The Socio- Economic Impact of Chikungunya Viral Epidemic in India.

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Abstract

Background

The infectious diseases in the developing and underdeveloped world are one of the prime factors responsible for health problems and poverty. The recent chikungunya viral epidemic in India stands as a glaring example reflecting the impact of a debilitating infection, affecting the most productive population in the age group (15-45 Years) especially from low economical back ground in earning their bread every day and leading to poverty and malnutrition super imposed with the infection. This infection has primarily affected the revenue generators of the family especially from poor economical class and resulted in exacerbation of malnutrition for their entire family including children. Here in this paper we bring into light the impact of poverty on this viral epidemic disease spread and perpetuation of the relentless spiral of further malnutrition, infection, disease, poverty and socioeconomic instability.

Methodology

A cross sectional, hospital-based studies were conducted in 3541 consenting patients from three states in South India with clinically confirmed and successfully managed chikungunya viral fever cases, during the chikungunya epidemic in India from February to August 2006. The participants name, age, sex, address, height, weight, occupation, nutritional status, monthly income of the family, family size, type of house, location of house, clinical symptoms, physical examination, number of persons infected in the

family, morbidity period, adverse reactions to any drugs, previous history and special concern if any as narrated by the patient has been studied.

Findings

Our research reveals that 80% (2832.8/3541) of the chikungunya affected populations are below the poverty line according to World Bank's definition of income level less than $ 1 dollar per individual per day (calculated average family size was 4.5). Majority of the affected participants (64%, 2250/3541) are the revenue generators of the family in the most productive age group of 15-45 years. Over 61.9% (2189/3541) has suffered from the disease for more than 2 weeks.

Conclusions

This research concludes that participants below the poverty line have contracted the disease in large numbers. As Chikungunya has debilitated revenue generators of the family for over 2 weeks it reduces productivity on the community level and further disturbs their entire families' (including children) socioeconomic stability, which leads to malnutrition, susceptibility to other infections and relentless spiral of poverty perpetuation.

Manuscript

Introduction

Chikungunya virus is a mosquito-transmitted alpha virus belonging to the family Togaviridae, which was first reported in 1952 in Tanganyika. It is responsible for an acute infection of abrupt onset, characterized by high fever, arthralgia, myalgia, rash, photophobia and retro orbital pain. It is assumed that the symptoms are generally of very short duration (one week) and recovery is often complete. The virus is endemic in Africa, India and South-East Asia and is transmitted by Aedes mosquitoes through an urban or sylvatic transmission cycle. The virus has massively emerged with more than 2 million suspected cases in India between February and August, 2006[1]. This recent epidemic of chikungunya has eclipsed all other prevalent communicable diseases in south and central India like Malaria, Dengue, and Filaria. Although the epidemic seems to have waned in all other parts of the country, but it is still prevalent in Kerala (Tiruvanathapuram) to such an extent that it is leading to mass migration of the population.

This disease tends to mainly effect population below poverty line. Although it is largely believed that complications of the disease are not very serious, but as the disease debilitates an individual (especially from poor background) it could lead to serious socioeconomic instability, malnutrition, energy loss, reduced productivity at community level and exacerbation of poverty. In addition this disease has an impact to an extent that some state government plans to initiate a promising low cost health cover plan for the

poor below poverty line has been suspected to be cornered. In mean time several states tourism departments seem depressive as hundreds of visit visas and domestic trips have been cancelled due to chikungunya scare [2].

Last year this infection has affected more than 10 million populations through out India. This year the dreaded epidemic just started and the cases are increasingly reported through out the country [3]. Although this disease was highly prevalent, till date to best of our knowledge there are no original reports on the impact of poverty and socioeconomic profile on the spread of disease. Here we report for the first time our research emphasizing these areas mainly.

Methodology

Study setting

Our study was conducted in government tertiary hospitals of three states of southern India Andhra Pradesh (Srikalahasthi), Karnataka (Mangalore), and Tamilnadu (Salem) during the recent chikungunya epidemic. Our study was conducted between May 2006 and November 2006. The study was approved by ethics committee at the K.S Hegde Medical Academy, Deralakatte, Mangalore, India. A written informed consent was obtained from all patients after thoroughly explaining them the objective of the study.

Study participants: inclusion and exclusion criteria

Participants for this study were recruited from both inpatient and outpatient facilities of the department of internal medicine and special chikungunya counters of the fore mentioned hospitals. The patient selection for the study was done meticulously because we did not confirm the chikungunya infection using any investigation; instead we choose to eliminate the other possibilities by designing a very organized patient inclusion and exclusion criteria (See Figure 1). Consenting patients were interviewed by a trained medical student, who completed the questionnaire containing the patients' name, age, sex, address, height, weight, occupation, nutritional status, monthly income of the family, family size, type of house, location of house, clinical symptoms, physical examination, number of persons infected in the family, morbidity period, adverse reactions to any drugs, previous history and special concern if any as narrated by the patient.

Participants were eligible only if they satisfied all of the following criteria: 1) any age group; 2) presence of signs and / or symptoms of chikungunya infection (i.e., fever, polyarthralgia, rash, myalgia, retro orbital pain); 3) all other blood, sputum and urine investigations for other infections like dengue, malaria, typhoid, leptospirosis, syphilis tuberculosis should be negative 4) they should be willing to come for regular follow up and inform any change in the treatment themselves or report to the medical students and trained health workers who makes a visit once every week to their residence 5) should not have medical/ disease conditions like osteoarthritis, rheumatoid disease that mimics chikungunya profile earlier to the onset of chikungunya infection 6) successfully managed . Participants were excluded if they 1) had taken alternative medicine therapy 2)

had chronic debilitating conditions or mental disorders that would preclude informed consent 3) had faced some unforeseen incident like accident, fracture etc.

Data analyses and statistics

All the filled questionnaires were numbered. The numbered questionnaires were entered sequentially in Microsoft excel. Analysis was conducted using SPSS Version 11 (Statistical Package for Social Sciences). The main outcomes measured were 1) relation between disease incidence and percapita income 2) Percapita income and disease morbidity and 3) Age group and percapita income. Statistical test chi-Square was done and $p<0.05$ was considered as statistically significant

Findings

Description of the study population

A total of 3541 suspected chikungunya cases satisfying fore mentioned criteria have been recruited for the study. The age of the study population ranged from 4-80 years (see Table 1) and the majorities of the populations effected were mainly in the most productive age group (15-45 years) and are from poor economical background (See Fig.2). The calculated mean size of participants' family was 4.5. The mean age of the affected population was 32 years. Of the 3541 patients 54% were female and 46% were male. Most patients were laborers (daily wagers) and farmers. All the patients were having

signs and symptoms of chikungunya fever and did not prove positive for any other disease investigated using blood, sputum and urine.

Prevalence and morbidity of Chikungunya in relation to house holds income per Month

Of the 3541 participants, 327 (9.2%) house holds income was less than 25 US Dollars/ Month, 2079 (58.7%) house holds income was between 26-125 US Dollars/ Month, 910 (25.7%) house holds income was between 126-225 US Dollars/ Month and 225 (6.4%) house holds income was more than 225 US Dollars per/ Month (See Table 1 and Figure 1) . The average family size was found to be 4.5. According to World Bank definition of poverty, this considers an individual earning less than one US dollar per individual per day as below poverty line. For a family with a family size of 4.5 persons requires 4.5 dollars per day, which for a month amounts to 135 US Dollars. Hence nearly 80% of the affected participants were below poverty line.

The morbidity period apparently appears to be increased in high income participants group because they can afford to take rest until complete recovery, while manual laborer or a daily wager cannot afford to do so. This relation is very clearly depicted in morbidity period above 30 days, where we find that with rise in income the percentage of participants' increases. The correlation obtained by Chi-square is found to be highly significant $P < 0.0001$ (See Table 2 and Figure 2)

Age group, Incidence of disease and Household Income per Month

The most productive population (revenue generators) 2250/3541 (63.5%) in the age group of 15-45 years have contracted the disease in highest numbers (See Table 1)

The disease incidence was less than 7% in all the age groups that corresponded to high income group with household income above 225 Dollars /Month. We find that as the household income decreases the incidence of the disease gradually rises in all age groups (See Table 3). This was found to be highly significant $P < 0.0001$.

Morbidity period of the disease (as a whole) and special reference to productive population

Another significant finding is over 62% percent of the participants 2189/ 3541 had morbidity period over 15 days and among which 24.5 % had suffered for more than one month (See Table 1 and Fig 3). We also find among the affected 63.5%, 2250/3541 population in the most productive age group of 15-45 years , 64.2% , 1445/2250 have suffered from the disease for more than 2 weeks (See Table 4).

Discussion

In this study, one of the largest epidemiological studies of the new reemergent disease chikungunya in India, we report that majority of the participants 2832/3541 (80%) who contracted the disease were below the poverty line. The disease incidence was also very low in all the age groups of high income. Another key finding of our study is that the most productive population in the age group of 15-45 years from low income groups are contracting the disease easily because they are liberally accessible to the mosquitoes owing to their high out door activities in comparison to other groups. These findings are especially relevant with reference to developing countries scenario because debilitating infection affecting this population group in low socio economic back ground communities could result in poverty exacerbation, malnutrition and increase susceptibility to other infections. As many adults were affected and majority of them are females - it was very detrimental for children because debilitated mother owing to infection could not arrange for daily nutritional requirements. We have frequently noted that families of patients like laborers, daily wagers were deprived of single meal a day for number of days because the disease was found to affect all the revenue generators of the family. We have identified such families and are also planning to track these adversely affected families to monitor development of any malnutrition related problems with special reference to children. During the research period itself many participants have contracted diarrhea related infections perhaps owing to their depressed immunity from malnutrition. In addition we have also reported this poverty and malnutrition related problems to the concerned authorities to enable them to initiate necessary measures.

Our research clearly brings into light that during an outbreak of a vector borne viral epidemic the government should take further steps in addition to common preventive measures like clearing vector breeding places, health education etc. The new policies should aim not only at attenuating existing epidemic but also should have foresight to prevent the initiation of subsequent epidemic in the future of different origin (viral diarrhea, tuberculosis which is not spread by vectors). Current research proves that malnutrition enhances individual susceptibility to infectious disease by lowering their immune system [4]. Hence the current chikungunya epidemic which induced malnutrition shall pave path way for outbreak of another epidemic and this vicious cycle perpetuates. An important measure to stop this vicious cycle is to conquer malnutrition through cost efficient and practical approaches while continuing preventive measures and health education. It is the urgent need of the hour during epidemics to provide therapeutic food formulations with balanced contents of macro and micro nutrients to all the affected individuals below poverty line. It was also disheartening to see that half the central government funds allocated to fight chikungunya were unspent last year as hundreds of millions of rupees are not required for rising awareness and initiating preventive measures [5]. In our perspective allocation of funds for the distribution of therapeutic food formulations during an epidemic outbreak to poor below poverty line with preventive measures would have been very useful.

In the context of what is known as 10/90 gap (10% of global health research funding is being targeted to health problems that account for 90% of the global disease burden), research on infection and malnutrition are highly warranted for scientific, economic, and

ethical reasons [4]. We call for integration of researchers, physicians, policy makers from diverse backgrounds to plan for identifying and implementing necessary strategies to curb the current epidemic and prevent the origin of subsequent epidemic in future.

References:

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TABLE No: 1

SOCIO – DEMOGRAPHIC PROFILE OF STUDY POPULATION (N = 3541)

PROFILES	NUMBER	PERCENTAGE
AGE GROUP (Years)		
a) < = 5	122	3.4
b) 6 – 14	443	12.5
c) 15 – 45	2250	63.5
d) 46 – 60	519	14.7
e) > = 61	207	5.8
SEX		
a) Male	1627	45.9
b) Female	1914	54.1
TYPE OF HOUSE		
a) Thatched	427	12.1
b) Tiled	592	16.7
c) Concrete	2522	71.2
DAYS OF SUFFERING (MORBIDITY)		
a) < = 7	934	26.4
b) 8 – 14	418	11.8
c) 15 – 30	1323	37.4
d) > 30	866	24.5
HOUSE HOLD INCOME (US DOLLARS)/MONTH		
a) < = 25	327	9.2
b) 26 – 125	2079	58.7
c) 126 – 225	910	25.7
d) > 225	225	6.4

TABLE No: 2

HOUSE HOLD INCOME V/S DAYS OF MORBIDITY

INCOME (US $)	DAYS OF MORBIDITY								TOTAL
	< = 7		8 - 14		15 - 30		> 30		
	No	%	No	%	No	%	No	%	
< = 25 $	92	28.1	61	18.7	125	38.2	49	15.0	327
26 – 125 $	650	31.3	269	12.9	766	36.8	394	19.0	2079
126 – 225 $	165	18.1	72	7.9	366	40.2	307	33.7	910
> 225 $	27	12.0	16	7.1	66	29.3	116	51.6	225

Chi Square = 234.8, df = 9, P < 0.0001

TABLE No: 3

AGE GROUP V/S HOUSE HOLD INCOME/MONTH

AGE GROUP (YEARS)	PER CAPITA INCOME/MONTH IN DOLLARS								TOTAL
	< = 25 $		26 – 125 $		126 – 225 $		> 225 $		
	No	%	No	%	No	%	No	%	
< = 5	16	13.1	97	79.5	6	4.9	3	2.5	122
6 – 14	35	7.9	271	61.2	113	25.5	24	5.4	443
15 – 45	202	9.0	1279	56.8	619	27.5	150	6.7	2250
46 – 60	50	9.6	302	58.2	132	25.4	35	6.7	519
> 60	24	11.6	130	62.8	40	19.3	13	6.3	207

Chi Square = 46.4, df = 12, P < 0.0001

TABLE No: 4

AGE GROUP V/S DAYS OF MORBIDITY

AGE GROUP (YEARS)	DAYS OF MORBIDITY								TOTAL
	< = 7		8 - 14		15 - 30		> 30		
	No	%	No	%	No	%	No	%	
< = 5	51	41.8	38	31.1	30	24.6	3	2.5	122
6 – 14	127	28.7	72	16.3	193	43.6	51	11.5	443
15 – 45	569	25.3	236	10.5	866	38.5	579	25.7	2250
46 – 60	133	25.6	50	9.6	164	31.6	172	33.1	519
> 60	54	26.1	22	10.6	70	33.8	61	29.5	207

Chi Square = 154.8, df = 12, P < 0.0001

Figure 1

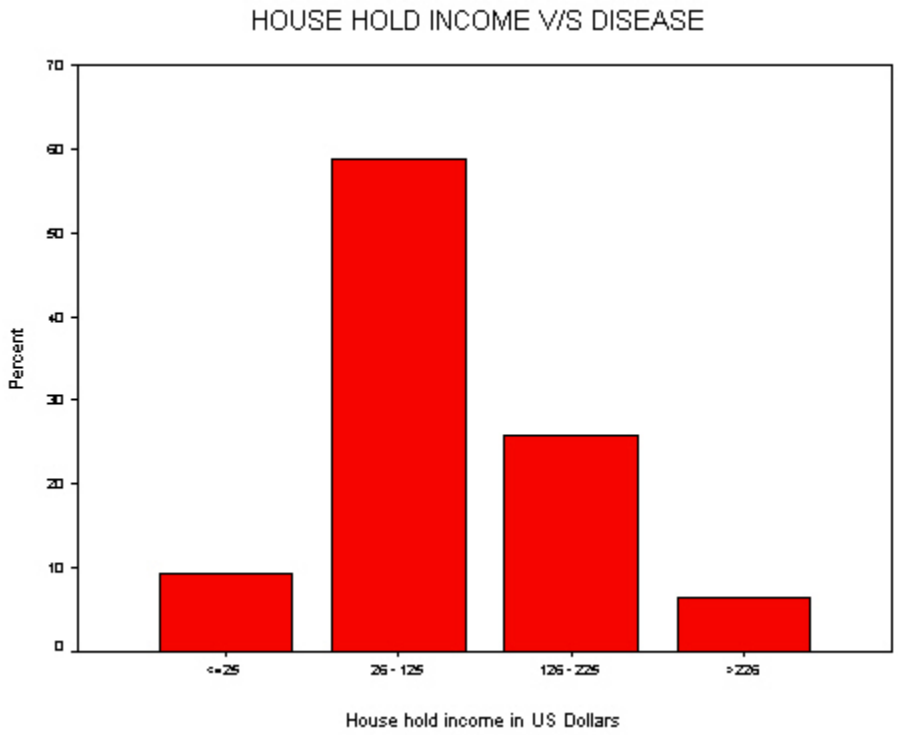

HOUSE HOLD INCOME V/S DISEASE
Percent
70
60
50
40
30
20
10
0
<=25
26 - 125
126 - 225
>226
House hold income in US Dollars

Figure 2

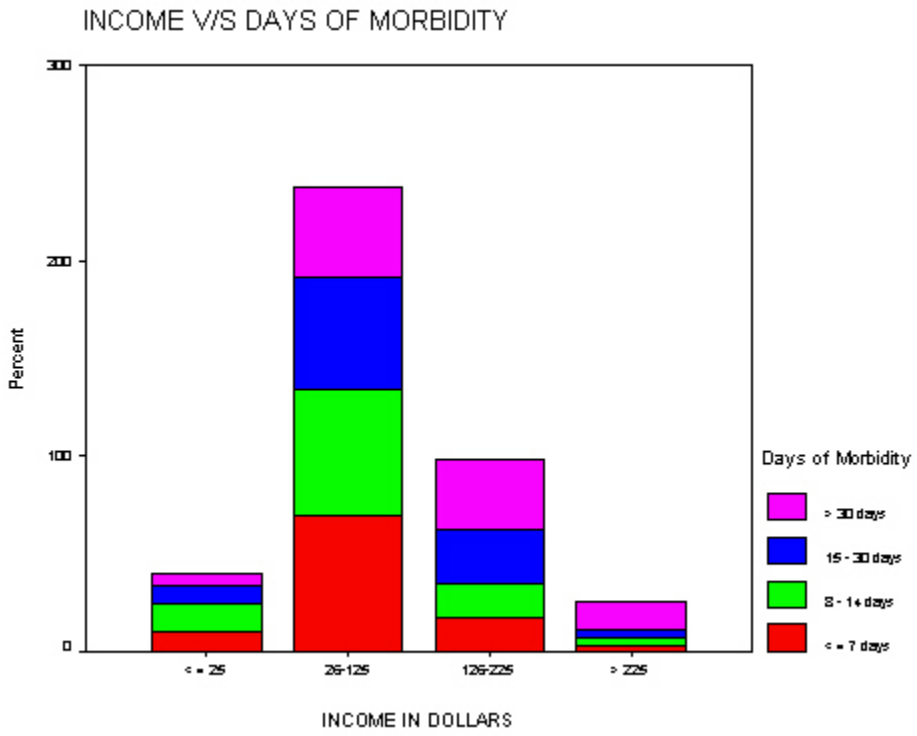
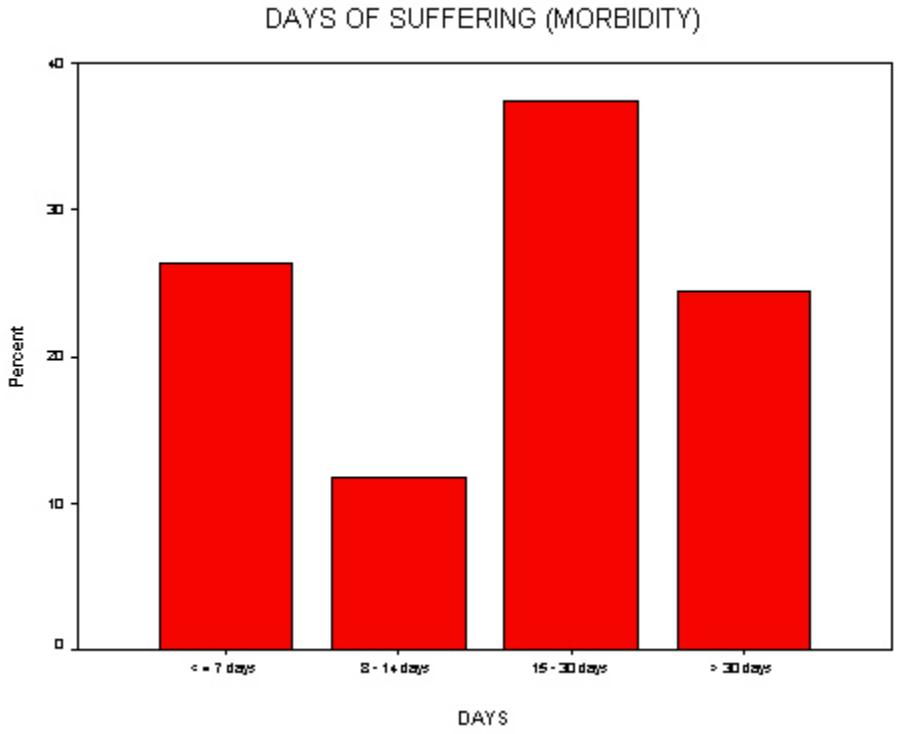

INCOME V/S DAYS OF MORBIDITY
Percent
300
200
100
0
< = 25
26-125
126-225
> 225
INCOME IN DOLLARS
Days of Morbidity
> 30 days
15 - 30 days
8 - 14 days
< = 7 days

Figure 3


DAYS OF SUFFERING (MORBIDITY)
Percent
0
10
30
40
< = 7 days
8 - 14 days
15 - 30 days
> 30 days
DAYS