



## “UNDERESTIMATION OF CHIKUNGUNYA INFECTION IN CENTRAL INDIA: 10 YEAR STUDY”

**Dr. Monu Singh\***

Non- Registered Junior Resident (MD. Microbiology), Dept of Microbiology, Indira Gandhi Govt. Medical college, Nagpur, 440001, India. \*Corresponding Author

**Dr. Sharmila S. Raut**

Professor and head of department of Microbiology, Indira Gandhi Govt. Medical college, Nagpur, 440001, India.

**ABSTRACT** **Background:** Major outbreak of chikungunya infection reported in India affecting more than 1.3 million people. Despite the number estimated actual disease burden is much higher due to potential underestimation of cases. Present study was carried out to determine seropositivity, seasonal variation and clinical profile of Chikungunya infection in central India.

**Method:** Study was carried out from January 2007 to December 2017. Sera of 353 clinically suspected cases were tested for IgM antibody by ELISA.

**Results:** Seroprevalence of Chikungunya infection was found to be 16.99%. Female (58.34%) were affected more than males (41.67%). Peak was observed in month of August. Most common clinical feature reported was fever followed by joint pain.

**Conclusions:** In Central India there is notable seropositivity, but actual disease burden is not known due to lack of clinical suspicion which can be overcome by continuous surveillance and testing to have a baseline data.

**KEYWORDS :** Central India, Chikungunya, Seropositivity

### INTRODUCTION

Chikungunya is an arthropod borne arboviral infection. The Chikungunya virus (CHIKV) is an RNA virus that belongs to the alpha virus genus of the Togaviridae family.<sup>1</sup> The name 'Chikungunya' has been derived from the Makonde word meaning "that which bends up" in reference to the stooped posture developed as a result of the arthritic symptoms of the disease.<sup>2</sup> CHIKV was first isolated from the serum of a febrile human in Tanganyika (Tanzania) in 1953. Between the 1960s and 1980s, the virus was isolated repeatedly from numerous countries in central and southern Africa as well as in Senegal and Nigeria in western Africa. During the same period, the virus was also identified in many parts of Asia.<sup>3</sup>

In Asia, CHIKV activity was first isolated in Bangkok, Thailand in 1958,<sup>4</sup> followed by various outbreaks reported in India, Indonesia, Maldives, Myanmar, Sri Lanka and Thailand. First Indian outbreak was first reported in Calcutta in 1963. Since then several outbreaks of chikungunya fever have been documented from different parts of the country.<sup>5</sup>

The major outbreak reported in India happened in Kolkata in 1963, which was followed by further outbreaks in Tamil Nadu, Andhra Pradesh and Maharashtra in 1964 to 65 and in Barsi in 1973.<sup>4</sup> Subsequently, there has been no active or passive surveillance carried out in India and it was believed that chikungunya had disappeared from the Indian subcontinent. Thereafter, since December 2005 outbreak of CHIKV infection has been ongoing in various states of India (Karnataka, Maharashtra, Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Gujarat, Orissa and Kerala) with potential spread to neighbouring states.<sup>4,6</sup>

Chikungunya infection is transmitted by mosquito *Aedes aegypti* and *Aedes albopictus*. In India, both the vector are known to exist and are widely prevalent during the post monsoon season.<sup>7</sup> It is estimated that CHIKV infection has affected more than 1.3 million people across 150 districts of 8 states in India. Despite the number estimated, the actual disease burden was thought to be much higher due to potential underestimation from lack of accurate reporting.<sup>8</sup>

The high morbidity and loss in daily activity associated with CHIKV infection results in considerable economic loss among the affected nations, specifically India. This emphasizes the need for proper surveillance, diagnosis, detailed understanding of epidemiology for getting a baseline data on seroprevalence which helps in planning a prevention strategy.

### MATERIAL & METHODS

**Study sites** - The present observational cross-sectional study was carried out from January 2007 to December 2017 in department of

Microbiology at a tertiary care hospital, Indira Gandhi Govt. Medical College, Nagpur, India which is a sentinel surveillance site under National Vector Borne Disease Control Programme (NVBDCP).

**Patients and clinical specimens** - Study group consisted of clinically suspected cases of chikungunya infection admitted in the hospital as well as those who attended outpatient department.

#### Diagnostic test -

10-15ml blood samples was collected through venipuncture and serum was separated as per the standard guidelines. The serum samples were subjected to Chikungunya IgM antibody detection by ELISA (NIV Chikungunya IgM Capture ELISA kit, NIV, Pune, India). The test was performed as per manufacturer's instructions.

**RESULTS** - Total of 353 serum samples from suspected chikungunya cases were collected and subjected to Chikungunya IgM antibody detection by IgM capture ELISA. 60 samples were positive. Seroprevalence of chikungunya in chikungunya suspected cases was found to be 16.99% (Table 1).

**Table 1: Positivity of Chikungunya by IgM ELISA.**

	IgM ELISA (n= 353) (%)
Positive	60 (16.99)
Negative	293 (83)
Total	353

Out of the 60 IgM ELISA positive chikungunya cases, 152 (43.05%) were from urban area and 201 (56.94%) were from rural area. Also the seropositivity for rural area (61.66%) were higher than urban area (38.33%) (Table 2).

**Table 2: Area wise distribution of suspected Chikungunya cases and IgM ELISA positive cases.**

Area	No. of suspected Chikungunya cases (n=353) (%)	No. of IgM ELISA positive cases (n=60) (%)
Urban	152 (43.05)	23 (38.33)
Rural	201 (56.94)	37 (61.66)
Total	353	60

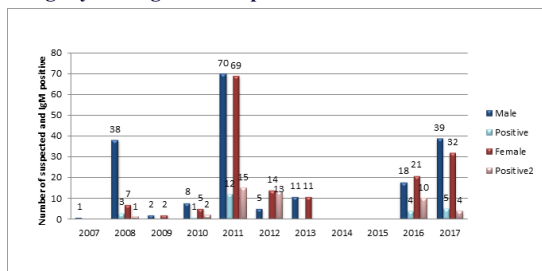
Number of suspected cases where more in male (54.39%) than female (45.60%), while seropositivity was higher in females (58.34%) than the males (41.67) (Table 3).

**Table 3: Gender wise distribution of suspected Chikungunya and IgM ELISA positive cases.**

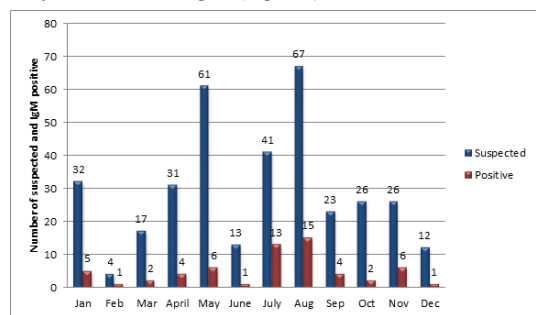
Gender	No. of suspected chikungunya cases (n=353) (%)	No. of IgM ELISA positive cases (n=60) (%)
Male	192 (54.39)	25 (41.67)
Female	161 (45.60)	35 (58.34)
Total	353	60

Maximum number of suspected chikungunya cases and IgM ELISA positive cases were reported in year 2011 followed by year 2017 for both males and female (Figure 1).

**Figure 1: Gender wise and year wise distribution of suspected chikungunya and IgM ELISA positive cases.**



Maximum number of suspected chikungunya cases and IgM ELISA positive cases were reported in the months of August, followed by May and July as shown in the figure (Figure 2).



Variety of clinical signs and symptoms were reported, most common clinical feature were fever followed by joint pain, fever with chills, abdominal pain, maculopapular rash and hemorrhagic manifestation (Table 4).

**Table 4: Clinical presentation of suspected Chikungunya cases and IgM ELISA positive cases.**

Sign and symptoms	No. of suspected Chikungunya cases (n=353) (%)	No. of IgM ELISA positive cases (n=60) (%)
Fever	342 (96.88)	60 (100)
Joint pain	301 (85.26)	44 (73.33)
Fever with chills	290 (82.15)	42 (70)
Abdominal pain	220 (62.32)	25 (41.66)
Maculopapular rash	180 (50.99)	15 (25)
Hemorrhagic manifestations	87 (24.64)	10 (16.66)

**DISCUSSION**

Chikungunya is not a notifiable disease. However, depending upon the spread, countries in the region may make it mandatory for the primary health centres, other clinics and hospitals to notify suspected cases to authorities. Though case diagnosis can only be made by laboratory means, chikungunya should be suspected when epidemic occurs with the characteristic triad of fever, rash and joint manifestations.<sup>9</sup>

**Seroprevalence of chikungunya infection**

In the present study, out of 353 chikungunya suspected cases, 60 cases were positive for chikungunya IgM antibody by ELISA. Seroprevalence of chikungunya in chikungunya suspected cases is 16.99%. While higher seroprevalence of 25.37% was reported by Ray P et al of which highest cases were detected in Hubli, Karnataka (49,36%) followed by Jaipur, Rajasthan (16.28%) and Delhi (0,56%) India by RT-PCR and/or IgM-ELISA testing.<sup>8</sup> Seropositivity of 11.86% was reported by Srikanth P et al in south India by one-step RT-PCR,<sup>10</sup> 9.6% by Patil SS et al in Kasegaon, Maharashtra,<sup>11</sup> 1.6% by Rajderkar SS in Tasgaon area of Western Maharashtra.<sup>5</sup>

**Area wise distribution**

CHIKV observed mostly in the urban and periurban areas.<sup>12</sup> In contrast in our study it was observed that out of the 353 suspected chikungunya cases, 43.05% (153/353) were from urban area while 56.94% (201/353) were from rural area. In 60 IgM ELISA positive

cases 38.33% (23/60) were from urban area and 61.66% (37/60) were from rural area which shows higher seroprevalence in rural area. Our findings were in accordance with Kawle AP et al who observed seroprevalence of CHIKV in their study was higher in the rural areas of Kalmna and Kothari of Ballarpur Taluka, Maharashtra in India.<sup>13</sup>

**Gender wise distribution**

Males and females respond differently to CHIKV infection, which is further modified by the stage of life cycle they belong. Biological differences in males and females in different age groups is influenced by hormonal, immunological, genetic or lipid metabolism.<sup>14</sup> Males and females frequently have different activity patterns related to gender driven differences in occupation and in family roles. Depending on the activity and the disease, these gendered differences may increase the risk of exposure in either of the sexes.<sup>15</sup>

In the present study, females (58.34%) were affected more than the males (41.67%). The ratio of male to female in IgM ELISA positive cases was found to be 1:1.4 This observation is similar to that in other studies done by Mahapatra T in delhi,<sup>16</sup> Dumpala S et al in Nalgonda district in Telangana,<sup>17</sup> Jain SK et al in Hyderabad and Nalgonda Districts of Andhra Pradesh.<sup>18</sup> In contrast higher seropositivity in males were observed by Ray P et al in Delhi and Rajasthan,<sup>8</sup> Rajderkar SS et al in Tasgaon, Maharashtra,<sup>5</sup> Patil SS et al in Kasegaon, Maharashtra.<sup>11</sup>

**Year wise distribution**

In the present study maximum number of suspected chikungunya cases and IgM ELISA positive cases were reported in year 2011 i.e., 39.37%(139/353) and 45%(27/60) respectively while in year 2017 suspected cases were more 20.11% (71/353) but seropositivity was less 15%(09/60). No clinical suspected cases were noted in year 2014 and 2015.

**Month wise distribution**

Chikungunya fever has been observed to occur mostly during the monsoon and post monsoon seasons during which time there is high breeding of both Aedes albopictus and Aedes aegypti. In India the first CHIKV outbreak in 1963 was observed during July to December, coinciding with the monsoon and post monsoon seasons.<sup>8</sup> However, in the present study, CHIKV was detected throughout the year, maximum number of chikungunya suspected cases were reported in the months of August, May and July. Similarly amongst the IgM ELISA positive cases, peak was seen in the months of August followed by May and July. While Mahapatra T observed that chikungunya cases peaked during October than other months.<sup>16</sup>

**Clinical Manifestation**

The symptoms are most often clinically indistinguishable from those observed in dengue fever. Therefore, it is very important to clinically distinguish dengue from chikungunya virus infection. Unlike dengue, hemorrhagic manifestations are relatively rare and as a rule shock is not observed in chikungunya virus infection. Most often chikungunya is a self limiting febrile illness.<sup>2</sup>

The most common presenting feature in suspected chikungunya cases in our study was fever (96.88%), followed by joint pain in 85.26%, fever with chills in 82.15%, abdominal pain in 62.32%, maculopapular rash in 50.99%, hemorrhagic manifestations in 24.64% cases.

In 60 IgM ELISA positive cases, fever was present in all (100%) cases, followed by joint pain in 73.33%, fever with chills in 70%, abdominal pain in 41.66%, maculopapular rash in 25%, hemorrhagic manifestations in 16.66% cases. Similar findings were reported by Jain SK et al who observed fever and arthralgia in 100% cases followed by joint pain in 81.4%, rash in 14.8%.<sup>18</sup> Patil SS et al also observed fever with joint pain as most common symptoms in 100% cases followed by headache in 45.3%, joint swelling in 40.3% and rashes in 3.9%.<sup>11</sup> While Rajderkar SS et al observed joint pain as most common symptom in 100% cases followed by fever in 73.30%.<sup>5</sup>

Chikungunya is self-limiting viral illness, some neurological complications like meningoencephalitis, demyelinating neuropathy, optic neuritis and myocarditis are not uncommon. Till date, no specific treatment is available for this infection.<sup>16</sup> Beneficial effect is achieved by supportive therapy that helps to ease symptoms, such as administration of non-steroidal anti-inflammatory drugs, and getting plenty of rest.<sup>12</sup>

## CONCLUSION

Chikungunya is a re-emerging infection may be due to a variety of social, environmental, behavioural and biological changes. Continuous sero-surveillance needs to be maintained in outbreak and non-outbreak areas to have a baseline data. Though in Central India there is notable seropositivity in clinically suspected cases, but actual disease burden is not known due to lack of clinical suspicion. This underestimation of cases can be overcome by continuous surveillance and testing the sample for chikungunya infection whenever mosquito borne disease is suspected.

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