Original Article

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Microbiology Section

Profile of The *Chikungunya* Infection: A Neglected Vector Borne Disease which is Prevalent In The Rajkot District

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ABSTRACT

Background: *Chikungunya* Virus has been responsible for significant human morbidity probably for several hundred years; yet in spite of its prevalence, the *Chikungunya* Virus epidemiology and the mechanisms of virulence and pathogenesis are still poorly understood and undetermined.

Aims: This study was done to show that the *Chikungunya* infection has shown a change in its pattern of occurrence with respect to the clinical features, the gender and the age group which are predominant and the season of the outbreak. The present study was conducted to evaluate the features of the Chikugunya infection in patients with acute febrile illness from various geographical regions of Rajkot district, Gujarat, India.

Type of Study: A cross-sectional study, multi centric study.

Statistical method: The Chi-square test for the goodness of the fit and independence.

Methods: One hundred ninty three serum samples of suspected cases of patients who attended the outdoor and indoor patients departments at a tertiary care hospital, Rajkot and the primary health centres, the community health centre and the urban health centres that were covered in the Rajkot district, which were collected during the period of one year from 1st January 2011 to 25th December 2011, were studied. The sera were processed and tested for the detection of the *Chikungunya* IgM antibody by using a solid phase, capture micro well ELISA technology.

Results: Out of the total 193 cases, 84 were positive for the *Chikungunya* IgM antibody. Out of the total 84 positive cases, 32 were males (38.09%) and 52 were females (61.9%). Female patients showed more prevalence of this disease. A majority of the patients presented with fever, headache and joint pain: 44(52.38%). The highest prevalence of *Chikungunya* was found in the 40-50 years age group, which occurred in 34 (40.47%) cases. In the months of November and December, the occurrence of *Chikungunya* was more.

Conclusion: This study emphasizes the need for a continuous surveillance on the disease burden by using multiple diagnostic tests and it also warrants the need for appropriate molecular diagnostic techniques for an early detection of the *Chikungunya* virus.

Key Words: Age, *Chikungunya*, Clinical features, Seasonal variation, Sex correlation

INTRODUCTION

The first recognized outbreak of *Chikungunya* occurred in east Africa in 1952-1953. Soon after, epidemics occurred in the islands of the Pacific Ocean, and worldwide. In India, the infection reemerged in seven states in 2005 and after the latest report in 2010, it has spread to more than 18 states/union territories within the country, affecting more than 3.7 million individuals. The intensity of the infection has increased with every passing year with 45%–63% during outbreaks [1].

The *Chikungunya* virus (CHIKV) is an enveloped positive-strand RNA virus which belongs to the genus, Alpha virus of the family, Togaviridae [2, 3]. The *Chikungunya* infection is generally characterized by fever and joint pain with additional symptoms which include chills, vomiting, nausea, headache and rashes [4-6]. In India, both Aedes aegypti and Aedes albopictus are known to exist and they are widely prevalent during the post monsoon season, which cause an increased incidence of the *Chikungunya* Virus infection during the months of November and December, with more females being affected.

MATERIAL AND METHODS

The study population

The patients who attended The Civil Hospital, Rajkot, India, the primary health care centres and the community health care centres which were covered under the district Rajkot, who presented with the sign and symptoms of fever, headache and joint pain which were suggestive of the acute *Chikungunya* infection were included in this study.

The case definition and the criteria for inclusion in the study

The patients with one or more of the following characteristics were included in the study:

1. An acute clinical illness that included malaise, extreme fatigue, fever and anorexia for up to 10 days.
2. Arthralgia which was most commonly symmetrical and peripheral, which was noted in the ankles, toes, fingers, elbows, wrists and the knees. The joints exhibited extreme tenderness and swelling, with the patients frequently reporting incapacitating pain that lasted for weeks or months.

3. The non-pruritic rash was typically maculopapular and erythematous in character and it was visible, starting 2–5 days post-infection, lasting up to 10 days, and was distributed primarily on the face, limbs and the trunk of the body.

The study sample

All the 193 eligible serum samples of the suspected cases of the *Chikungunya* patients who attended the outdoor and indoor patients departments at a tertiary care hospital in Rajkot and the primary health care centres, the community health care centres and the urban health centres which were covered under Rajkot district, which were collected during the one year study period which extended from 1st January 2011 to 25th December 2011, were processed and tested for the detection of the *Chikungunya* IgM antibody by using a solid phase, capture micro well ELISA technology (National Institute of Virology-Pune).

Data Collection

A specially designed, semi-structured questionnaire form was used to collect the data on the demographic factors like age, sex, and residence, in addition to the data on the history of the illness, the possible risk factors and the results of the investigations.

Blood samples (5-8 ml) were drawn from all the patients as a part of the routine laboratory work and the sera were separated and obtained for the processing for the *Chikungunya* IgM ELISA. These patients belonged to different localities of Rajkot.

Ethical Considerations

The data which were collected for the purpose of the current research were a part of the diagnostic technique. So an ethical consideration was not needed. While the patients with the suspected *Chikungunya* infection were dealt with, the patients' privacies were secured and the identifying information was kept confidential. A prompt treatment was provided for all the study subjects.

RESULTS

Out of the total 193 cases, 84 were positive for the *Chikungunya* IgM antibody. Out of the total 84 positive cases, 32 were males (38.09%) and 52 were females (61.9%). A high prevalence was seen in female patients. The age group which was most commonly affected in this study was the 40-50 years age group, with 34 (40.4%) cases occurring in this age group. Only 20(23.81%) cases occurred in the 20-30 years age group.

Among the total 84 positive cases, a majority of the patients presented with the triad of fever, headache and joint pain. There were 44(52.38%) cases with fever, headache and joint pain; while 15(17.85%) cases presented with fever, 7(8.33%) cases presented with joint pain, 3(3.57%) cases presented with GIT and vomiting symptoms, 2(2.38%) cases presented with rashes, 3(3.57%) cases presented with haemorrhage and 5(5.95%) cases presented with retro orbital pain. The *Chikungunya* infection shows seasonal variations in the month of November and December. There is an increased breeding of the Aedes mosquito in the post monsoon season.

DISCUSSION

Chuikungunya is a re-emerging debilitating infection. The name itself indicates the degree of the discomfort which is caused. '*Chikungunya*', in Makonde means, 'that which bends up' or 'to dry up or become contorted'. *Chikungunya* Virus was first detected in 1963 in West Bengal [7]. This was followed by several epidemics in Chennai, Pondicherry, Vellore, Visakhapatnam, Rajmundry, Kakinada, Nagpur and Barsi between 1964 and 1973 [8]. These outbreaks have even inspired the writing of songs about the virus and the recognition of 'Keelamma the *Chikungunya* goddess'[9]. Over ten thousand cases have been reported. It has been suspected that many cases of *Chikungunya* either go misdiagnosed or unreported [10].

THE REASONS FOR THE OUTBREAK OF *CHIKUNGUNYA*

The phylogenetic analysis of the E1 gene of *Chikungunya* Virus indicates only three lineages with distinct genotypic and antigenic characteristics i.e. the "central/east African genotype [11], the "Asian genotype" [12] and the "west African genotype [13]. Additionally, a mutation at the 226 amino-acid (Valine–Alanine) of the E1 gene was observed during the recent outbreaks and it has been associated with the more efficient replication of *Chikungunya* Virus in Aedes albopictus [14]. *Chikungunya* Virus of the latest outbreak displayed the ECSA lineage, due to the accumulation of mutations in the viral genome, which has led to the appearance of new subgroups and has suggested a dynamic evolution of the virus [15].

THE PRESENT STUDY

Gender and age comparison:

When the Chi-square test was applied: Chi-square was 8.803, DF was 1 and the p value was 0.0030 [16]. In the present study, more females were affected, with a F:M ratio of 1.62:1. More number of cases occurred in the age group of 40-50 years [Table/Fig-1], which was comparable with the occurrences in other studies like those which were done on the Kerala outbreak [17], in which females were affected 194 (54.8%) more than the males. In the 2005-2006 Reunion Island and Indian Ocean outbreak [18] more males were affected, with a M:F ratio of 1.24:1, with the 58 years age group being mostly affected.

	MALE	FEMALE	TOTAL
POSITIVE	32(38.09%)	52(61.9%)	84
NEGATIVE	65	44	109

[Table/Fig-1]: Gender comparison
When chi-square test is applied: chi-square is 8.803, DF-1; p value is 0.0030 Shows that in the present study more females are affected.

Comparing the signs and symptoms with those of other studies

In other studies, the common presenting symptoms were only fever and joint pain, followed by vomiting and rashes [18, 19]. In the present study, more patients had the triad of fever, headache and joint pain, which showed that headache may be the presenting symptom with fever and joint pain. Rash was seen only in very few patients [Table/Fig-2].

Comparison of the seasons of occurrence

In the present study, the Chikunguny cases occurred in the months of November and December, because in the post monsoon season, there is water accumulation. This artificial water collection is the source of breeding of the Aedes mosquito and the increased frequency of mosquito bites. The lack of awareness amongst the general public and the improper sanitation cannot be ignored. In other studies, most of the cases occurred between March to April, thus showing a seasonal variation [17, 18] [Table/Fig-3].

Sign & Symptoms	Present Study Cases	Study-1 Gianandrea Borgherini et al., [18]	Study-2 M. Kannan et al., [17]
Fever	15(17.85)	129 (89%)	354(100%)
Fever headache & joint pain	44(52.38%)	NA	NA
Joint pain	7(8.33%)	151(96%)	352 (99.4%)
GIT Vomiting	3(3.57%)	74 (47.1%)	39 (11%)
Rash	2(2.38%)	63(40.1%)	286 (80.8%)
Hemorrhage	3(3.57%)	Rare	5(1.5%)
Retro Orbital Pain	5(5.95%)	NA	NA

[Table/Fig-2]: Comparing the sign and symptoms with other study

Present Study	Nov-December 2011
Gianandrea Borgherini et al., (18)	March-April 2006
M. Kannan et al., [17]	May 2007

[Table/Fig-3]: Comparison of season of occurrence

Chikungunya Virus Fever Situation in the Country during 2006 (Prov.). State	No. of districts affected	Total fever cases/Suspected *Chikungunya* Virus fever cases (percentage values)	No. of samples sent to NIV/ NICD	No. of confirmed cases
Karnataka	27	762026 (54.74)	5,000	298
Maharashtra	34	268333 (19.28)	5,421	786
Tamil Nadu*	35	64802 (4.66)	648	116
Madhya Pradesh	21	60132 (4.32)	892	106
Gujarat	25	76012 (5.46)	1,155	225
Kerala	14	70731(5.08)	235	43

[Table/Fig-4]: Comparison of suspected cases of *chikungunya* in year 2006 of various States

Whether or not the virus moves to the new world, it is still a significant burden on the already overstretched hospitals, health systems and communities of the affected regions. An economic pressure is created on the state and national laboratories due to the outbreak and on the local businesses due to the absenteeism from work for weeks due to the incapacitating symptoms.

[Table/Fig-4] shows the suspected cases of *Chikungunya* in various states in 2006 [19, 20].

CONCLUSION

The sex prevalence of *Chikungunya* is more in females. It is seen more in the 40-50 years age group. Among the total symptomatic cases, the more common symptoms which are observed are fever, headache and joint pain. In the present study, *Chikungunya* occurred more in the winter season, in the months of November and December. This study emphasizes the need for a continuous surveillance on the disease burden and for laboratory research which is aimed at the development of vaccine candidates, antiviral strategies and diagnostic kits. To reach these goals, several investigations for characterizing *Chikungunya* Virus can be done by doing murine studies to investigate the cell tropism and the neurovirulence determinants, transmissibility studies in mosquitoes by using chimeric viruses, and virulence/pathogenesis studies which can investigate the outcomes of the *Chikungunya* Virus strain variations (A. M. Powers, C. H. Logue, J. P. Ledermann, B. J. Sheahan and G. J. Atkins, unpublished results). Hopefully, these efforts will lead to advances in the public health capacity for the prevention of future arboviral outbreaks, combined with a rapid control of the outbreaks that occur.

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