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Epidemiological Profile of Chikungunya Cases Reported in Year 2016 in District Amritsar, Punjab (India)

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Abstract

Introduction: Chikungunya is a viral disease, transmitted mainly by *Aedes aegypti* and *Aedes albopictus* mosquitoes. Chikungunya is an RNA virus belonging to alphavirus genus of family *Togaviridae*. It causes fever, severe joint pain, muscle pain, headache, nausea, fatigue and rash. Treatment is symptomatic as there is no antiviral drug or vaccine for Chikungunya. In Punjab there was only one reported case of Chikungunya fever in 2010, but this number reached 2472 cases in 2016. Desert coolers are potential source for breeding of mosquitoes. National Centre for Disease Control has developed a desert cooler called NICD cooler in which mosquito can't breed.

Objective: To assess epidemiological features of Chikungunya cases.

Methods: Blood samples collected from various hospitals of district Amritsar were tested for Chikungunya by Mac Elisa test in Government Medical College, Amritsar.

Results: There were 48 cases, with no reported death, that were confirmed by MAC-ELISA as positive for CHIKV. The age of 44 cases was found recorded with mean age 43.32 ±1.428 years. Cases were found mainly in adult and old age. Most of the cases reported were urban and majority were females. All cases were reported in the months of September to December with peak in November i.e. in rainy season and some months after this. *Aedes* mosquitoes breed at higher rates in hot and rainy season than other seasons of the year. Mean time gap between Chikungunya sample collection and testing was 3.13 ± 2.12 days.

Discussion: Age and area wise distribution of cases resembled with studies conducted in past. Higher percentage of female cases found was contrary to another study conducted in year 2016 in Varanasi. Transmission season of Chikungunya was found like the study conducted in year 2016. Time gap between sample collection and testing should be less than one day. All prevention and control measures should be taken well before the onset of rainy season; and use of NICD coolers should be promoted.

Limitation: There was under-reporting of cases due to non-involvement of many private hospitals.

Introduction

Chikungunya is a mosquito-borne viral disease first described during an outbreak in southern Tanzania in 1952. It is an RNA virus that belongs to the alphavirus genus of the family *Togaviridae*. The name "chikungunya" derives from a word in the Kimakonde language, meaning "to become contorted", and describes the stooped appearance of sufferers with joint pain (arthralgia). It is transmitted to humans by infected mosquitoes. It causes fever and severe joint pain. Other symptoms include muscle pain, headache, nausea, fatigue and rash. Joint pain is often debilitating and can vary in duration. Most patients recover fully, but in some cases joint pain may persist for several months, or even years. Occasional cases of eye, neurological and heart complications have been reported, as well as gastrointestinal complaints. Often symptoms in infected individuals are mild and the infection may go unrecognized. The disease shares some

clinical signs with dengue and zika and can be misdiagnosed in areas where they are common. There is no specific antiviral drug treatment and commercial vaccine for chikungunya. Treatment is focused on relieving the symptoms. The disease mostly occurs in Africa, Asia and the Indian subcontinent. However, a major outbreak in 2015 affected several countries of the Region of the Americas. Chikungunya has been identified in over 60 countries in Asia, Africa, Europe and the Americas. A large outbreak of chikungunya in India occurred in 2006 and 2007. Several other countries in South-East Asia were also affected. Since 2005, India, Indonesia, Maldives, Myanmar and Thailand have reported over 1.9 million cases. In 2016 there was a total of 349 936 suspected and 146 914 laboratory confirmed cases reported to the PAHO regional office, half the burden compared to the previous year [1].

Till 10 October 2006, 151 districts of eight states/provinces of India have been affected by chikungunya fever. The affected states are Andhra Pradesh, Andaman & Nicobar Islands, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Kerala and Delhi. More than 1.25 million cases have been reported from the country with 752,245 cases from Karnataka and 258,998 from Maharashtra provinces [2]. In India a major epidemic of Chikungunya fever was reported during the last millennium viz.; 1963 (Kolkata), 1965 (Pondicherry and Chennai in Tamil Nadu, Rajahmundry, Vishakhapatnam and Kakinada in Andhra Pradesh; Sagar in Madhya Pradesh; and Nagpur in Maharashtra) and 1973, (Barsi in Maharashtra). Thereafter, sporadic cases also continued to be recorded especially in Maharashtra state during 1983 and 2000 [3].

Clinically suspected Chikungunya fever cases reported in India since 2010 are as following: There were 48176, 20402, 15977, 18840, 27553, 64057, 62268 cases reported in the years 2010, 2011, 2012, 2013, 2014, 2015, 2016 and 2017 (Upto 18th October, 2017). In Punjab there was only one reported case of Chikungunya fever in 2010, but this number reached 2472 cases in 2016 [4]. First case of *Chikungunya* was reported from *Punjab* in Ferozepur in 2010. The case was an imported case of *Chikungunya* (from Delhi). The information was sent to GOI and the case got treatment at New Delhi [5].

The virus is transmitted from human to human by the bites of infected female mosquitoes. Most commonly, the mosquitoes involved are *Aedes aegypti* and *Aedes albopictus*. These mosquitoes can be found biting throughout daylight hours, though there may be peaks of activity in the early morning and late afternoon. Both species are found biting outdoors, but *Ae. aegypti* will also readily feed indoors. After the bite of an infected mosquito, onset of illness occurs usually between 4 and 8 days but can range from 2 to 12 days. The proximity of mosquito breeding sites to human habitation is a significant risk factor for chikungunya. The species *Ae. albopictus* thrives in a wider range of water-filled breeding sites than *Ae. aegypti*, including coconut husks, cocoa pods, bamboo stumps, tree holes and rock pools, in addition to artificial containers such as vehicle tyres and saucers beneath plant pots. This diversity of habitats explains the abundance of *Ae. albopictus* in rural as well as peri-urban areas and shady city parks. There is evidence that some animals, including non-primates, rodents, birds and small mammals, may act as reservoirs.

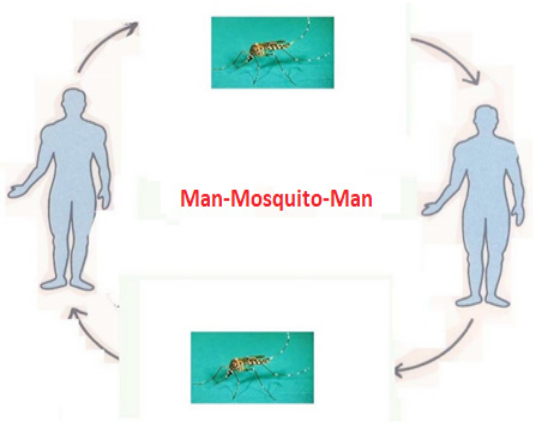


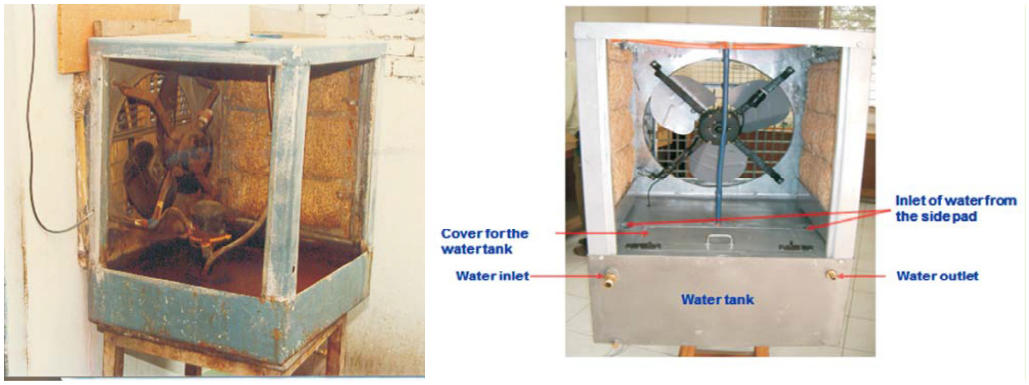
Figure 1: Transmission cycle [3].

Several methods can be used for diagnosis. Serological tests, such as Enzyme-Linked Immunosorbent Assays (ELISA), may confirm the presence of IgM and IgG anti-chikungunya antibodies. IgM antibody levels are highest 3 to 5 weeks after the onset of illness and persist for about 2 months. Samples collected during the first week after the onset of symptoms should be tested by both serological and virological methods (RT-PCR). Prevention and control relies heavily on reducing the number of natural and artificial water-filled container habitats that support breeding of the mosquitoes. This requires mobilization of affected communities. During outbreaks, insecticides may be sprayed to kill flying mosquitoes, applied to surfaces in and around containers where the mosquitoes land, and used to treat water in containers to kill the immature larvae. For those who sleep during the daytime, particularly young children, or sick or older people, insecticide-treated mosquito nets afford good protection. Mosquito coils or other insecticide vaporizers may also reduce indoor biting. Basic precautions should be taken by people travelling to risk areas [1]. Infected persons should be isolated from mosquitoes in as much as possible in order to avoid transmission of infection to other people [3]. A study conducted on patients recruited at three distantly located regions of India (North, West and South) from 1st June, 2008 through 31st May, 2009 i.e. Karnataka Institute of Medical Sciences (KIMS), Hubli, Karnataka (south); Sawai Man Singh Medical College (SMS) Jaipur, Rajasthan (West), and All India Institute of Medical Sciences (AIIMS) New Delhi (north) with AIIMS as the coordinating and testing Centre showed that rate of CHIKV prevalence based on patient age groups 0-5, >5-18

and >18 years of age and observed significantly higher detection ($p<0.05$) among adult populations (aged >18 years) [6].

A prospective study on chikungunya was conducted in Varanasi, from January to December 2016. All serum samples were tested for both chikungunya and dengue IgM antibodies by MAC ELISA test. Total of 186 samples, out of which 108 (58%) samples were total seropositive, 23 (12.37%) samples positive for chikungunya IgM antibodies, 57 (30.65%) samples positive for dengue and 28 (15.05%) samples positive for both chikungunya and dengue. The most affected age group was 20-30 years and males were more affected than females. A seasonal peak for chikungunya and its co-infection with dengue were seen in November. Conclusion: In India, the seroprevalence of chikungunya is increasing. India is a rapidly developing country where adequate sanitation is required. More aggressive intervention and vigilance by health authorities is needed to decrease vector borne diseases [7].

National research Development Corporation of Government of India Enterprise has found that in India about 60 to 70% of breeding of *Aedes* mosquitoes (Vectors of dengue and chikungunya) occurs in desert coolers in urban areas and about 40% in rural areas. It has developed a desert cooler called NICD cooler in collaboration with National Centre for Disease Control (Formerly called National Institute of Communicable Diseases) in which the mosquitoes can't breed [8]. NCDC has developed a modified cooler (Figure 2) below) with a covered water tank which prevents breeding of mosquitoes. Use of this cooler can be very helpful in preventing vector breeding and thus contribute towards control of dengue and chikungunya as a public health problem particularly in urban areas. Actions to reduce the impact of mosquito borne virus infections include the reduction of mosquito breeding sites. Regular desert coolers are potential breeding sites for mosquitoes. To prevent this, the National Centre for Disease Control has developed a desert cooler called NICD cooler that does not provide conditions for mosquitoes to breed. Ordinary desert coolers and NICD desert coolers are shown in following figure [9].



Ordinary desert cooler NICD desert cooler

Figure 2: Desert coolers [11].

(Contributed by Dr. R.S. Sharma, Additional Director & Head and Dr Roop Kumari, Joint Director, Centre for Medical Entomology & Vector Management, NCDC) for Medical Entomology & Vector Management, NCDC)

Objective

The present study was focused to assess the epidemiological features of Chikungunya cases reported in year 2016 in district Amritsar, Punjab (India)

Methods

It was a cross sectional study. The blood samples collected from various hospitals of district Amritsar were tested for chikungunya by Mac Elisa test in Government Medical College, Amritsar. For the quantitative data of age and time difference between sample collection and sample testing; the values of mean, standard deviation, minimum and maximum were calculated. For the qualitative data Goodness of fit test was applied to analyze the cases of chikungunya. The critical levels of significance were taken as significant and highly significant. The probability < 0.05 was labeled as significant and < 0.01 as highly significant.

Results

There were 48 cases, with no reported death, that were confirmed by MAC-ELISA as positive for CHIKV. The age of 44 cases was found recorded. The mean age of these 44 cases was 43.32 ± 1.43 years. The maximum and the minimum ages of the cases found were 72 and 20 years respectively.

Table 1 showing the age group wise distribution of cases. There was no case found below the age of 10 years and only 1 (2.3%) case was found in age group of 11 to 20 years. All other

cases 43 (97.3%) were found in the age above the 20 years. This shows that the cases of chikungunya were found mainly in the adult and old age. The difference in number of cases in various age groups was found highly significant statistically.

Age in years	No	%
11-20 Years	1	2.3
21-30 Years	12	27.3
31-40 Years	6	13.6
41-50 Years	12	27.3
> 50 Years	13	29.5
Total	44	100.0
$X^2 = 12.12$	d. f. = 4	$p < 0.01$

Table 1: Age group wise distribution of cases.

Table 2 showing the sex wise distribution of cases. Majority of the cases reported were females 30 (62.5%). Sex wise difference in number of cases reported was found insignificant statistically.

Sex	No.	%
Male	18	37.5
Female	30	62.5
Total	48	100.0
$X^2 = 3.06$	d. f. = 1	$p > 0.05$

Table 2: Sex wise distribution of cases.

Table 3 showing the area wise distribution of cases. Most of the cases reported were urban 46 (95.8%). Area wise difference in number of cases reported was found highly significant statistically.

Area	No.	%
Urban	46	95.8
Rural	2	4.2
Total	48	100.0
$X^2 = 36.76$	d. f. = 1	$p < 0.01$

Table 3: Area wise distribution of cases.

Table 4 is showing the month wise distribution of cases. All cases were reported in the months of September to December in rainy and winter seasons. Most of the cases, 33 (68.8%) were reported in November. Month wise difference in number of cases reported was found highly significant statistically.

Month	No.	%
September	5	10.4
October	3	6.2
November	33	68.8
December	7	14.6
Total	48	100.0
$X^2 = 18.95$	d. f. = 3	$p < 0.01$

Table 4: Month wise distribution of cases.

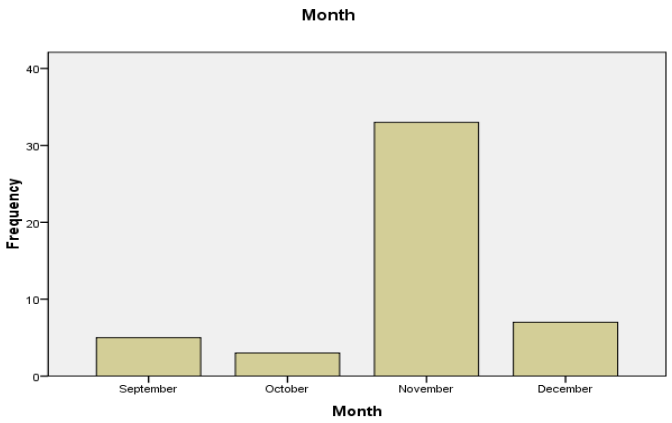


Figure 3: Bar diagram showing month wise distribution.

Table 5 showing the time gap between sample collection and sample testing. Mean time gap was 3.13 ± 2.12 days while the maximum and minimum gap was of 11 and 0 days respectively.

Time gap	Values (No. of days)
Mean	3.13
Std. Deviation	2.12
Minimum	0.00
Maximum	11.00

Table 5: Time gap between Chikungunya sample collection and sample testing.

Table 6 is showing the hospital wise distribution of cases. Most of the cases were reported in Guru Nanak Dev Hospital Amritsar. Hospital wise difference in number of cases reported was found highly significant statistically.

Hospital	No.	%
Guru Nanak Dev	45	93.8
SGRD*	2	4.2
Life Care	1	2.1
Total	48	100.0
$X^2 = 78.81$	d. f. = 2	$p < 0.01$
*Sri Guru Ram Das		

Table 6: Hospital wise distribution of cases.

Discussion

The cases of chikungunya found mainly in the adult and old age resembled with other previously conducted studies [6,7]. Sex wise higher percentage of female cases found was contrary to another study conducted in year 2016 in Varanasi [7]. It is speculated that the children below 10 years of age might have been less reported due to less awareness about chikungunya fever among people and even the medical staff confusing these cases with dengue cases, thus got the probable cases tested for dengue only. Though

there was lesser number of male cases reported than females, the difference found was insignificant statistically hence this might be due to chance. Area wise higher number and percentage of cases found in urban areas shows that the diseases have not yet been much transmitted into rural areas, hence response teams should be engaged to prevent its transmission to rural areas and reduce its magnitude both in urban and rural areas. The transmission season of chikungunya ranged from September to December. The peak of the number of the cases found in November was like the study conducted in year 2016 [7]. Transmission season of chikungunya had been like transmission season of dengue found in various studies conducted in Amritsar i. e in the rainy season and winter but with its peak in October [8,10,11]. Much higher incidence of chikungunya cases in months of September to December had been due to hot and rainy season in months of July to September, that lead to water collections at various sites and in small containers during these and some afterward months. *Aedes* mosquitoes breed at higher rates in hot and rainy season than other seasons of the year.

Mean time gap between sample collection and sample testing should be minimized. It should be tested and reported on the day of collection.

More emphasis should be paid on control measures in Guru Nanak Dev Hospital for prevention and control of chikungunya as most of the cases had sought the treatment there. Thus, all prevention and control measures like establishment of chikungunya wards in hospitals having beds covered with bed nets, availability of materials for early diagnosis of chikungunya, appropriate and prompt treatment of chikungunya cases should be taken well before the onset of rainy season; and use of NICD coolers should be promoted.

Limitation

There was under-reporting of cases as the cases reported were mainly from the 3 hospitals and there was non-involvement of many of the private hospitals. The reported cases were the laboratory tested cases in hospitals while in the district there might had been latent and undiagnosed cases.

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Additional Information

(i) Source of funding: Self.

(ii) Ethical clearance: Not needed as the study was based on the NVBDCP/IDSP programs.

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