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Sero-Prevalence Study of Chikungunya Cases in and around the area of Jamnagar, Gujarat (India)

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Abstract

Introduction: Chikungunya is a debilitating, non-fatal, mosquito borne viral fever caused by Chikungunya virus (CHIVA). The disease is transmitted to humans by the bite of Aedes aegypti and Aedes albopictus mosquitoes. Severe outbreaks of Chikungunya have been reported in several countries of Africa and Asia. Chikungunya fever is characterized by fever with sudden onset, arthralgia, rash, headache and myalgia. However, arthralgia is painful and long lasting, affecting primarily the peripheral joints.

Aims & Objectives: To find out the prevalence of Chikungunya fever in and around the regions of Jamnagar district, Gujarat (India).

Materials and Methods: The study was conducted from January-2016 to June-2017. Total 139 serum samples were collected from cases with pyrexia and arthralgia. Serum samples were tested for Chikungunya antibodies by Chikungunya IgM ELISA.

Results: Out of 139 samples 38 samples were confirmed positive for Chikungunya IgM antibodies. The prevalence rate of Chikungunya was 27.34% with maximum number of cases in the age group more than 15 years 37(97.37%). Females 25(65.79%) were more affected than males 13(34.21%).Maximum number of cases reported during post monsoon season July to December 28(73.68%).

Conclusion: Sero-prevalence of Chikungunya in our study 27.34%, 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 & early diagnosis to reduce the severity of disease.

Keywords: Seroprevalence, Chikungunya, Enzyme Linked Immunosorbent Assay, IgM, Jamnagar.

Introduction

Chikungunya is a "debilitating non-fatal viral fever". 'Swahili' is a language spoken in East Africa. The meaning of Chikungunya in Swahili language is 'that which bends up' in reference to the stooped posture developed as a result of the arthritic symptoms of the disease. The disease was first documented in 1952, following an outbreak on the Makonde Plateau, along the border between Tanganyika (Tanzina) and Mozambique.[(1)] Chikungunya fever is an arboviral disease caused by Chikungunya virus (CHIVA). It is a member of family Togaviridae and genus alphavirus. It is an enveloped ribonucleic acid virus. RNA is single-stranded, linear, positive-sense of approximately 11.8 kb.[(2)]

The disease is transmitted to humans by the bite of the female Aedes aegypti and Aedes albopictus mosquitoes. Chikungunya fever has been originally distributed in several parts of Africa, South Asia and Southeast Asia. In India, well-documented out breaks occurred in 1963 and 1964 in Kolkata and southern India respectively. A small outbreak of Chikungunya (CHIK) was reported from Solapur district, Maharashtra in 1973. The virus disappeared for three decades and re-emerged in French island of reunion in the Indian Ocean in 2005. In 2006, a large outbreak occurred in India, Andhra Pradesh, Andaman & Nicobar Islands, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Kerala and Delhi was badly affected. An outbreak of Chikungunya was reported from Italy in 2007 and Thailand and south India in 2009.[(3-7)] Recently in 2014, Chikungunya reached United States and cases have been reported from Florida by Centers for Disease Control and Prevention.[(8)]

The Chikungunya fever presents with triad of symptoms fever, arthralgia and rashes. A very important feature of Chikungunya fever is a debilitating and prolonged arthralgia that primarily affects the peripheral small joints. While the acute febrile phase of the illness normally resolves within a few days, the pain associated with CHIK-V infection of the joints typically persists for weeks to months or years together in chronic cases.[(9,10)] The incubation period ranges between 2 to 10 days. The fever and skin rash are short-lasting, but the joint pains may recur or linger for a long time, sometimes for as long as 3 years after the onset of disease.[(11)] The pain may begin in old fracture sites, and worsening of preexisting arthritis may occur. Tender, enlarged lymph nodes are common findings.[(12,13)]

Material and Methods

Study design: A retrospective observational study was conducted to find out Sero-prevalence of Chikungunya from January 2016 to June 2017 at a Microbiology Department, Shree M.P. Shah Government Medical

College, Jamnagar, Gujarat (India). Total 139 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 the individual showed two or more of the following 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.[14] 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 at Department of Microbiology of Shri M.P. Shah Medical College, Jamnagar, Gujarat used 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, dependent on the following principle. IgM antibodies in the patient's serum are captured by anti-human IgM (µ chain specific) coated on to the solid surface (wells). In the next step, CHIK antigen is added which binds to captured human IgM in the sample. Unbound antigen is removed during the washing step. In the subsequent step biotinylated anti CHIK monoclonal antibodies are added followed by Avidin-HRP. Subsequently, chromogenic substrate (TMB/H_2O_2) is added, the reaction is stopped by 1N H_2SO_4. The intensity of color / optical density is measured at 450 nm.

The present CHIK IgM kit contains all ready to use reagents has been evaluated for performance by Center for Disease Control(CDC), Fort Collins, CO, USA.

Interpretation of results

1. 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.
2. 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 139 cases tested, 38(27.34%) were positive for IgM antibodies

Table 1: Sero-prevalence of Chikungunya

Total Sample Tested	Positive Sample	Sero-prevalence (%)
139	38	27.34%

Out of these 38 positive samples, males were 13(34.21%) and females were 25(65.79%) (Fig.1).

Table 2: Sex wise Sero-prevalence of Chikungunya

	Total Sample	Positive Sample	Sero-prevalence (%)
Male	56	13	34.21%
Female	83	25	65.79%
	139	38	100%

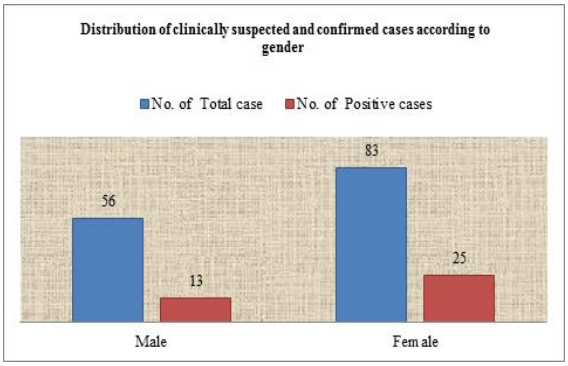

Fig. 1

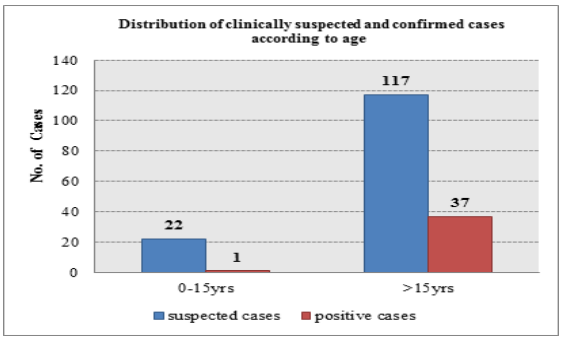

Fig. 2

Table 3 show the prevalence rate of Chikungunya was maximum 97.37% in more than 15 years age group and 2.63% in less than 15 years of age group (Fig. 2).The chi-square statistic is 4.5961, p-value is 0.032, this show age group wise distribution of Chikungunya IgM is statistically significant.

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

Age(Year)	Total Sample	Positive Sample	Sero-prevalence (%)	Chi-square	p-value
0-15	22	1	2.63%	4.5961	< 0.05
>15	117	37	97.37%		
	139	38	100%		

Table 4: Month wise distribution of Chikungunya cases

Month	No. of cases reported	No. of Positive cases
January-16	2	2
February-16	1	1
March-16	0	0
April-16	1	1
May-16	1	0
June-16	0	0
July-16	1	1
August-16	2	1
September-16	3	1
October-16	28	3
November-16	41	14
December-16	32	8
January-17	8	4
February-17	3	1
March-17	4	0
April-17	3	0
May-17	2	1
June-17	7	0

Table 5 show maximum cases were reported during post monsoon season July-2016 to December-2016, were 28(73.68%). And in January 2016 to June-2016, were 4(10.53%) and January-2017 to June-2017, were 6(15.79%) (Fig. 3).

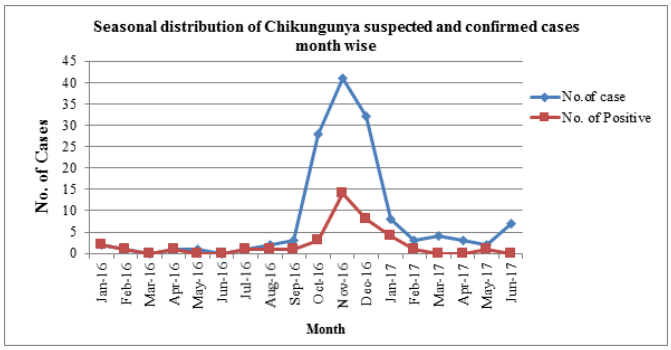

Fig. 3

Table 5: Seasonal Distribution of Chikungunya

	Jan-June 2016	July-Dec 2016	Jan-June 2017
Total Sample	5	107	27
Positive Sample	4	28	6
Prevalence (%)	10.53%	73.68%	15.79%

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 immunofluorescent antibody technique is another reliable technique for detection and identification of viral antigens from clinical samples.[15] A total of 139 serum samples from suspected cases of Chikungunya infection were received during the study period, out of which 38(27.34%) samples were positive for Chikungunya infection. The study also showed that mostly affected age group was > 15 years. Less than 15 years age group was least affected. In the gender distribution, the number of affected females 25(65.79%) was more than males 13(34.21%).

Study	Prevalence (%)	Male (%)	Female (%)	Age Group		July-December (%)
				< 15 years	>15 years	
Divya et al[16]	27.80%	44.8%	55.2%	5.60%	94.40%	-
Modi KP[17]	33.61%	42.52%	57.48%	4.78%	95.22%	-
Mohanty et al[18]	25.70%	46.00%	54.00%	-	-	71.26%
Atul J Sakhiya[19]	33.01%	41.02%	58.97%	-	-	-
Present Study	27.34%	34.21%	65.79%	2.63%	97.37%	73.68%

Present study of Sero prevalence 27.34% is similar to Divya et al 27.80% and Mohanty et al 25.70%.

In this study male and female prevalence is 34.21% and 65.79% respectively similar to Atul J Sakhiya et al study show 41.02% and 58.98% 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, less than 15 years, 2.63% and more than 15 years show 97.37% which is similar to Modi KP et al show 4.78% and 95.22% in less than 15 years and more than 15 years respectively and Divya e et al show 5.60% and 94.40% in less than 15 years and more than 15 years respectively.

In our study found that there is seasonal variation peaking in the months of July to December 73.68% which is similar to Mohanty et al study show 71.26%, coincided with the monsoon and post-monsoon periods when the vector density peaks.

Conclusions

Seroprevalence of Chikungunya in our study 27.34%, 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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References

1. Text book of Medical Microbiology - Topley & Wilson's Microbiology and microbial infections by Brian W J Mahy & Leslie collier ninth edition volume 1.
2. Text book of Medical Microbiology jawetz, Melnick & Adelbergs 24th edition.
3. Staples JE, Breiman RF, Powers AM. Chikungunya fever: an epidemiological review of a re-emerging infectious disease. Review article. Clinical Infectious Disease. 2009;49(6):942-48.
4. VS Padbidri, NS Wairagkar, GD Joshi, UB Umarani, et al. a serological survey of arboviral diseases among the human population of the Andaman and Nicobar islands, India. Southeast Asian Journal of Tropical Medicine and Public Health. 2002;33(4):749-800.
5. CVM Naresh Kumar, AM Anthony Johnson, DVR. Sai Gopal. Molecular characterization of chikungunya virus from Andhra Pradesh, India & phylogenetic relationship

with Central African isolates. Indian J Med Res. 2007;126:534-40.
6. Manimunda SP, Sugunan AP, Rai SK, Vijayachari P, Shriram AN, et al. Outbreak of chikungunya fever, Dakshina Kannada District, South India, 2008. Am J Trop Med Hyg. 2010;83(4):751-54.
7. Philippe Renault, Jean-Louis Solet, Daouda Sissoko, et al. A Major Epidemic of Chikungunya Virus Infection on Réunion Island, France. Am J Trop Med Hyg. 2007;77(4):727–31.
8. Johansson MA, Powers AM, Pesik N, Cohen NJ, Staples JE. Now casting the Spread of Chikungunya Virus in the Americas. PLoS ONE. 2014;9(8):e104915.
9. Pialoux G, Alex B, Stéphane G, et al Chikungunya, an epidemic arbovirosis- Review article. Lancet Infect Dis. 2007;7:319–27.
10. SD Suryawanshi, AH Dube, RK Khadse, SV Jalgaonkar, PS Sathe, et al. Clinical profile of chikungunya fever in patients in a tertiary care centre in Maharashtra, India. Indian J Med Res. 2009;129:438-41.
11. Brighton SW, Prozesky OW, de la Harpe AL. Chikungunya virus infection. A retrospective study of 107 cases. S Afr Med J 1983;63:313–5.
12. De Ranitz CM, Myers RM, Varkey MJ, Isaac ZH, Carey DE.Clinical impressions of chikungunya in Vellore gained from study of adult patients. Indian Med Res 1965;S3:756–63.
13. Bodenmann P, Genton B. Chikungunya: An epidemic in real time. Lancet 2006;368:258.
14. Guidelines for prevention and control of Chikungunya fever (2009). Published by WHO regional office for South East Asia.
15. A B Sudeep and D Parashar. Chikungunya: an overview, J. Biosci. 33(4), November 2008, 443–449.
16. Divya, P., Krishna S. 2016. Seroprevalence of Chikungunya virus infection in Ballari and nearby districts of Karnataka. International Journal of Medical Microbiology and Tropical Diseases, 2(4):175-17.
17. Modi, K.P., et al "Sero-Prevalence of Dengue and Chikungunya, their Co-infection and Teasonal trends of these infections at a tertiary care hospital, ahmedabad, gujarat." *international journal of microbiology research* 9.1 (2017):819-822.
18. Mohanty I, Dash M, Sahu S, Narasimham MV, Panda P, Padhi S. Seroprevalence of Chikungunya in southern Odisha. J Fam Med Primary Care 2013;2:33–6.
19. Sakhiya, A.J., Gamit M, Prajapati K, Patel D, Shah P. 2015. Seroprevalence of Chikungunya cases in a tertiary-care hospital in Ahmedabad. Int J Med Sci Public Health, 4:1297-1300.