

INCIDENCE OF CHIKUNGUNYA FEVER IN GHATAMPUR MUNICIPALITY, KANPUR NAGAR DISTRICT, UTTAR PRADESH, INDIA

GUPTA SURENDER NIKHIL¹, SACHAN PAWAN², GUPTA NAVEEN³, SWAIN PUSHPANJALI,⁴ GUPTA SHIVANI⁵

ABSTRACT

OBJECTIVES: (i) To estimate the magnitude, compare the results of two wards (Shivpuri and Achhimohal) and (ii) to formulate recommendations for prevention and control.

STUDY DESIGN: Experimental study

PLACE AND DURATION: 1st October to 16th November 2006 in residents of Shivpuri and Achhimohal ward

METHODOLOGY: We selected and compared two wards; Shivpuri ward with high attack rate and the other Achhimohal one-low attack rate. We defined a case as the occurrence of fever with joint pain with or without skin rashes during the period of 1st October to 16th November 2006 in residents of Shivpuri and Achhimohal ward. We collected information on age, sex, residence, date of onset, symptomatology, history of treatment, deaths in the family. We described outbreak in time, place and person characteristics. We collected 14 random blood samples from shivpuri and 7 blood samples from Achhimohal ward for serological investigation. We conducted entomological survey for species identification.

RESULTS: We identified total 384 case-patients among 2,202 residents (overall attack rate (AR: 384/2202 (17%); Median age: 31 year) in both the wards. [343/1173 (29%) in Shivpuri ward vs 41/1029 (4%)]; sex specific AR was 52% for females. The major symptoms were fever 384/384 (100%), arthralgia 380/384 (99%). Severity of disease and oedema were less prevalent in children of age group 1-15 year as compared to older age group 31-45 years [109/239 (46%), 13/183 (7%)]. The attack rate was highest 88/239 (37%) and statistically significant ($P < 0.03$) in Shivpuri ward adjacent to pond. Both wards, Shivpuri-141 of 343 (41%) and Achhimohal-23 of 41 (56%) reported consulting with unqualified private practitioners. 19/21 were positive for anti Chikungunya IgM antibodies. 38/43 households (88%) in Shivpuri ward and 6/43 households (13%) in Achhimohal ward identified three species of Aedes mosquitoes.

CONCLUSION: Chikungunya is mosquito born and laboratory confirmed; severely debilitating disease. Recommended for aggressive Information, Education and Communication (IEC) for emptying the storage of water once in a week and rational use of drugs.

KEYWORDS: Chikungunya, outbreak, Chikungunya IgM antibodies, Kanpur, India

INTRODUCTION

Chikungunya fever is an arbovirolosis caused by Chikungunya virus (CHIKV), a mosquito-transmitted alphavirus belonging to the Togaviridae family.¹ It is an uncommon viral illness, caused by the Chikungunya virus and transmitted by the bite of an infected Aedes mosquito.² Chikungunya virus was isolated for the first time from a Tanzanian outbreak in 1952. Between 1960 and 1982, outbreaks of chikungunya fever were reported from Africa and Asia. In Asia virus strains have been isolated in Bangkok in 1960s, various part of India including Vellore, Calcutta, and Maharashtra in 1964, Sri Lanka in 1969, Vietnam in 1975, Myanmar in 1975 and in Indonesia in 1982.³ After an interval of more than 20 years, chikungunya fever has been

reported from several countries including India, various Indian Ocean Island including Comoros, Mauritius, Reunion and Seychelles.^{4, 5} In February 2005, an outbreak of chikungunya fever was reported on the French Island of Reunion in the Indian Ocean. As of May 2006, virus has hit 258,000 residents in the past year (out of a population of about 777,000). 219 deaths have been associated with chikungunya.⁶ From February 2006 to October 2006, the WHO regional office for South-East Asia has reported 151 Districts in 8 States/Provinces of India affected by chikungunya fever.⁷ The affected States are Andhra Pradesh, Andaman and Nicobar Islands, Tamilnadu, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Kerala and Delhi. As of October 2006, more than 1.25 million suspected cases has been reported, including 752,245 in Karnataka and 258,998 in Maharashtra.⁸ Most CHIKV infections were symptomatic and characterized by a dengue-like illness of sudden onset combining high fever, poly-arthralgia, myalgia, headache, asthenia and rash.^{9,10}

METHODOLOGY

Objectives: (1) estimate the magnitude of the outbreak (2) confirming the diagnosis of fever through history taking, clinical examination and laboratory investigation (3) compare the results of two wards (Shivpuri and Achhimohal) of Ghatampur municipality (4) initiate appropriate measures to reduce morbidity and mortality (5) formulate recommendations for control.

Sampling technique employed: As the outbreak was spread throughout the district Kanpur with massive population (2.1 millions approx), hence we were requested for only two wards to be involved for comparative study to estimate the incidence of chikungunya case patients in the context of a public health response to an outbreak; One ward Shivpuri (near pond) was reported to have high attack rate while the other ward (Achhimohal) was harboring to have low attack rate. We defined a case as the occurrence of fever with joint pain with or

1. Epidemiologist-In-Charge,
Regional Health and Family Welfare Training Centre,
Chheeb, Kangra, Himachal Pradesh, India.
2. Medical Officer,
Community Health Centre, Ghatampur municipality,
Kanpur Nagar District, Uttar Pradesh.
3. Freelance Researcher in Epidemiology,
Kangra, Himachal Pradesh, India.
4. Associate Professor,
Department of Statistics and Demography,
National Institute of Health and Family Welfare, New Delhi.
5. Freelance Researcher,
Food Technology and Infectious Diseases,
SU, Solan, Himachal Pradesh, India

Correspondence to:

Dr. Gupta Surender Nikhil

Epidemiologist-In-Charge,
Regional Health and Family Welfare Training Centre,
Chheeb, Kangra, Himachal Pradesh, India.
E-Mail: drsurendernikhil@yahoo.com

without skin rashes during the period of 1st October 2006 to 16th November 2006 in residents of Shivpuri and Achhimohal ward of Ghatampur municipality of Kanpur Nagar district, Uttar Pradesh. We conducted active case search by visiting house to house to identify the case- patients that meet the case definition.

We reviewed surveillance data for occurrence of fever with joint pain cases in previous years from district and community health center of Ghatampur. We collected information on age, sex, residence, date of onset, symptomatology, history of treatment, also near pond, deaths in the family since 1st October as sequel of fever. We drew a spot map to show the attack rates in different streets of Shivpuri and Achhimohal wards. We constructed an epidemic curve to examine the dynamic of the outbreak in these two wards. We counted case-patients and divided by the population size of the affected age group and sex group to obtain the attack rates.

We explained the purpose of collecting the samples and the processing of the samples to the population of study areas. We took informed written consent to collect 14 random blood samples of case-patients from shivpuri ward and 7 blood samples of case-patients from achhimohal ward for serological investigation. We collected 5 ml of blood from case-patients, using sterile equipments, separated serum and virus transport media, and all these samples were stored. We assigned international identification numbers and labeled other epidemiological details on all the samples. We transported the specimen to National Institute of Virology (NIV), Pune in reverse cold chain separately where it was tested for IgM antibodies against Chikungunya virus using IgM capture ELISA. The samples were only taken from those who were willing, while fifteen reluctant/refusing populations were dropped. However, as this investigation was conducted in the context of a public health response to an outbreak, and therefore ethical committee review was not indicated. We entered and analyzed the data by MS-Excel sheet and using Epi info version 3.3.2 and SPSS-16.

We searched for indoor and outdoor containers (e.g. cement tanks, plastic drums and earthen pots) containing water. When we found a water containing vessels, we searched it for the presence of mosquito larvae. We also collected stored water having mosquito larvae and sent the sample for species identification at Department of Zoology, Ambedkar University, Agra, Uttar Pradesh.

RESULTS

In our study results, we identified total 384 case-patients among 2,202 residents (overall attack rate: 384/2202 (17%) in both the wards. Of total 384 case-patients (Median age: 31 year) 52% were females. The patients presented with acute onset of fever lasting for an average of five days with pain in both small and large joints. The arthralgia and myalgia were mainly peripheral, commonest involving joints were ankle, knee, wrist and small joints of hands. Usually more than one joint were involved.

Oedema and pain was less reported in children of 1-15 yr of age group as compared to older age groups of 31-45 year age group (Table - I) and the difference was statistically significant ($P < 0.001$). Of total 384, 49% (188/384) patients reported pain in more than four joints. 31% (120/384) patients reported macular rashes on the body. No patient had history of shock and hemorrhage. Only four patients presented with hemorrhagic gums. There were no deaths. Of total 384 patients, 164/384 (44%) reported consulting with unqualified private practitioners. Of 164, 111/164 (68%) reported being prescribed antibiotics and steroids.

We compared the results of these two wards. We identified 343 case-patients in a population of 1173 in Shivpuri ward and 41 case-patients in a population of 1029 in Achhimohal ward [attack rate 343/1173 (29%) in Shivpuri ward vs 41/1029 (4%) in Achhimohal ward]] (Table - I). The difference of attack rate is statistically significant ($p < 0.001$). The attack rate was highest 109/239 (46%) among 31-45 age group in Shivpuri ward and 13/183 (7%) among 45+ years in Achhimohal ward. The children (0-15 age-group) were less affected in both the wards. There was no difference in attack rates by gender (169/600 (28%) in males vs. 174/573 (30%) in females in Shivpuri ward and 16/543 (3%) in males vs. 25/486 (5%) in females in Achhimohal ward). The attack rate in different areas of these two wards ranged 0% to 37% (Figure - I). The attack rate was highest 88/239 (37%) in the areas of Shivpuri ward adjacent to pond and this was statistically significant ($P < 0.03$). Epidemic curve indicated that peak of the outbreak was around 21-24 October 2006 in Shivpuri ward and then gradually declined (Figure - II). In Achhimohal ward, the peak of the outbreak was around 6-11 November 2006 and then declined (Figure - III) in the month January, 2007. A major symptom fever 384/384 (100%), joint pain 380/384 (99%), itch/rash 119/384 (31%) and chill 59/385 (15.4%). Bleeding was reported in 1% of the cases. Of the 343 case-patients in Shivpuri ward, 103/343 (30%) case-patients reported skin rashes. Of the 41 case-patients in Achhimohal ward, 17/41 case-patients (41%) reported skin rashes (Table - II). Joint pains (4 or more joints) and severity of pain were more pronounced among older age group (> 45 years) than younger age group (1-15) years. The difference of intensity in joints pains and complete recovery of illness between age groups were found significant (Table - III).

Of total 384 patients, 164 (44%) reported consulting with unqualified private practitioners. Of these, 111 (68%) reported being prescribed antibiotics and steroids. Arthralgia, myalgia, oedema, lethargy, weakness and distaste were reported to persist even after the fever subsided. 141 of 343 (41%) case-patients in Shivpuri ward and 23 of 41 (56%) case-patients in Achhimohal ward visited to unqualified medical practitioners for medication for a good premium. 101 of 141 (72%) case-patients of Shivpuri ward and 10 of 23 (43%) case-patients of Achhimohal ward, who visited to unqualified medical practitioners have history of treatment with antibiotics and steroids.. Of total 21 blood samples collected for serological

Table - I: Attack rates of fever by age and sex, Shivpuri and Achhimohal ward, Ghatampur municipality, Kanpur Nagar, Uttar Pradesh

Age-group (In Years)	Shivpuri Ward				Achhimohal Ward		
		Number Of Cases	Population	Attack Rate (%)	Number Of Cases	Population	Attack Rate (%)
	0-15	69	452	15	9	321	3
	16-30	102	324	31	12	312	4
	31-45	109	239	46	7	213	3
	45+	63	158	40	13	183	7
Sex	Male	169	600	28	16	543	3
	Female	174	573	30	25	486	5
Total		343	1173	29	41	1029	4

investigation, 19 were positive for anti Chikungunya IgM antibodies. We surveyed 190 households in Shivpuri ward and 196 households in Achhimohal ward for entomological assessment. Of 43 households' containers with larvae, 38/43 households (88%) in Shivpuri ward and 6/43 households (13%)

in Achhimohal ward showed the presence of mosquito larvae in these containers. Three species of Aedes mosquitoes identified, (i) Aedes dorsalis, (ii) Aedes sollicitans and (iii) Aedes campestris.

Table - II: Comparison of symptoms observed among Chikungunya cases in different age groups, sex and occupation (n= 384)

Age group	Chills (%)	Rash*(%)
<16	7.7	41.0
16-30	13.2	30.7
31-45	21.6	32.8
>45	17.1	19.7
Sex	Chills (%)	Rash (%)
Male	16.8	26.5
Female	14.1	35.7

*P < 0.05 **p < 0.01 among different age groups, sex and occupation (Chi square test)

Table - III: Duration of illness, number of joint pains and severity of pains symptoms observed among Chikungunya cases in different age groups

Characteristics	Age group			
	< 16 (n=78)	16-30 (n=114)	31-45 (n=116)	>45 (n=76)
Duration of illness (mean)	4.37	4.68	4.82	4.72
Joints pain** (4 or more joints) (%)	55.1	69.3	81.0	77.6
Severity of pain*	14.1	21.9	25.0	34.2
Recovery from illness* %	61.5	62.3	64.7	81.6

*P < 0.05**p < 0.01 Characteristics of illness by age group (Chi square test)

Figure - I: Attack rate (%) in different areas of Shivpuri and Achhimohal wards, Ghatampur municipality, Kanpur Nagar, Uttar Pradesh, India, 2006

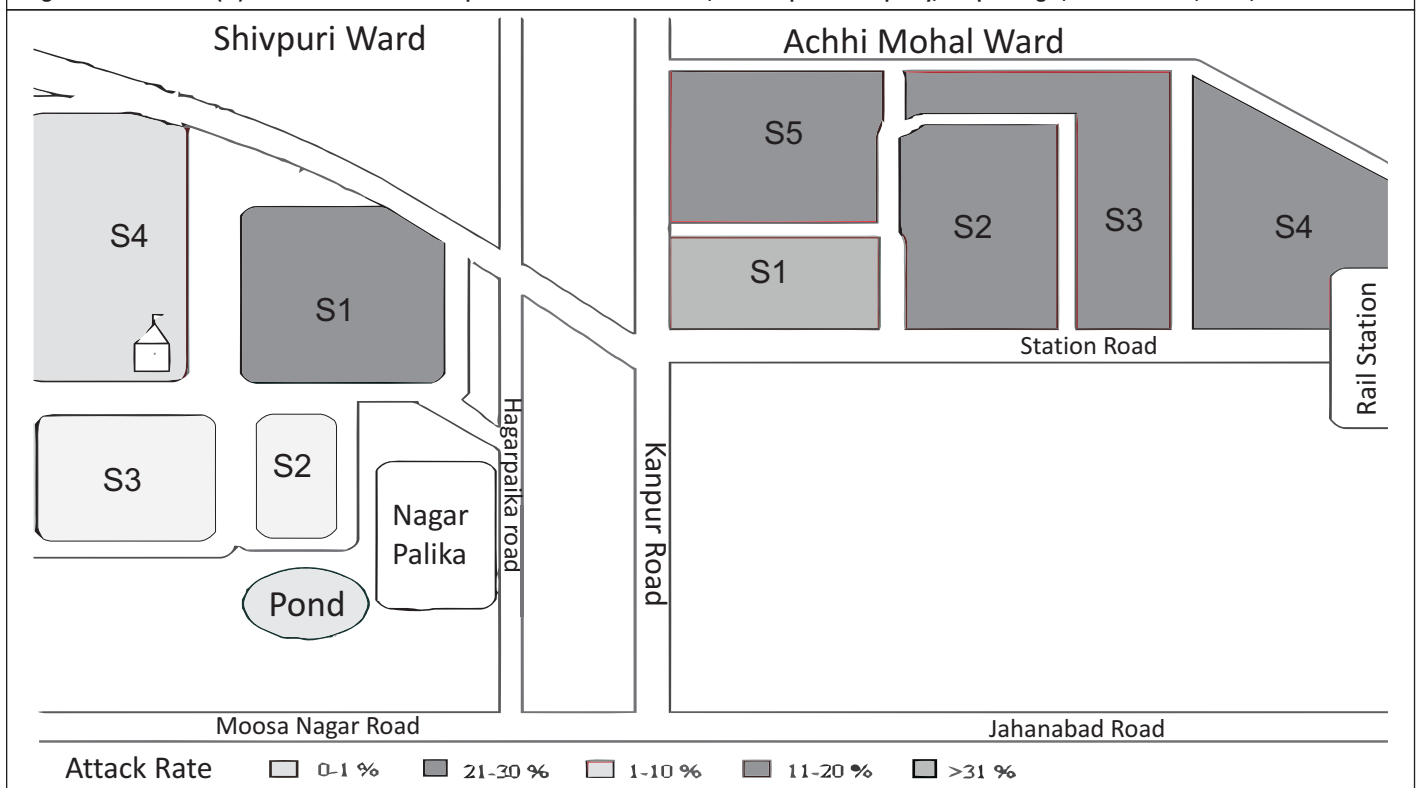


Figure - II: Distribution of cases by onset date, Shivpuri ward. Ghatampur, Kanpur Nagar, Uttar Pradesh, India, 2006

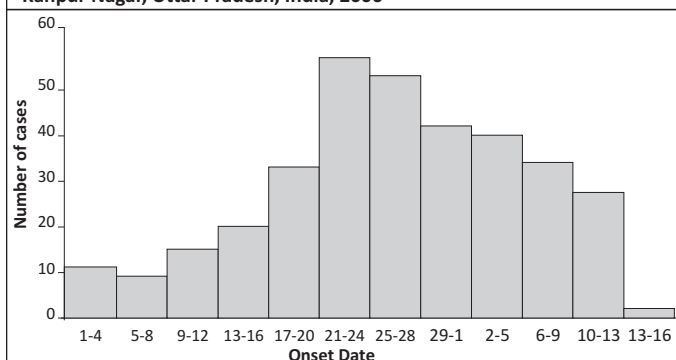
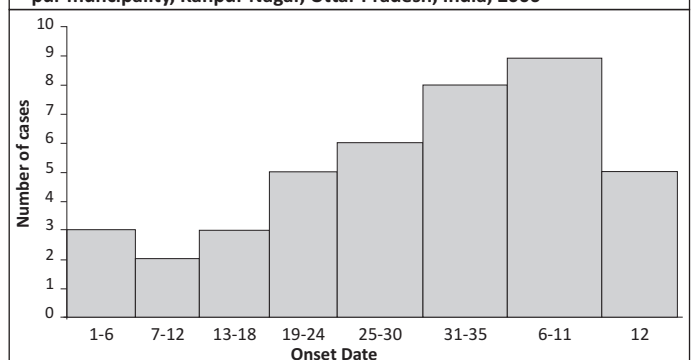


Figure - III: Distribution of cases by onset date, Achhimohal ward. Ghatampur municipality, Kanpur Nagar, Uttar Pradesh, India, 2006



DISCUSSION

This is a small comparative study of two wards of Kanpur Nagar district; one with high attack rate near the pond and other with lower one in which more of incidence of chikungunya case patients were estimated, so it is a sero-prevalence study. The clinical findings suggest Chikungunya and Dengue virus possibly caused that outbreak. In a study comparing chikungunya and dengue clinical manifestations in Thailand, the onset of symptoms was more abrupt, the febrile course was shorter and maculopapular rashes, arthralgia were significantly more frequent in chikungunya than in dengue whereas shock and gastrointestinal hemorrhage occurred in dengue patients.^[11, 17]

Our study results match the above clinical picture. The age appears to be important factor; the younger age group is spared of the severity of the disease while the disease affects predominantly in older age groups seriously with higher attack rates and case fatality is uncommon in chikungunya fever.^[12] Both sexes are more or less equally affected. In the present outbreak, acute onset of febrile illness, arthralgia and skin rashes were predominant clinical manifestations in the absence of gastrointestinal haemorrhage, shock and death^[13]. In India, during 2006 CHIKV epidemic more cases were reported in the adult age groups even though all age groups were affected^[18]. In Reunion, women (68%) were reported to be more affected than men, with more adults being affected than children (74% of victims were over 30 yr of age)^[19]. The blood samples were also positive for anti Chikungunya IgM antibodies^[14]. These findings indicated the possibility of chikungunya infection in the present outbreak.

Haemorrhagic manifestations including petechiae and/or skin rashes were generally uncommon in the chikungunya cases during earlier outbreak episodes worldwide. In our study also there was neither any shock or gastrointestinal bleeding excepting a few case patients of hemorrhagic gums but the skin rash was as high as 43% in both the wards of Shivpuri and Achhimohal. However, travellers returning from Indian Ocean Islands during 2006 were reported to profusely exhibit rash (53.2%)^[20]. In another study itching was reported in 19.3 per cent cases from Reunion islands with peeling of the skin in a few cases^[21]. In contrast, in Kerala we recorded itching/rash in 80.8 per cent of the patients^[13]. In yet another study bullous rashes and blisters were reported from children suffering with chikungunya; they had even demonstrated CHIKV from the blister fluid by PCR^[22]. Such cases were not encountered during the present survey.

Aedes aegypti is the primary vector of chikungunya to humans. *Aedes albopictus* may also play a role in human transmission in Asia.^[15] In the present outbreak mosquitoes identified were *Aedes* but species were different (*Aedes dorsalis*, *Aedes sollicitans* and *Aedes campestris*). The urban and semi-urban settings with lot of artificial collections of water in containers contribute to the breeding of *Aedes* mosquito^[16] which is the vector for both dengue and chikungunya virus. In Shivpuri ward, 23% (43/190) household's stored water in various containers with 88% (38/43) showed the presence of mosquito larvae in these containers. These findings suggest storage water in these containers was contributing/risk factor for high attack rate in Shivpuri ward. The case-patients visited mostly to unqualified medical practitioners for medication of this disease and receive unnecessary treatment like antibiotics and steroids, thereby causing an unwanted financial burden, especially on the poor. The cases were occurring for about a month in Ghatampur municipality but health system did not notice the outbreak. A local newspaper only reported it. This shows weakness in the routine surveillance system leading to delay in identifying the outbreak and reducing the opportunity for control. Small sample size is also the limitation of the comparative study.

CONCLUSION

1. Chikungunya is mosquito born and laboratory confirmed; severely debilitating disease for older patients with particular reference to prolonged arthralgia, skin rashes, eye pain, oedema with substantial DALY burden on the poor^[24].
2. Weak surveillance system is in place as the news paper reported the cases;
3. Presence of mosquito larvae in various old water containers.
4. Irrational and indiscriminate use of antibiotics and steroids in the community

RECOMMENDATIONS

On the basis of these conclusions, we formulated the recommendations.

First, educate the community about the self-limiting nature of mosquito born disease and its treatment

Second, strengthen the surveillance system to detect outbreak early and initiate control measures

Third, aggressive IEC activities to empty their water storage; at least once a week

Fourth, counsel private practitioners (i) To promote rational use of drugs in chikungunya (ii) To abstain from the use of dangerous, unnecessary and costly medications

ACKNOWLEDGEMENTS

We gratefully acknowledge the cooperation we received in investigation of Chikungunya outbreak from the Chief Medical Superintendent of community health center of Ghatampur, its staff and also case patient's alongwith their attendants in different areas of Shivpuri and Achhimohal wards of Ghatampur municipality. We owe our special thanks for guidory support from National Institute of Epidemiology, Chennai and also for laboratory support for National Institute of Virology, Pune, India.

REFERENCES

1. Gérardin P, Guernier V, Perrau J, Fianu A et al; Estimating Chikungunya prevalence in La Réunion Island outbreak by serosurveys: Two methods for two critical times of the epidemic; BMC Infect Dis 2008 8:99
2. Laras K, Sukri NC, Larasati RP; Tracking the re-emergence of epidemic chikungunya virus in Indonesia. Trans R Soc Trop Med Hyg 2005; 99(2): 128-41.
3. WHO: Chikungunya fever a re-emerging disease in Asia. Website: [http://www.searo.who.int/en/section10/section2246.htm; Retrieved on 14th Feb2013]
4. Pavri K. Disappearance of Chikungunya virus from India and South East Asia. Trans R Soc Trop Med Hyg 1986; 80: 491.
5. Zeller HG. Dengue, arbovirus and migrations in the Indian Ocean. Bull Soc Pathol Exot 1998; 91:56-60.
6. Ravi V. Re-emergence of Chikungunya virus in India. Indian J Med Microbiol 2006 24:83-4.
7. Rapid spread of Chikungunya virus infection in Orissa: India; WHO: Epidemic and pandemic alert and response (EPR), chikungunya in India, 17 October 2006. [Website: icmr.nic.in/ijmr/2011/march/0312.pdf; Retrieved on 14th Jan2013]
8. Chikungunya Fever in India. Travelers' Health Outbreak Notice April 21, 2006 CDC. [Website http://www.cdc.gov/travel; Retrieved on 23rd Feb2013]
9. Borgherini G, Poubeau P, Staikowsky F; Outbreak of chikungunya on reunion island: early clinical and laboratory features in 157 adult patients; Clin Infect Dis 2007; 44:1401-07.

10. Staikowsky F, Le Roux K, Schuffenecker I, Laurent P, Pet G: Retrospective survey of Chikungunya disease in Reunion Island hospital staff; *Epidemiol Infect* 2008; 136(2):196-206.
11. Nimmanitya S, Halstead SB, Cochen SN, Margiotta MR. Dengue and chikungunya virus infection in man in Thailand, 1962-1964. Observations on hospitalised patients with haemorrhagic fever. *Am J of Trop Med and Hyg* 1969; 18: 954-71.
12. Park K; Textbook of Preventive and Social Medicine, Banarasidas Bhanot publications 18th Edition, Jabalpur-India; 2005; 230.
13. Kannan M, Rajendran R, Sunish IP, Balasubramaniam R, Arunachalam N; A study on chikungunya outbreak during 2007 in Kerala, South India; *Indian J Med Res* March 2009;129; 311-15
14. Moro ML, Gagliotti C, Silvi G, Angelini R, Sambri V, Rezza G, et al. Chikungunya virus in northeastern Italy: a seroprevalence survey. *Am J Trop Med Hyg.* 2010; 82(3):508-11
15. Chikungunya distribution and global map. Atlanta: CDC; 2010 Website [http://www.cdc.gov/ncidod/dvbid/Chikungunya/CH_GlobalMap.html Retrieved on 23rd Feb 2013].
16. Singh NP, Jhanb R, Agarwal SK. The 2003 outbreak of Dengue fever in Delhi, India; *Southeast Asian J Trop Med Public Health* 2005; 36(5): 1174-8.
17. Ligon BL. Reemergence of an unusual disease: The chikungunya epidemic, *Semin Pediatr Infect Dis* 2006; 17: 99-104.
18. Jain SK, Kaushal K, Bhattacharya D, Venkatesh S, Jain DC, Lal S. Chikungunya viral disease in Bhilwara district, Rajasthan state, India. *J Commun Dis* 2007; 37: 25-32.
19. Quatresous I. Chikungunya outbreak in Reunion, a French overseas department. *Euro Surveill* 2006; 11: 113.
20. Simon F, Parola P, Grandadam M, Fourcade S, Oliver M, Brouqui P, et al. Chikungunya infection: an emerging rheumatism among travellers returned from Indian Ocean islands, Report of 47 cases. *Medicine* 2007; 86: 123-37.
21. Talarmin F, Staikowsky F, Schoenlaub P, Risbourg A, Nicolas X, Zagnoli A, et al. Skin and mucosal manifestations of chikungunya virus infection in adults in Reunion Island. *Med Trop*, 2007; 67: 167-73.
22. Gilles P, Bernard A, Gaüzère, Stéphane J, Michel S. Chikungunya, an epidemic arobovirosis. *Lancet Infect Dis* 2007; 7: 319-27.
23. Seyler T, Hutin Y, Ramanchandran V, Ramakrishnan R, Manickam P, Murhekar M; Estimating the burden of disease and the economic cost attributable to chikungunya, Andhra Pradesh, India, 2005-2006, *Transactions of the Royal Society Trop Med and Hyg*; 2010; 104:133-8.