific flu-like symptoms, a distinctive rash, and severe joint pain. Most of the clinical presentations are shared within Chikungunya, malaria, and the other febrile illnesses that are present throughout the tropics; the disease can therefore be misdiagnosed particularly in areas where malaria is endemic. The incubation period ranges from 2

to 10 days. The symptoms usually resolve within a few days but may be prolonged for weeks or months in severe cases<sup>3</sup>.

Since it was first reported in the 1950s Chikungunya cases have occurred in several countries in Africa, Europe and Asia<sup>4</sup>. The spread of chikungunya in several countries is attributed to the expansion of vectors in suitable environmental conditions and to travellers visiting countries where the disease is endemic and then transmitting CHIKV when they return to non-endemic countries.

The increasing prevalence of CHIKV is causing significant morbidity and economic loss<sup>5</sup>. According to the Centres for Disease Control and Prevention (CDC, 2015), the loss of working time and the extra health care expenditure to manage the virus are a huge burden on the society and individuals affected. Expansion of the CHIKV epidemic and increased awareness of the severity of infection have drawn attention to the disease as an important public health threat of global relevance. Due to the unavailability of vaccines for CHIKV prevention of the spread of disease mainly centres on vector control<sup>6</sup>. This study aimed to determine the seroprevalence and associated risk factors of CHIKV infection among febrile patients in Western Rajasthan.

### **Materials and methods**

It was a cross-sectional study done at Viral Research Diagnostic Laboratory (VRDL) of Department of Microbiology, Dr. S.N. Medical College to confirm the diagnosis. All the patients registered from January 1st, 2023 to December 31st, 2023 with fever or Chikungunya like symptoms were serologically tested for Chikungunya IgM. The serological test was done using RICT to detect Chikungunya IgM. Enzyme Linked Immuno-Sorbent Assay (ELISA) test was performed by kits supplied by National Institute of Virology (NIV), Pune to detect the levels of Chikungunya IgM antibodies. The ELISA test was performed in the Viral Research Diagnostic Laboratory (VRDL) of Dr. S.N. Medical College by automated DAVINCI Quattro (Biomeuriex, Marcy l'Etoile, France) along with spectrophotometric reading which was recorded quantitatively as Optical Density (OD) value. The OD value of samples were compared with the cutoff value (calculated as instructed by manufacturer) and reported as positive or negative. Detection of IgM antibody was considered to be positive for sero-diagnosis. The pre-designed CRFs (case report forms) filled by physicians were used to collect the following socio-demographic information like Age, Sex, Area of residence (rural/urban) and clinical manifestation of serologically diagnosed cases.

### **Inclusion criteria**

Outdoor and indoor patients of all age group and both sexes who were admitted in various wards of this hospital and were advised to undergo testing for acute febrile illness and Chikungunya fever for diagnostic purpose.

### **Exclusion criteria**

Patients whose blood sample was not requested for testing for acute febrile illness and Chikungunya fever.

### **Study Period**

The study was conducted on patients registered in all the tertiary care hospitals associated with Dr. S. N. Medical College from January 1st, 2023 to December 31st, 2023.

### **Statistical analysis**

The collected data was transferred to a computer. The SPSS Data Editor Software version 20 was used for analysis of the data. Chi-square test was performed and p value  $\leq 0.05$  were considered statistically significant.

Sample collection and laboratory analysis:

Five milliliters of venous blood was collected aseptically using a plain tube. The blood sample was centrifuged and the serum was separated and transferred into 1.5 ml volumes, placed in a cryovial and stored in -20 degree Centigrade.

**Results:** A total of 102 patients associated group of Hospitals of Dr. S.N. Medical College, Jodhpur with the complaint of fever and other Chikungunya like symptoms. Out of these patients, 40 patients were tested serologically positive for Chikungunya IgM. Figure 1 shows the month-wise distribution of Chikungunya cases in the year 2023. The highest number of suspected cases (38) was reported in the month of November out of whom 16 were positive (Table 1) (Figure 1). Highest number of Chikungunya cases was reported in 41-50 years age group (57.50%). Chikungunya cases in age group 21- 30 years and 31-40 years were 26.66% and 33.33%, respectively (Table 2). Tables 3 and 4 showed sex wise and area wise distribution of Chikungunya cases. Out of all reported cases 82.5 % cases were males and only 17.5% cases were females. 87.5% cases belonged to urban area while 12.5% belonged to rural area<sup>7</sup>.

In the present study, the presence of anti-CHIKV IgM antibodies was observed in few months of the year. However, IgM antibodies to CHIKV infection may remain detectable for 3 to 4 months after infection, therefore, further studies using a molecular test approach are needed to better investigate the seasonality of infection<sup>8</sup>. Increased anti-CHIKV seropositivity was observed during winter (November and December). This suggests the presence of high viral transmission during monsoon post- monsoon periods, which is consistent with a study in Tami Nadu<sup>10</sup>. The findings suggest that vector control and preventive measures should be strengthened during and at the end of the rainy season which coincides with the breeding times of vectors.

### Limitations

The study was conducted among patients presenting to health institutions and thus, it may not necessarily reflect the true seroprevalence of CHIKV infection at the community level. Nationwide surveillance should be done at large to determine the burden of the disease<sup>8</sup>. Despite these limitations, the information obtained in this preliminary study might be used as a baseline in the study area and could increase the awareness of CHIKV infection for clinicians and health policy- makers in the country<sup>9</sup>.

### Recommendations

Due to the lack of vaccines for CHIKV, vector control strategies, Following measures can be taken both at personal and government's level to reduce morbidity and mortality from Chikungunya Fever:

- Source reduction: Avoid collection of water
- Spraying of insecticide and larvicide: Both regular and focal spraying can be done depending on the incidence of disease.

### Conflict of interest

The authors have declared that no conflicts of interest.

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## Tables

Table 1. Number of Positive Cases in each month

Month	Positives	Total
January	1	3
February	1	4
March	2	3
April	2	4
May	1	2
June	1	2
July	2	5
August	1	6
September	1	7
October	2	8
November	16	38
December	10	21
<b>Total</b>	<b>40</b>	<b>102</b>

Table 2. Age wise distribution of Chikungunya suspected Cases

Age in Years	Total (Positives)	Positive %
10-20	8 (2)	25
21-30	15 (4)	26.66
31-40	27 (9)	33.33
41-50	40 (23)	57.50
51-60	12 (2)	16.66

Table 3. Sex wise distribution of Chikungunya Cases

Gender	No. of Cases	Percentage
Males	33	82.5
Females	7	17.5

Table 4. Areawise distribution of Chikungunya cases

Area	No. of Cases	Percentage
Urban	35	87.5
Rural	5	12.5

Fig. 1 Monthwise distribution of Cases

