

Prevalence of various symptoms and cost of treatment during the chikungunya epidemic in Ahmedabad, Gujarat, India, in 2006

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Abstract

Ahmedabad city in the State of Gujarat was one of the cities most affected by an epidemic of chikungunya. This paper attempts to document the epidemiological profile of chikungunya cases in the city of Ahmedabad in 2006. It also tries to study the economic burden of the disease on patients and understand their treatment-seeking behaviour.

There was an average of 2.4 suspected chikungunya patients in a family of five members. Mean duration of illness was 19 days. Thirteen per cent of those suffering from chikungunya were admitted to hospital. The economic burden of chikungunya disease on a patient was US\$ 28.5, out of which approximately US\$ 15.4 was out-of-pocket expenditure on medical treatment, US\$ 4.0 was on transportation. The average wage loss per patient (workers and non-workers) was US\$ 10.4; with the average wage loss per worker being US\$ 22.5. The cost of inpatient care was 1.5 times higher than the cost of outpatient care. An outbreak of an emerging disease creates unanticipated catastrophic health-care expenditure. Based on the study, the economic burden of chikungunya in Ahmedabad in 2006 (for 60 777 cases) was approximately US\$ 1.7 million. The priorities when tackling such unexpected disease outbreaks should include strengthening of preventive and curative measures and continued research on the socioeconomic impact to help in policy-making and resource allocation.

Keywords: Chikungunya; cost of treatment; Ahmedabad; India.

Introduction

In India, chikungunya fever is as old as it is globally. The epidemic was first reported during the 1960s in Kolkata in West Bengal, Pondicherry and Chennai in Tamil Nadu, Rajahmundry, Visakhapatnam and Kakinada

in Andhra Pradesh, Sagar in Madhya Pradesh, and Nagpur in Maharashtra. Thereafter, sporadic cases also continued to be recorded, especially in Maharashtra state during 1973 and 2000.^[1] The Indian health system was again recently challenged by the re-emergence of chikungunya disease after a gap of 32 years

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in December 2005.^[2] The National Institute of Communicable Diseases (NICD) Delhi issued a warning notice against the disease in March 2006. The states of Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, Kerala, Gujarat, Andaman and Nicobar Islands and Orissa were affected by the disease^[1] on a major scale. As per data from the National Vector-Borne Disease Control Programme (NCBDCP), 1 390 322 suspected and 1985 confirmed chikungunya fever cases were reported from 152 districts across the 13 states in India in the year 2006.^[1]

The state of Gujarat in India was also affected by the chikungunya epidemic between July and October 2006 with more than 72 589 officially reported cases.^[1] Jamnagar was the first city in the state to be affected by the disease in April 2006 after focal epidemics in Maharashtra and Karnataka. The epidemic also affected Ahmedabad city¹ extensively during the months of August–November 2006. Municipal health centers and hospitals in Ahmedabad reported 60 777 cases of chikungunya during the year (*Source: National Vector Borne Disease Control Programme, Department of Health, Government of Gujarat*).

In the present paper, we document the epidemiological profile of chikungunya cases in the city of Ahmedabad, Gujarat, India. We also study the economic burden of chikungunya disease on patients and try to understand their treatment-seeking behaviour.

¹ Ahmedabad is the largest city in the state of Gujarat and one of the largest urban agglomerations in India. As per the 2001 Indian census, the area under Ahmedabad Municipal Corporation has a population of 3 520 085. The population of the Ahmedabad urban agglomeration [which includes the region governed by Ahmedabad Urban Development Authority (AUDA)] is 4 525 013. The urban agglomeration accounts for 22 per cent of Gujarat's urban population. There are 43 wards in the city. Ahmedabad has a literacy rate of 79.9 per cent, which is the highest in Gujarat, where 87.8 per cent males and 71.1 per cent females are literate.

Materials and methods

We conducted a community-based study in the 43 wards of Ahmedabad city, Gujarat between the months of September and December 2006.

A purposive sampling approach was used to identify the study population in each ward of the city. A structured questionnaire was filled in by health workers and link workers of the Municipal Corporation of Ahmedabad. Each health worker was asked to complete 10–15 questionnaires related to their work area. The households which reported to have cases of fever, joint pain, vomiting, skin rashes, etc. suggesting chikungunya symptoms were visited by these health workers for the interview. The information on each member of the household was covered in one interview schedule (one schedule per household). The respondent was the head of the household. Interviewers continued to visit households until they had filled in 10–15 questionnaires or visited households in their work area. The information on socioeconomic and demographic characteristics, treatment-seeking behaviour, cost of treatment, and loss in wages was collected. The data was coded, entered and analysed using SPSS Version 13.0 for Windows (SPSS com, Chicago, IL, USA).

The cost of treatment was calculated taking into consideration the out-of-pocket expenditure in treatment (which includes consultation, blood test, medicine, hospital stay) and transportation. Expenditures were recorded in Indian rupees (INR) and later converted to US dollars at the exchange rate of 45.5 rupees per US dollar (the average value between April and December 2006.^[3]) The total cost of the treatment incurred to a patient was calculated after taking into consideration the loss of wages to a household.



A total of 3362 households were surveyed from 43 wards of the city, covering a population of 17 455, averaging 5.2 members per household. Almost half of the households earned their livelihood through daily wage work, whereas, 13% owned a business and one fifth had listed “service” as their primary occupation. Half of the members in a household (mean 2.6) suffered from fever, joint pain or other problems (cold and cough, vomiting, typhoid, malaria, skin problems/itching). For further analysis, the study considered only the cases with two symptoms, i.e. fever with joint pain, and the remaining cases (only fever and others) were excluded from the analysis.

Limitation

The aim of the study was to understand the profile of the population affected by chikungunya and not to measure the prevalence of the disease in the population. The information collected during the home visits was purely self reported and subjective. The symptoms were not verified by medical personnel. The information gathered may also be affected by the subjective understanding of the questionnaire by the interviewers.

Results

Profile of the patients

Approximately 46% of the surveyed population (7944) suffered from fever coupled with joint pain or only joint pain (2.4 members per household). Out of the total number of those affected, 80% had fever along with joint pain (6359) where 20% reported to have only joint pain (1589).

Among the patients, 54% were females and 46% males. The most seriously affected age group was 20–49 with a mean of 35 years (Figure 1).

A total of 8.5% of the patients (aged 14+) were working: 81% male and 22% female. Most of the working male and female patients were daily wage-earners (45% and 16%, respectively) (Figure 2). Non-working female sufferers included those who were involved in non-wage-earning household work.

The city of Ahmedabad is divided into five zones. The Central zone of the city was comparatively most affected (51%) compared with other zones: North zone (46%), East zone (47%), South zone (42%) and West zone (41%).

Figure 1: Age distribution of suspected chikungunya cases (per cent)

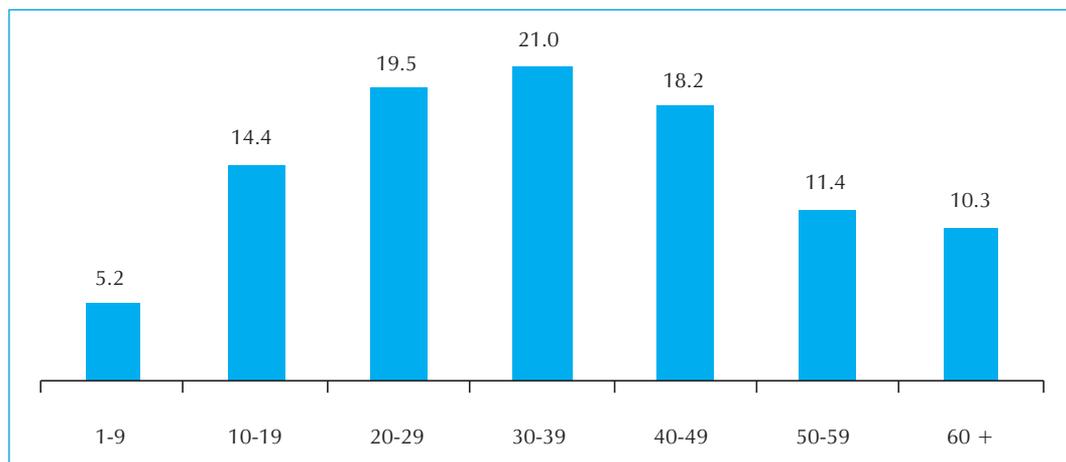


Figure 2: Occupation of the sufferers by sex (> 14 years) (per cent)

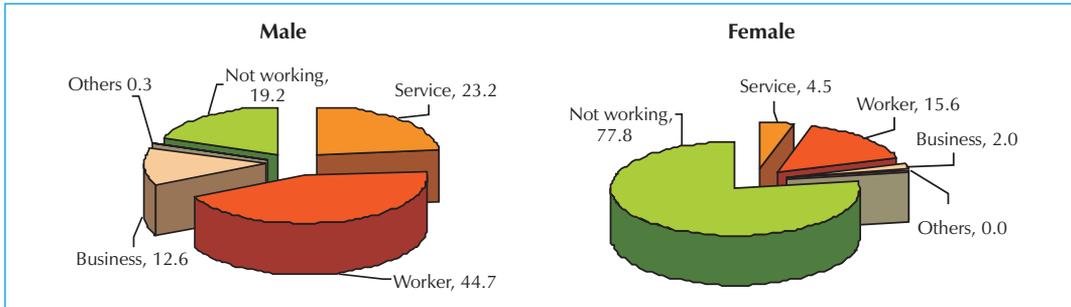
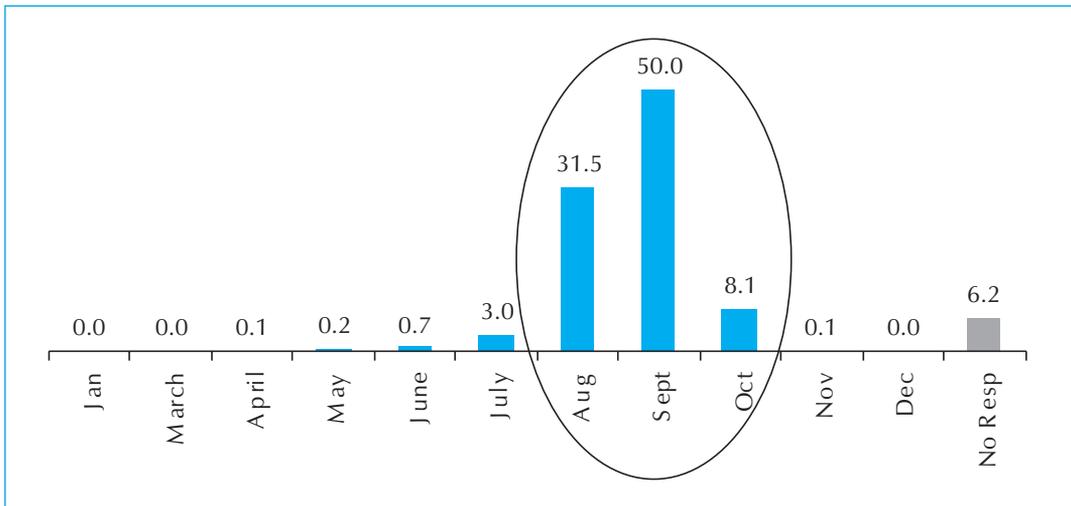


Figure 3: Month-wise per cent of suspected chikungunya cases, 2006



Chikungunya illness and treatment-seeking

The number of suspected chikungunya cases was the highest in the month of September (50%) followed by August (32%) (Figure 3).

On average, chikungunya symptoms lasted for 19 days. Twenty-nine per cent of the patients reported that their illness had lasted for less than one week. A similar proportion suffered for one month or more (Table 1). A patient rested for an average of 12.8 days after the recovery.

The majority of the patients consulted a doctor whereas 13% were admitted to the hospital for treatment. Forty-five per cent of the patients reported getting their blood tested. One quarter of the patients also practised home remedies (Figure 4).

Cost of treatment, transportation and wage loss (in US\$)

On average the cost of chikungunya fever treatment was US\$ 28.5 (INR 1296); including US\$ 15.4 (INR 699) on medical treatment



Table 1: Duration of Illness (per cent)

Duration	Fever with joint pain	Only joint pain	Total
Less than one week	30.3	22.9	28.8
Two weeks	23.1	19.8	22.5
Three weeks	19.5	21.7	20.0
One month	14.6	19.7	15.6
More than one month	12.4	16.0	13.1
Total*	6274	1535	7811

* Total may differ because of missing cases

and US\$ 4 (INR 183) on transportation. The average wage loss for patients working outside their homes (44% of surveyed population) was US\$ 22.5 (INR 1024) (Table 2). Moreover, the average wage loss (workers and non-workers) per patient was US\$ 10.4 (INR 473).

The average cost incurred during the treatment differed for inpatients and outpatients (Table 3).

The cost of treatment for outpatients was US\$ 24.3, whereas the cost increased twofold for a patient who was admitted to hospital. The cost of transportation was also higher for inpatients than outpatients. An outpatient, who was working outside the home, lost an

Figure 4: Treatment seeking behavior among chikungunya cases, Ahmedabad 2006 (per cent)

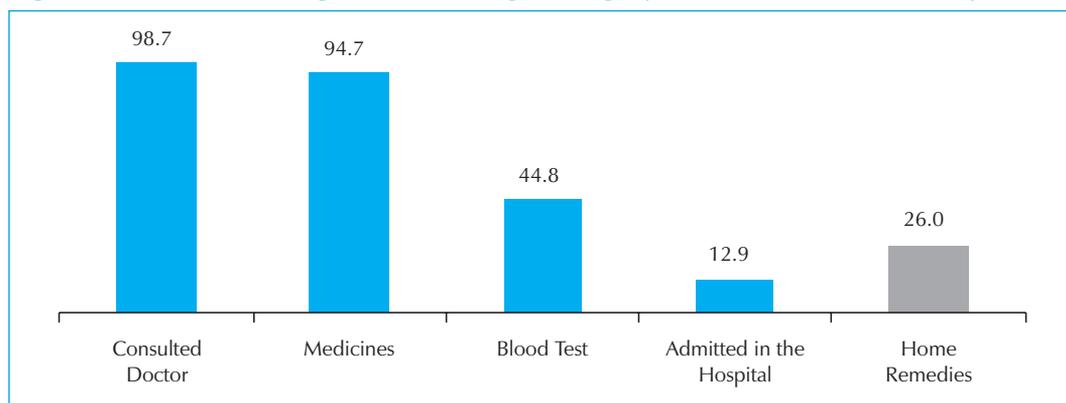


Table 2: Total cost incurred during chikungunya (in US\$)

	Mean (US\$)	SD	Range	N
Cost of treatment	15.4	24.8	0-659.3	7837
Cost in transportation to hospital	4.0	8.8	0-153.8	7784
Wage loss (working outside the home for wages)	22.5	28.1	0-329.7	3238
Wage loss (total sufferers 14+)	10.4	22.2	0-329.7	7009
Total cost incurred during chikungunya*	28.5	38.7	0-747.3	7883

* Total may differ because of missing cases
N=Number



Table 3: Average cost of treatment and wage loss during type of treatment (in US\$)

		Admitted	OPD
Cost of treatment	Mean	35.6	12.4
	SD	52.4	15.2
	Range	0-659.3	0-219.8
Cost of transportation	Mean	8.0	3.4
	SD	16.4	6.8
	Range	0-153.9	0-153.9
Wage loss (working outside the home for wages)	Mean	32.7	20.9
	SD	38.6	25.8
	Range	0-329.7	0-263.7
Wage loss (total sufferers 14+)	Mean	15.3	9.6
	SD	31.0	20.4
	Range	0-329.7	0-263.8
Total cost incurred during chikungunya	Mean	57.3	24.3
	SD	71.2	28.9
	Range	0-747.3	0-340.7

OPD: outpatient department
SD: standard deviation

average wage of US\$ 20.9 during his/her illness whereas this loss was recorded as US\$ 32.7 for the average inpatient (working outside home). For all in- and outpatients (working and non-working), the average wage loss was US\$ 15.3 and US\$ 9.6, respectively. The total out-of-pocket and indirect cost of treatment was US\$ 57.3 per inpatient and US\$ 24.3 per outpatient. With an increased duration of illness, there was also an increase in the total cost of treatment (Table 4).

Discussion

Chikungunya is a “neglected” tropical arboviral infection in the developing world,^[4] as there are limited studies on the impact of the disease on socioeconomic and medical determinants. Even though the disease is generally considered self-limiting and rarely life-threatening, the widespread occurrence of it causes substantial morbidity and economic loss due to ill health.^[5,6,7] Studies indicate that an outbreak of an emerging disease creates unforeseen catastrophic health-care expenditure and reinforces the poverty and ill-health nexus.^[5]

Table 4: Total cost of treatment as per duration of illness (in US\$)

Duration of illness	Cost of treatment	Cost of transportation	Wages loss (only working)	Wage loss (total sufferers 14+)	Total cost incurred
One week or less	9.5	2.6	14.2	6.2	17.3
Two weeks	13.1	3.4	19.6	9.5	24.8
Three weeks	17.0	4.7	24.8	12.3	32.7
One month	20.4	5.0	29.9	13.8	37.7
More than one month	23.5	5.9	31.0	13.7	42.0



Our study addresses the economic loss consequent to the chikungunya disease. It considers only a few direct (medicine, transportation and hospitalisation) and indirect costs (loss of pay) for the treatment of chikungunya. It does not address several other indirect costs related to days lost (for patient and relatives), such as food and lodging. In the present study, the economic burden of reported chikungunya disease on a patient was US\$ 28.5, which includes US\$ 15.4 as out-of-pocket expenditure on medical treatment, US\$ 4 on transportation and US\$ 10.4 due to wage loss. During 2006, the real per capita income of Gujarat was US\$ 583 per annum (US\$ 48.6 per month).^[6] This study estimates that approximately 59% of the average monthly income was spent on the treatment of suspected chikungunya symptoms, which amounts to US\$ 28.7 per month. This is an underestimate because our study did not estimate the opportunity costs of the illness (e.g. males/females working at home, children missing school time, etc.).

A study by Gopalan and Das^[5] calculated the loss of economic productivity due to chikungunya disease among the breadwinners in a village of Orissa. The median out-of-pocket health-care expenditure on treatment was US\$ 84, which is much higher than the estimated cost in our study. An article on an epidemic in South India also shows a similar result.^[7] It says that apart from the expenditure on treatment, lingering debilitation following chikungunya infection takes away the victim's productivity and negatively impacts family incomes for weeks or months. Another study on a Chikungunya outbreak during 2005–2006 in India reveals another toll of the disease.^[9] It

suggests that poor people are more commonly affected, as malnutrition enhances individual susceptibility to infectious disease by lowering immunity. The loss of income during illness led to worsening poverty. The scope of the present study does not consider the effect of the fever on poverty or vice versa. However, the reported occupations of patients in the present study indicate that they may have a low standard of living since more than half of the surveyed families were working for daily wages.

Based on our study, the economic burden of chikungunya in Ahmedabad in 2006 (for 60 777 cases) was approximately US\$ 1.7 million (INR 78.7 million). The total cost of the epidemic to society may be much higher as this estimate does not cover unreported cases and several other indirect costs. Research also suggests that according to informal reports from various parts of the country, the incidence of disease was probably higher than the reported figures with the government.^[5] With an assumption that the actual cases of chikungunya were 5 or 10 times higher than those reported, the total cost is pegged at US\$ 8.6 million (INR 393.8 million) in the former case or US\$ 17.3 million (INR 787.6 million) in the latter.

The priorities of tackling such an unexpected disease outbreak should include the strengthening of preventive and curative measures. There is also a need for a detailed and systematic study of chikungunya disease along with its socioeconomic impact. Such studies will help in policy-making and resource allocation for mosquito-borne disease by the state and central governments.



References

- [1] Ministry of Health and Family Welfare. Chikungunya Fever. National Vector-Borne Disease Control Programme, Director-General of Health Services, 2009. Available at <http://nvbdcp.gov.in/Doc/Facts%20about%20Chikungunya17806.pdf>. Accessed on 7th September 2010.
- [2] Lahariya C, Pradhan SK. Emergence of chikungunya virus in Indian subcontinent after 32 years: a review. *Journal of Vector Borne Diseases*, 2006, 43:151-160.
- [3] Antweiler W. Exchange Rate Review. Published by University of British Columbia, Vancouver BC, Canada, 2009.
- [4] LaBeaud AD. Why arboviruses can be neglected tropical diseases? *PloS Neglected Tropical Disease*, 2008, 2(6): e247. doi:10.1371/journal.pntd.0000247.
- [5] Gopalan SS, Das A. Household economic impact of an emerging disease in terms of catastrophic out-of-pocket health care expenditure and loss of productivity: Investigation of an outbreak of chikungunya in Orissa, India. *Journal of Vector-Borne Diseases*, 2009, 46, 57-64.
- [6] Krishna MR, Reddy MR, Reddy SR. Chikungunya outbreak in Andhra Pradesh, South India. *Current Science*, 2006, 91 (5): 570-571.
- [7] Varshney V, Kannada D. Chikungunya chase. *Down to Earth*, 2008, October 1-15, 38-40. Available at <http://www.downtoearth.org.in/node/5132>.
- [8] Gupta S. States performance in per capita income growth. ASSOCHAM ECO PULSE, January 2008. Available at <http://www.assochem.org/arb/aep/states-per-capita-income.doc>, accessed on 29th October 2009.
- [9] Kumar CJ, Babii CA, Krishnan BU, Kumar A, Joy S, Jose T, Philip A, Sambasivaiah K, Hegde BM. The socioeconomic impact of the chikungunya viral epidemic in India. *Open Medicine*, 2007, 1 (3), 150-152.

