

AN OUTBREAK OF CHIKUNGUNYA EPIDEMIC IN SOUTH INDIA-KARNATAKA

A.S. Talawar & H.S. Pujar

Department of Statistics, Karnataka University, Dharwad, India.

E-mail: talwar_as@hotmail.com

ABSTRACT

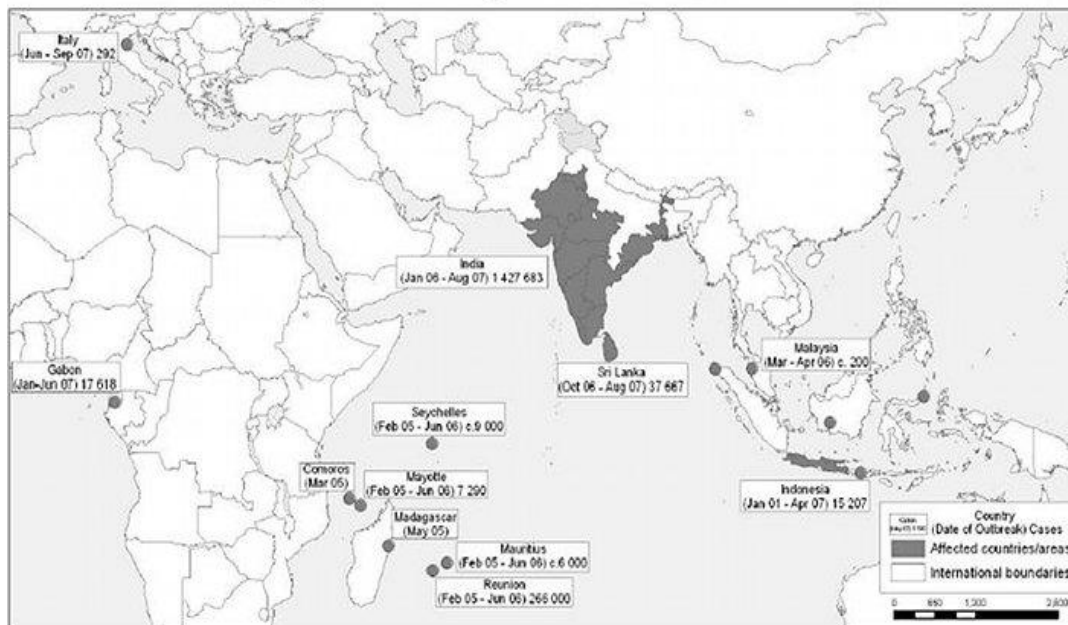
Reports of large-scale outbreaks of fever caused by CHIKV virus infection in several parts of the country especially in Southern India have confirmed the re-emergence of this virus. In 2006, Southern India states Andhra Pradesh, Karnataka, Tamil Nadu and Kerala together contributed more than 70% of the total country's incidence out which Karnataka state alone contributed nearly 55% of incidence. In 2008, Karnataka and Kerala together contributed more than 95% of the total suspected cases and in 2009 also 41,649 suspected CHIKV cases have been reported and 3,239 cases were confirmed for Karnataka. There is no specific treatment (therapies) or vaccines are available for CHIKV. But the Homoeopathic system of medicine claims to have medicines as well as preventive measures against this disease.

Key words: CHIKV, *Aedes aegypti*, dengue, incidence and outbreak.

1. INTRODUCTION

Chikungunya (CHIKV) virus has recently re-emerged as an important pathogen causing epidemics of the disease in several countries. Epidemic resurgence of CHIKV was recorded in 2000 in the Democratic Republic of Congo (DRC), in Indonesia during 2001-03 and in India during 2005-06, after a gap of 39, 20 and 32 years respectively. In December 2006, there were outbreaks of 3,500 confirmed cases in the Maldives, and over 60,000 suspected cases and over 80 deaths in Sri Lanka. The widespread outbreak of CHIKV in India is in the states of Maharashtra, Gujarat, Madhya Pradesh and mainly in southern states Andhra Pradesh, Tamil Nadu, Karnataka, and Kerala. In Kerala state, 43,138 suspected cases and 125 deaths were occurred due to this outbreak, with the majority of the casualties reported in the district of Alapuzha, mainly in Cherthala. In early 2007, CHIKV spread from Kerala and Tamil Nadu to Sri Lanka and many people were infected. CHIK outbreaks in east, south, west and central Africa have been documented (see "Fig 1" for global distribution of CHIKV).

**Fig 1: Chikungunya (CHIKV) global distribution map (countries affected)
Chikungunya Outbreak reported countries, as of October 2007**



Source: WHO report, 2007

2. SPREAD OF THE EPIDEMIC

CHIKV virus is indigenous to tropical Africa and Asia, where it is transmitted to humans by the bite of infected mosquitoes, usually of the genus *Aedes* mosquito. *Aedes albopictus* is considered to be the vector in Reunion and other islands of the Indian Ocean. Although both *Aedes aegypti* and *Aedes albopictus* mosquitoes are prevalent in India, the former is the main responsible vector for the spread (Yergolkar *et al.*, 2006). CHIKV fever is a relatively rare form of viral fever caused by an alphavirus that is spread by the bite of an infected “*Aedes aegypti* mosquito”. The mosquito usually transmits the disease by biting an infected person and then biting someone else. An infected person cannot spread the infection directly to other persons (i.e. it is not a contagious disease) (see “*Fig 2*”). In Makonde language, CHIKV means “**that which bends up**”. Although it may feed at any time, the peak biting periods of mosquitos are few hours after dawn and in the late afternoon until a few hours after dark. The mosquito’s preferred breeding areas are in areas of stagnant water, such as flower vases, uncovered barrels, buckets, and discarded tires, but the most dangerous areas are wet shower floors and toilet bowls, as they allow the mosquitoes to breed right in the residence (www.cdc.org 2006). CHIKV virus is highly infective and disabling but is not transmissible between people. In India, the first CHIKV outbreak was recorded in 1963 in Kolkata (Calcutta) followed by epidemics in eastern coastal areas Chennai (nearly 4,00,000 cases), Pondicherry and Vellore of Tamil Nadu state in 1964, Visakhapatnam, Rajmundry and Kakinada of Andhra Pradesh state in 1965 (Rao, 1966), Nagpur and Barsi of Maharashtra state in 1965 and 1973 respectively (Padbidri and Ganeswar, 1979). In view of the long absence of CHIKV epidemics, it was under the impression that CHIKV virus had disappeared from India and South-East Asia (Burke *et al.*, 1985; Pavri, 1986). Serological surveys supported this view (Neogi *et al.*, 1995), see also Vidya *et al.* (2007). The outbreak of CHIKV fever that started in the Indian Ocean Islands in early 2005 spread through adjoining islands and appeared in peninsular India by late 2005. It has been estimated that over 1, 80,000 suspected cases of CHIKV fever have occurred in India since December 2005 (Ravi, 2006). Andhra Pradesh (AP) was the first state to report this disease in December 2005, and one of the worst affected states (over 80,000 suspected cases); it spread to Tamil Nadu in April 2006 and to Karnataka and Kerala in May 2006. However, reports of large-scale outbreaks of fever caused by CHIKV virus infection in several parts of Southern India have confirmed the re-emergence of this virus (Enserink, 2006), see “*Fig 3*”, “*Fig 4*” for the suspected cases of CHIKV during 2006-09 and its distribution in India particularly in south-India respectively.

Fig 2.: Transmission Cycle of CHIKV



Sources: Directorate of National Vector Borne Disease Control Programme

Fig .3: CHIKV suspected cases of South India during 2006-09

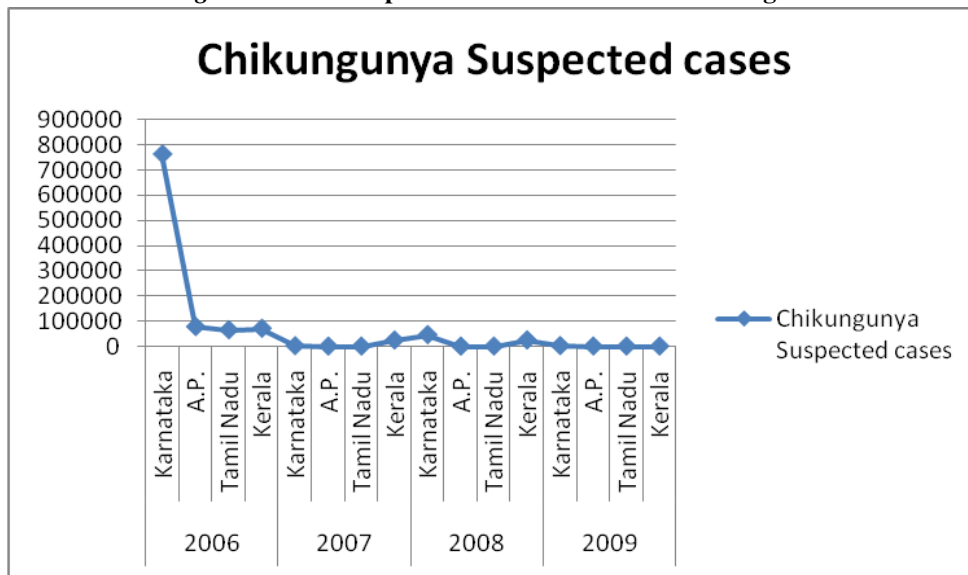
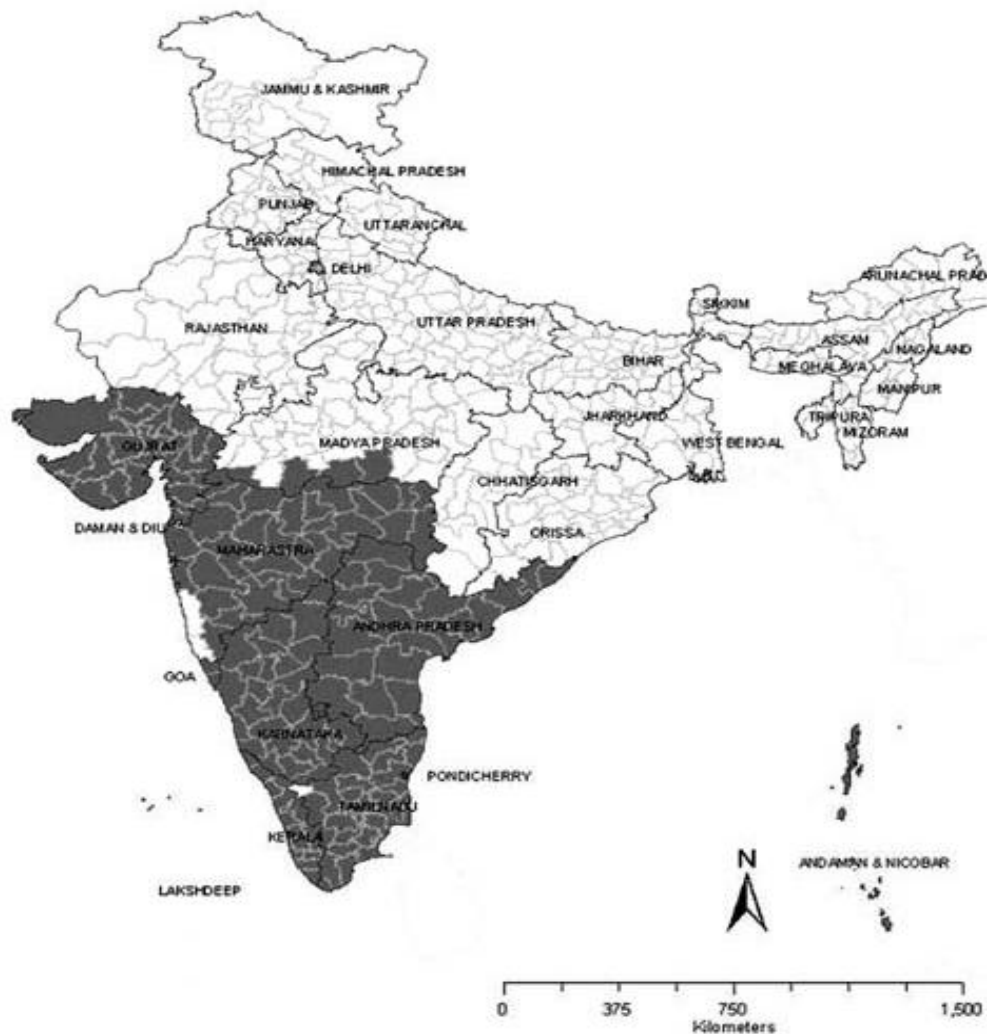


Fig 4: Spreading of Chikungunya fever (shaded area- states affected) in India during 2006-2010.



Source: Krishnamoorthy et al. (2009)

3. EFFECTS OF THE EPIDEMIC

CHIKV virus is an arbovirus, of the genus, *Alphavirus*, that is transmitted to humans by virus-carrying *Aedes* mosquitoes. There have been recent outbreaks of CHIKV associated with severe morbidity. CHIKV causes an illness with symptoms similar to dengue fever. CHIKV manifests itself with a prolonged arthralgic disease that affects the joints of the extremities. The acute febrile phase of the illness lasts only two to five days. The pain associated with CHIKV infection of the joints persists for weeks or months. All age groups were affected, including newborns. Recovery from the disease varies by age. Younger patients recover within 5 to 15 days and middle-agers recover in 1 to 2.5 months. Recovery is longer for the elderly. The severity of the disease as well as its duration is less in younger patients and pregnant women. In pregnant women, no untoward effects are noticed after the infection.

4. EPIDEMIC STATUS OF KARNATAKA STATE

Karnataka was the worst affected state during 2006 CHIKV outbreak, 27 districts of the state reported over 7, 62,026 (54.74% of the total) suspected cases. Several districts of the state such as Gulbarga, Tumkur, Bidar, Raichur, Dharwad, Bellary, Chitradurga, Davangere, Kolar and Bijapur have recorded large number of CHIKV virus related fever cases in 2006, Bijapur (over 80,00 cases) and Gulbarga (more than 52,353 cases) are the worst affected districts during the epidemic outbreak. In 2007, only 1705 suspected CHIKV cases were reported and whereas in 2008, the state reported 45,618 cases, more than 64 percent of the entire suspected cases in India in 2008, the Mangalore (over 27,408 reported cases) was the worst affected district of the state. Unofficial reports suggested that more number of individuals were suffered from symptoms of CHIKV. In 2009, the total of 41,649 suspected CHIKV cases have been reported and 3,239 cases were confirmed for CHIKV ("Table 1", "Table 2", "Table 3"). There has also been a marked decrease in CHIKV cases in 2010 in the state with 5,244 cases reported and 528 cases were confirmed (by the end of august 2010). There is no statistical relationship between CHIKV and Dengue cases (though CHIKV causes an illness with symptoms similar to dengue fever), refer "Table 2", "Table 3".

Table1: Chikungunya (CHIKV) Fever Situation in the Country during 2006 (Prov.).

State	No. of districts affected	Total fever cases/Suspected CHIKV fever cases (percentage values)	No. of samples sent to NIV/NICD	No. of confirmed cases
Andhra Pradesh	23	77535 (5.57)	1,224	248
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
A & Nicobar	2	4469 (0.32)	0	0
GNCT of Delhi	12	560(0.04)	560	67
Rajasthan	1	102 (0.01)	44	24
Pondicherry	1	542 (0.04)	52	9
Goa	2	287(0.02)	75	2
Orissa	13	6461(0.46)	171	34
West Bengal	1	-	21	21
Lakshadweep	2	35(0.003)	6	6
Total	213	13,92,027	15,504	1,985

Sources: Directorate of National Vector Borne Disease Control Programme

Table 2: As on 19-9-2008, the total of 70740 suspected cases of CHIKV have been reported from 8 States in the India. The State-wise suspected cases of CHIKV are as follows

State	CHIKV cases (percentage values)	Dengue cases (percentage values)
Andhra Pradesh	5 (0.01)	24 (1.15)
Goa	16 (0.02)	18 (0.86)
Gujarat	168 (0.24)	250 (11.94)
Haryana	20 (0.03)	739 (35.29)
Karnataka	45618 (64.49)	221 (10.55)
Kerala	24505 (34.64)	308 (14.71)
Maharashtra	398 (0.56)	252 (12.03)
Tamil Nadu	10 (0.01)	282(13.47)
Total	70740 (100.0)	2094(100.0)

Sources: Directorate of National Vector Borne Disease Control Programme

Table 3: As on 30-04-2009, the total of 2717 suspected cases of CHIKV have been reported from 7 States in the India. The State-wise suspected cases CHIKV are as follows

State	CHIKV cases (percentage values)	Dengue cases (percentage values)
Andhra Pradesh	549 (20.21)	20 (2.45)
Goa	64 (2.36)	6 (0.73)
Karnataka	1913 (70.41)	45 (5.51)
Kerala	38 (1.40)	485 (59.36)
Maharashtra	102 (3.75)	75 (9.18)
Tamil Nadu	16 (0.59)	113 (13.83)
West Bengal	35 (1.29)	73 (8.94)
Total	2717 (100.0)	817 (100.0)

Sources: Directorate of National Vector Borne Disease Control Programme

4.1. A Case of Dakshina Kannada (or Mangalore District of Karnataka State) during 2008

As on 05-07-2008, out of the 45,618 CHIKV cases of Karnataka state, the total 27,408 suspected cases have been reported from all the Taluks of Mangalore district. The Taluk-wise suspected cases are as follows

Table 4: The District-wise suspected cases of CHIKV of Karnataka State in 2008.

District	Suspected Cases	Blood sample collected	Number of positives	Dengue cases
D.K.	27,408	396	122	24
Kodagu	1,074	85	20	0
Shimoga	454	41	8	0
Udupi	357	165	40	0
Mysore	343	53	23	0
Dharwad	325	19	18	0
Belgaum	267	20	10	1
Hassan	171	36	10	0
Bangalore	30	30	12	1
U.K.	23	23	0	0
Tumkur	21	21	11	1
Gadag	24	4	3	18

Table 5: The Taluk-wise suspected cases of CHIKV in 2008

Taluk	Suspected Cases	Number of positives	Dengue cases
Mangalore	2426	32	7
Beltangadi	3252	17	2
Bantwal	9628	20	4
Puttur	9419	13	5
Sulya	2683	22	6
Total	27,408	104	24

In some areas of Mangalore district about 50% of the population is affected by this disease. Also a large number of infections are unreported or are misdiagnosed (**Table 4 and 5**).

5. CONCLUSION

There is no specific treatment (therapies) or vaccines are available for chikungunya. But the Homoeopathic system of medicine claims to have medicines as well as preventives against this disease. The effects of these medicines are not scientifically proved. They claim to have used these effectively in recent outbreaks in Kerala State of India. The most effective means of prevention are those that protect against any contact with the disease carrying mosquitoes.

6. REFERENCES

- [1]. Burke, D. S., Nisalak, A. & Nimmannitya, S. (1985). Disappearance of Chikungunya virus from Bangkok. *Trans R Soc Trop Med Hyg* **79**, 419–420.
- [2]. CDC (2006). Chikungunya fever: essential data, <http://www.cdc.org>
- [3]. Enserink M. (2006). Massive outbreak draws fresh attention to little-known virus, *Science*, **311**, 1085.
- [4]. Krishnamoorthy, K., Harichandrakumar, K.T., A. Krishna Kumari & Das, L.K. (2009). Burden of chikungunya in India: estimates of disability adjusted life years (DALY) lost in 2006 epidemic, *J. Vector Borne Dis.*, **46**, March 2009, 26–35.
- [5]. Neogi, D. K., Bhattacharya, N., Mukherjee, K. K., Chakraborty, M. S., Banerjee, P., Mitra, K., Lahiri, M. & Chakravarti, S. K. (1995). Serosurvey of chikungunya antibody in Calcutta metropolis. *J Commun Dis.*, **27**, 19–22.
- [6]. Padbidri, V. S. & Gnaneswar, T. T. (1979). Epidemiological investigations of chikungunya epidemic at Barsi, Maharashtra state, India. *J Hyg Epidemiol Microbiol Immunol.*, **23**, 445–451.
- [7]. Pavri, K. M. (1986). Disappearance of Chikungunya virus from India and South East Asia. *Trans R Soc Trop Med Hyg.*, **80**, 491.
- [8]. Rao, T. R. (1966). Recent epidemics caused by Chikungunya virus in India, 1963–1965. *Sci Cult* **32**, 215–220.
- [9]. Ravi, V. (2006). Re-emergence of chikungunya virus in India, *Indian J Med. Microbiol.* , **24**, 83-84.
- [10]. Vidya, A. A., Shubham, S., Sarah, C., Rashmi, S. G., Atul, M. W., Santosh, M. J., Sudeep, A. B and Akhilesh, C. M. (2007). Genetic divergence of Chikungunya viruses in India (1963–2006) with special reference to the 2005–2006 explosive epidemic, *J. Gen. Virol.*, **88**, 1967-1976.