

Threats and Re-emergence of Chickungunya Fever in Indian Sub-continent

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Abstract

Zoonosis are among the most frequent and dreaded risk to which man kind is exposed today, human health is inextricably linked to animal health and production. Over the past 6 years, a number of zoonotic and vector borne viral diseases were recorded in South-east Asia and the Western Pacific and there was sudden upsurge in the number of emerging and re-emerging zoonotic diseases in Indian Sub-continent and *Chikungunya* fever is one of them. The precise reasons for the re-emergence of *Chikungunya* in the Indian subcontinent as well as the other small countries in the southern Indian Ocean are an enigma. Although, it is well recognized that re-emergence of viral infections are due to a variety of social, environmental, behavioural and biological changes, which of these contributed to the re-emergence of *Chikungunya* virus would be interesting to unravel. *Chikungunya* is generally spread through bites of infected mosquitoes, mosquitoes become infected when they feed on a animal infected with CHIK virus. Monkey and possibly other wild animals may serve as reservoirs of infection.

Keywords: Re-emergence, Threat, Chickungunya, Fever, Zoonosis, Health, Disease, Monkey, Virus.

History

The disease is caused by the *Chikungunya* virus, which is spread to humans by mosquito bites. It was first described by Morion Robinson and W.H.R Lumsden in 1955, following an outbreak in 1952 on the Makonde Plateau, along the border between Mozambique and Tanzania. (that is the main part land of modern day Tanzania) and had since been found in Africa, India, and South East Asia. The name *Chikungunya* is derived from a local Tanzanian word meaning "that which bends up", a reference to the stooped posture many patients develop as a result of painful inflammation of the joints commonly associated with the disease.

Distribution and Re-emergence in India

The disease has been recorded through out the major continents of the world but Asia and African continent are mostly affected. *Chikungunya* is no stranger to the Indian sub-continent. Since its first isolation in Kolkata, in 1963, there have been several reports of *Chikungunya* virus infection in different parts of India. In India, the disease has been reported from various states like Andhra Pradesh, Andaman and Nicobar, Delhi, Goa, Gujrat, Haryana, Karnataka,

Kerala, Kolkata, Lakshadweep, Madhya Pradesh, Maharashtra, Orissa, Pondicherry, Rajasthan, Tamilnadu, Uttar Pradesh and West Bengal. After the outbreak of 1971, there had been no active or passive surveillance carried out in the country and therefore, it was presumed that the virus had disappeared from the subcontinent. However, recent reports of large scale outbreaks of fever caused by *Chikungunya* virus infection in several parts of Southern India have confirmed the re-emergence of this virus, and thus creates public health crises and alarmed international experts. During 2007, a total of 56365 suspected cases of *Chikungunya* fever have been reported from fourteen different states and union territories in India. The state of Kerala alone accounts for 42.7 % of total number cases, the state of West Bengal and Lakshadweep recorded higher number of cases in 2007 as compared to 2006. Whereas no case was reported from Madhya Pradesh, Pondicherry and islands of Andaman and Nicobar as compared to 2006 when 60132, 542 and 1549 cases were reported, respectively.

Etiology

Chikungunya virus is an *Arbovirus* closely

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related to the *O'nyong'nyong virus* <http://en.wikipedia.org/wiki/O%27nyong%27nyong_virus>, the *Ross River virus* <http://en.wikipedia.org/wiki/Ross_River_virus> in Australia, and the viruses that cause eastern equine encephalitis <http://en.wikipedia.org/wiki/Eastern_equine_encephalitis> and western equine encephalitis <http://en.wikipedia.org/wiki/Western_equine_encephalitis>. *Chikungunya virus* is a member of the genus Alphavirus belongs to family Togaviridae a single stranded RNA virus.

Host Range

Humans, primates, other mammals, birds.

Mode of Transmission

Chikungunya is generally spread through bites of infected mosquitoes, mosquitoes become infected when they feed on a animal infected with CHIK virus. Monkey and possibly other wild animals may serve as reservoirs of infection. In Africa, *Chikungunya* is spread via sylvatic cycle <http://en.wikipedia.org/wiki/Sylvatic_cycle> in which the virus largely resides in other primates <<http://en.wikipedia.org/wiki/Primate>> in between human outbreaks. *Aedes aegypti* (the yellow fever mosquito), a household container breeder and aggressive daytime biter which is attracted to humans, is the primary vector of CHIK virus to humans. *Aedes albopictus* (the Asian tiger mosquito) may also play a role in human transmission in Asia, and various forest-dwelling mosquito species in Africa have been found to be infected with the virus.

Pathogenicity

It is a self limiting febrile viral disease having incubation period of about 2 -12 days but generally 3 - 7 days characterized by arthralgia or arthritis typically in the knee, ankle and small joints of the extremities, high fever, followed by a maculopapular rash, buccal and palatal enanthema can occur nausea and vomiting may occur while mild hemorrhages may be present especially in children ; inapparent infections are common, but immunity is long lasting.

Symptoms

The symptoms of *Chikungunya* include fever which can reach 39°C, (102.2°F) a petechial <<http://en.wikipedia.org/wiki/Petechial>> or maculopapular <http://en.wikipedia.org/wiki/Maculopapular_rash> rash <<http://en.wikipedia.org/wiki/Rash>> usually involving the limbs and trunk, and arthralgia <<http://en.wikipedia.org/wiki/Arthralgia>> or arthritis affecting multiple joints which can be debilitating. The symptoms could also include headache <<http://en.wikipedia.org/wiki/Headache>>, conjunctival infection, and slight photophobia<<http://en.wikipedia.org/wiki/Photophobia>>. The fever typically

lasts for two days and then comes down abruptly. However, other symptoms, namely joint pain, intense headache, insomnia <<http://en.wikipedia.org/wiki/Insomnia>> and an extreme degree of prostration last for a variable period; usually for about 5 to 7 days. Dermatological <<http://en.wikipedia.org/wiki/Dermatology>> manifestations are maculopapular rash <http://en.wikipedia.org/wiki/Maculopapular_rash>, Nasal blotchy erythema <<http://en.wikipedia.org/wiki/Erythema>>, Freckle <<http://en.wikipedia.org/wiki/Freckle>>-like pigmentation over centro-facial area, flagellate <<http://en.wikipedia.org/wiki/Flagellate>> pigmentation on face and extremities, lichenoid eruption and hyperpigmentation in photodistributed areas, multiple aphthous-like ulcers <<http://en.wikipedia.org/wiki/Ulcer>> over scrotum <<http://en.wikipedia.org/wiki/Scrotum>>, crural areas and axilla <<http://en.wikipedia.org/wiki/Axilla>>.

Diagnosis

The definitive diagnosis can only be made by laboratory means, but *Chikungunya* fever should be suspected when epidemic disease occurs with the characteristic triad of fever, rash and rheumatic manifestations. Three main laboratory tests are used for diagnosing *Chikungunya* fevers: virus isolation, serological tests and molecular technique of Polymerase chain reaction (PCR).

Virus isolation

For virus isolation 2-5 ml of whole blood is collected during the first week of illness. The CHIK virus produces cytopathic effects in a variety of cell lines including BHK-21, HeLa and Vero cells. The cytopathic effects must be confirmed by CHIK virus specific antiserum and the results can take between 1-2 weeks.

Serological Diagnosis

For serological diagnosis between 10-15 ml of whole blood sera are required. Demonstration of four fold increase in antibody in acute and convalescent sera or demonstrating IgM antibodies specific for CHIK virus. A commonly used test is the Immunoglobulin M Antibody (IgM) capture enzyme-linked immunosorbent assay (MAC-ELISA) with the results available in 2-3 days. Cross-reaction with other Flavivirus antibodies such as *o'nyong-nyong* occur in the MAC-ELISA however, the latter viruses are relatively rare in South East Asia. Further confirmation is done by Neutralization tests and Hemagglutination Inhibition Assay (HIA).

Molecular Diagnosis

Reverse transcriptase polymerase chain reaction (RT-PCR) technique for diagnosing CHIK virus

has been developed using nested primer pairs amplifying specific components of three structural gene regions, capsid (C), envelope E-2 and part of envelope E1. PCR results can be available from within 1-2 days.

Treatment, Prevention and Control

Although not a life threatening infection but symptomatic treatment for mitigating pain and fever is done by using anti-inflammatory, analgesics, antipyretic drugs along with supportive therapy of antibiotics and tonics to check secondary bacterial infection and to cope up with the stress. Prevention is entirely dependent upon taking steps to avoid mosquito bites and elimination of mosquito breeding sites.

Barriers to mosquito bites: Wear full sleeve clothes and long dresses to cover the limbs.

Use mosquito coils, repellents and electric vapors, mats during the daytime.

Use mosquito nets.

Check mosquito breeding: The *Aedes* mosquitoes that transmit *chikungunya* breed in a wide variety of manmade containers which are common around human dwellings.

Draining water from coolers, tanks, barrels, drums and buckets, etc

Removing from the house all objects, e.g. plant saucers, etc. which have water collected in them.

Biological control: Rearing of larvicidal fishes (*Gambusia* Spp.).

Biocides can be used to stop infestation and growth of

mosquito.

Community participation: Cooperating with the public health authorities in anti-mosquito measures and in maintaining hygienic environment.

Role of public health authorities: National program for prevention and control of vector borne diseases should be strengthened and efficiently implemented with multisectoral coordination.

Legislations for elimination of domestic or peridomestic mosquito breeding sites should be effectively enforced.

Communities must be made aware of the disease and their active cooperation in prevention and control measures.

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