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Seroprevalence of Chikungunya IgM Antibody among Febrile Patients in a Tertiary Care Hospital, Jamnagar, Gujarat (India)

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Original Research Article

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Abstract: Chikungunya Fever is one of the most important arboviral infections of medical significance. It is characterized by an abrupt onset of fever with severe arthralgia followed by constitutional symptoms and rash lasting for 1-7 days. The disease is almost self-limiting and rarely fatal. Chikungunya virus (CHIKV) is a RNA virus belonging to the family Togaviridae, Genus Alpha virus. Aim of the study is to know the seroprevalence of Chikungunya infection in a Tertiary Care Hospital in Jamnagar, Gujarat, India. A retrospective study was conducted at a Microbiology Department, Shree M.P. Shah Govt. Medical College, Jamnagar, Gujarat. Serum samples were collected from 382 suspected cases of Chikungunya fever and tested for Chikungunya IgM antibodies by ELISA over a 1 year period from July 2017 to June 2018. Of the 382 serum samples tested, 67 (17.54%) were positive for Chikungunya IgM antibodies. Out of these 67 positive samples, males were 30 (44.78%) and females were 37 (55.22%). The most affected age group was 31 to 45 years 22 (32.84%), followed by 16 to 30 years 17 (25.36%). From the present study it can be concluded that the Chikungunya cases are on rise. Hence, Chikungunya has become a major public health problem in India. Favorable mosquitogenic condition during monsoon period is primarily responsible for the rapid spread of Chikungunya. This requires continuous monitoring of the viral circulation in both endemic and non-endemic areas and rapid implementation of Chikungunya control programme. For these infections early detection and access to proper medical care will cause lower fatality rate.

Keywords: Chikungunya virus; Togaviridae; Immunoglobulin M; ELISA; Jamnagar.

INTRODUCTION

Chikungunya (CHIK) is caused by an arbovirus (Chikungunya virus) that belongs to the genus Alpha virus under the Togaviridae family. The name CHIK is derived from the Makonde word which means "that which bends up" describing the stooped posture due to arthritic feature of the disease. Chikungunya is a viral disease that is spread by the bite of Aedes aegypti and Aedes albopictus mosquito. The incubation period is usually 2-3 days. The symptoms of this disease are sudden onset of crippling arthralgia accompanied with fever, chills, headache, nausea, vomiting, low back pain and rash lasting for a period of 1-7 days. The acute phase lasts for 2-3 days and may remit for 1-2 days after a gap of 4-10 days resulting in a "saddle back" fever curve. Arthralgias are poly-articular, migratory and predominantly affect the small joints of hands, wrists and feet, with lesser involvement of larger joints. Maculo-papular rash may be seen typically over the face and trunk. In acute phase most patients have headache and conjunctival redness is seen in some cases. It is self-limiting and rarely fatal disease [1].

The virus was first isolated in blood samples obtained during an epidemic of a "dengue like" disease that occurred between 1952 and 1953 in Tanzania [2]. CHIKV is an emerging arbovirus that is widespread in tropical regions and is spreading rapidly to temperate climates with recent epidemics in Africa and Asia and also documented outbreaks in Europe and America [3]. It was unknown to Indian population till it appeared as a major epidemic in 2006. Around 1.38 million Indian populations were affected by this disease. The states that first affected were Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, Gujarat, and Kerala. All ages and both sexes were affected [4]. Resurgence of Chikungunya has been attributed to various factors including globalization, increase in the mosquito population, loss of herd immunity and the

mutation A226V in the E1 gene causing a significant increase in CHIKV infectivity for Aedes Albopictus [5].

In India, National Institute of Virology (NIV), Pune is a WHO collaborating center for arboviral diseases. It is engaged in diagnosis, outbreak investigations and preparations of reagents for diagnosis of arboviral infections. Infections with CHIKV are confirmed by the detection of the virus, viral RNA, or CHIKV-specific antibodies in patient samples. Enzyme-linked immunosorbent assays (ELISAs) detect both anti-CHIKV immunoglobulin (Ig) M and IgG antibodies from either acute- or convalescent phase samples.

MATERIALS AND METHODS

Study design

A retrospective observational study was conducted to find out Sero-prevalence of Chikungunya from July 2017 to June 2018 at a Microbiology Department, Shree M.P. Shah Government Medical College, Jamnagar, Gujarat (India). Total 382 blood samples were received from different wards of Guru Gobindsingh Tertiary Care Hospital from suspected cases of Chikungunya fever and tested for Chikungunya IgM antibody using NIV Pune ELISA kit.

Specimen selection criteria

Sample collected after 5 days of onset of Fever.

Sample collection and storage

Patients suspected of Chikungunya fever were examined by hospital clinicians at either outpatient services or, for inpatients, when attending the emergency unit or upon admission to a ward. All cases of fever for which an individual showed two or more of the Chikungunya-like signs and symptoms were suspected as a Chikungunya virus infection. A single blood sample (approximately 2-3 ml) was collected from each patient suspected of Chikungunya virus infection at the time of admission into hospital. Specimen collection and separation of serum were performed using strict aseptic precautions and following standard microbiological methods. Serum samples for ELISA test were prepared and stored at 2-8°C until tested.

Detection of Chikungunya IgM by capture ELISA

Serum samples were screened for Chikungunya IgM antibody by μ-capture Chikungunya IgM enzyme linked immunosorbent assay (ELISA) kit was used (supplied by the National Institute of Virology, Pune; under the National Vector Borne Disease Control Program). The presumptive diagnosis by NIV Chikungunya MAC ELISA may be confirmed by a confirmatory test as per WHO guidelines [6]. Manufacturer's instructions were strictly followed for performing the test and interpreting the results. Optical Density (O.D) was measured at 450 nm using ELISA reader method and test results were interpreted either Positive or Negative according to manufacturer's instructions. The sensitivity and specificity of detection quoted by the manufacturer were 95% and 98%, respectively. This diagnostic kit provided qualitative detection of IgM antibodies specific to Chikungunya virus in human serum.

Interpretation of results

- If OD value of sample tested is less than OD of Negative control by a factor 2.0, the sample should be considered as Negative for Chikungunya IgM.
- If OD value of sample tested exceeds OD of Negative control by a factor 3.0, the sample should be considered as positive for Chikungunya IgM.

RESULTS AND DISCUSSION

Out of the 382 cases tested, 67(17.54%) were positive for Chikungunya IgM antibodies.

Out of these 67 positive samples, males were 30(44.78%) and females were 37(55.22%) (Table-2 & Figure-1)

Table-1: Sero-prevalence of Chikungunya

Total Sample Tested	Positive Sample	Sero-prevalence (%)
382	67	17.54%

Table-2: Sex wise Sero-prevalence of Chikungunya

	Total Samples	Positive Samples	Sero-prevalence (%)
Male	176	30	44.78%
Female	206	37	55.22%
	382	67	100%

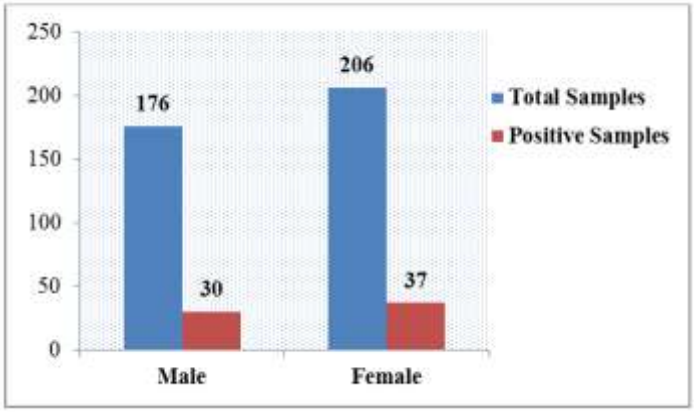

Fig-1: Sex wise Sero-prevalence of Chikungunya

Table-3 show the prevalence rate of Chikungunya was maximum 22 (32.84%) in 31-45 years age group followed by 16 to 30 years 17 (25.37%) and 16 (23.88%) in > 45 years of age group 12 (17.91%) less than 15 years of age group and (Figure-2).

Table-3: Age-group wise Sero-prevalence of Chikungunya

Age(Years)	Total Samples	Positive Samples	Sero-prevalence (%)
0-15	126	12	17.91%
16-30	92	17	25.37%
31-45	73	22	32.84%
>45	91	16	23.88%
	382	67	100%

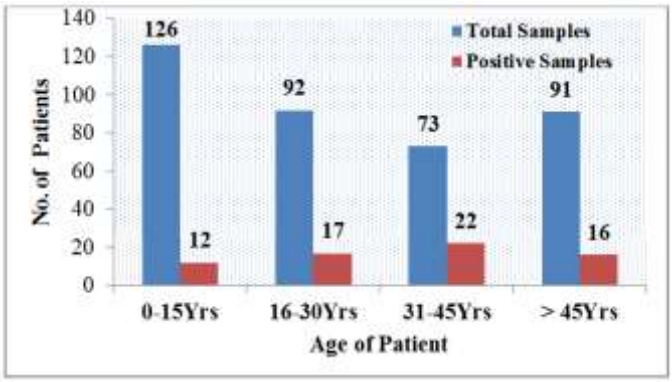

Fig-2: Age-group wise Sero-prevalence of Chikungunya

Table-4: Month wise distribution of Chikungunya cases

Month	No. of cases reported (n=382)	No. of Positive cases (n=67)
July-17	03	00
August-17	17	03
September-17	38	05
October-17	75	15
November-17	138	26
December-17	56	12
January-18	12	01
February-18	15	01
March-18	05	00
April-18	10	01
May-18	11	02
June-18	02	01

Table-4 and Figure-3 show maximum cases were reported during post monsoon season October-2017 to December-2017, were 55(82.08%). And minimum in January 2018 to June-2018, were 5(7.58%).

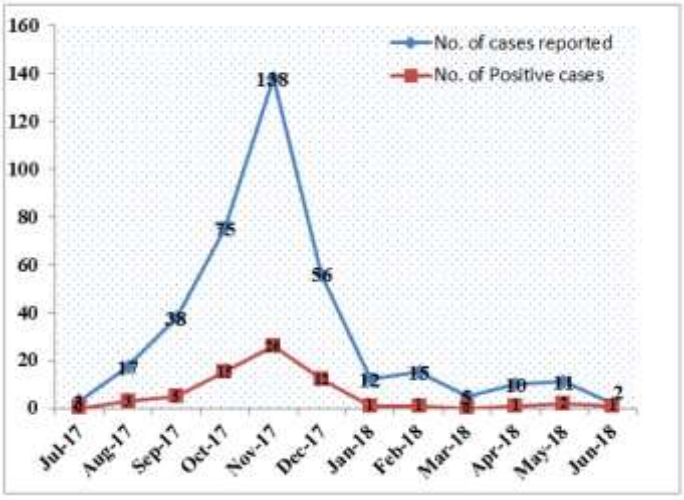

Fig-3: Month wise distribution of Chikungunya cases

Since no effective vaccines or therapeutics are available, early detection and proper diagnosis plays the key role in the effective control of Chikungunya infection. The development of immunoglobulin M antibody (IgM) capture enzyme linked immunosorbent assay has been a major achievement in serology as it provided a rapid and reliable technique for the diagnosis of arboviruses. Indirect immune-fluorescent antibody technique is another reliable technique for detection and identification of viral antigens from clinical samples [7]. A total of 382 serum samples from suspected cases of Chikungunya infection were received during the study period, out of which 67(17.54%) samples were positive for Chikungunya infection. The study also showed that mostly affected age group was 31-45 years. Less than 15 years age group was least affected. In the gender distribution, the number of affected females 37(55.22%) was more than males 30(44.78%).

Study	Prevalence (%)	Male (%)	Female (%)	Age Group
				31-45yrs
Kinnari S *et al*., [8]	16.50%	36.09%	63.91%	-
Divya *et al*., [9]	21.80%	44.80%	55.20%	-
Modi KP [10]	33.61%	42.52%	57.48%	27.29%
Present Study	17.54%	44.78%	55.22%	32.84%

Present study of Sero prevalence 17.54% is similar to Kinnari S *et al*., 16.50% and Divya *et al*., 21.80%.

In this study male and female prevalence is 44.78% and 55.22% respectively similar to study Divya *et al*., show 44.8% and 55.20% in male and female respectively and in Modi KP *et al*., study show 42.52% and 57.48% in male and Female respectively.

Based on age group in present study, age group 31-45 years show 32.84% which is similar to Modi KP *et al*., show 27.29%.

CONCLUSIONS

Seroprevalence of Chikungunya in our study 17.54%, which was high in late monsoon, suggests that it continues to be a major health problem in our setup and indicates the need of appropriate strategies to reduce the severity of disease. In Indian scenario due to low socio-economic conditions, overcrowding and poor sanitary conditions which facilitate the presence of the Aedes vector species and contribute to the spread of the Chikungunya virus to wider areas. Therefore, screening of Chikungunya virus and other arboviruses is necessary to prevent the complications as early as possible.

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