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Chikungunya Epidemic in India- A Major Public-Health Disaster

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ABSTRACT

Chikungunya is a relatively rare form of viral fever caused by an alpha virus that is spread by mosquito bites from the *Aedes aegypti* mosquito. There can also be headache, conjunctival infection and slight photophobia. In the present epidemic in the state of Andhra Pradesh in India, high fever and crippling joint pain is the prevalent complaint. Fever typically lasts for two days and abruptly comes down; however joint pain, intense headache, insomnia and an extreme degree of prostration lasts for a variable period, usually for about 5 to 7 days. The paucity of the scientific information on various epidemiological aspects of chikungunya virus threatens off an epidemic as control of spread of virus might be difficult in the absence of appropriate knowledge. There is an immediate need of the research on chikungunya virus, for an effective vaccine besides strengthening the existing diagnostic laboratory facilities. The current outbreak can also be taken as a lesson for establishment of a system for continuous surveillance of diseases, considered disappeared from the countries. The re-emergence and epidemics are unpredictable phenomena but the impact of such events can be ameliorated by appropriate knowledge and by being in the right state of preparedness. Indian vaccine maker Bharat Biotech has successfully developed a vaccine against chikungunya virus, the company claimed in a recent report.

Keywords: Chikungunya, epidemic, health, disaster

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INTRODUCTION

Chikungunya fever is a re-emerging viral illness that is spread from human-to-human by the bite of virus-carrying mosquitoes. The disease is mostly confined to people living in tropical Africa and Asia and is characterised by a sudden and severe fever, skin rash and joint and muscle pain. Chikungunya Virus, also known as Buggy Creek Virus, is transmitted by *Aedes aegypti* mosquito bites. The mosquitoes that cause infection due to the Chikungunya virus in Africa and Asia are the same mosquitoes that cause yellow fever and dengue fever in many parts of the world. Hence many parts of the world could be affected by the Chikungunya virus. Genetic analysis of the Chikungunya viruses reveal that there are two distinct types of the virus - one contains all isolates from western Africa and the second comprising all southern and East African strains, as well as isolates from Asia. Chikungunya fever (CHIK fever) is a mosquito borne illness of humans caused by chikungunya virus. The virus is currently causing one of the largest reported outbreaks of CHIK fever in last 40 years. The virus, first reported in 1952 in Tanzania, has been attributed to many outbreaks in a number of countries, since then. Chikungunya virus is geographically distributed in Africa, Southeast Asia and India. Sporadic cases are regularly reported from different countries in the affected regions. Since January 2005, countries in the Indian Ocean are facing an unparalleled outbreak caused by chikungunya virus. In one study over 12% of patients who contract Chikungunya virus infection develop chronic joint symptoms. There is no antiviral drug or medicine specifically for Chikungunya. But since chikungunya is cured by immune system in almost all cases there is no need to worry. Treatment usually is for the symptoms and includes taking sufficient rest, taking more fluid food and medicines to relieve pain (paracetamol for example). Aspirin should be avoided. Honey and lime mix is found to have soothing effect on the disease. Avoiding specific medicines is actually recommended for quick recovery. Also very mild exercise to joints can help ease the pain. Currently there is no vaccination against Chikungunya. Research is ongoing on the development of DNA vaccination against Chikungunya. Till 10 October 2006, 151 districts of eight states/provinces of India have been affected by chikungunya fever. The affected states are Andhra Pradesh, Andaman & Nicobar Islands, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Madhya Pradesh, Kerala and Delhi. More than 1.25 million cases have been reported from the country with 752,245 cases from Karnataka and 258,998 from Maharashtra provinces. In some areas attack rates have reached up to 45%. Maryland, US-based vaccine maker Novavax, which has recently formed a joint venture with India's Cadila Pharmaceuticals to develop vaccines against chikungunya and dengue fever, is another potential player in the field.

HISTORY OF CHIKUNGUNYA DISEASE

Chikungunya (pronounced as chik'-en-GUN-yah) disease was first detected in 1952 in Africa at a place called Makonde Plateau. This is a border area between Tanzania and Mozambique. The name "chikungunya" is from the Makonde language and its meaning is "that which bends up". This is a reference to the Chikungunya symptom where patients walk in a stooped posture due to joint pain. Chikungunya is also known as Chicken guinea, Chicken gunaya and Chickengunya. The similarity to the word "Chicken" has also led to a lot of

misconceptions about the disease. There were two medical reports published in 1955 which identified and described Chikungunya disease. "An epidemic of virus disease in Southern Province, Tanganyika Territory, in 1952-53. II. General description and epidemiology" by W.H.R. Lumsden and "An epidemic of virus disease in Southern Province, Tanganyika Territory, in 1952-53. I. Clinical features." by M. Robinson looked at the infections at Makonde Plateau. In these papers, authors note the similarity of Chikungunya to Dengue fever. Since 1952, Chikungunya showed cyclical outbreaks. Most number of Chikungunya cases were reported between 1960 and 1982 in Africa and Asia. The disease was not reported for a long time and it reappeared in 1999. From 2003 onwards frequent outbreaks were reported especially in south India. Following is a short summary of reported outbreak of Chikungunya worldwide.

CHIKUNGUNYA EPIDEMIOLOGY

Chikungunya virus is an alpha virus closely related to the O'nyong'nyong virus, the virus in Australia, and the viruses that cause eastern equine encephalitis and western equine encephalitis. Chikungunya is generally spread through bites from "Aedes aegypti" mosquitoes, but recent research by the Pasteur Institute in Paris has suggested that Chikungunya virus strains in the 2005-2006 Reunion Island outbreak incurred a mutation that facilitated transmission by "Aedes albopictus" (Tiger mosquito). Concurrent studies by arbovirologists at the University of Texas Medical Branch in Galveston, Texas, confirmed definitively that enhanced chikungunya virus infection of "Aedes albopictus" was caused by a point mutation in one of the viral envelope genes (E1). Enhanced transmission of chikungunya virus by "Aedes albopictus" could mean an increased risk for chikungunya outbreaks in other areas where the Asian tiger mosquito is present. A recent epidemic in Italy was likely perpetuated by "Aedes albopictus". In Africa, chikungunya is spread via a sylvatic cycle in which the virus largely resides in other primates in between human outbreaks.



Figure-1: The *Aedes aegypti* mosquito biting human flesh.

CAUSES CHIKUNGUNYA FEVER

Chikungunya disease is a viral disease transmitted in humans by the bite of infected mosquitoes. *Aedes aegypti* mosquito (also called yellow fever mosquito) is the primary transmission agent for Chikungunya Virus (CHIKV). This is usually found in tropics and hence the

reason why Chikungunya is predominantly seen in Asian countries. In recent cases, another mosquito species named *Aedes albopictus* is found to be a carrier. *Aedes aegypti* bites during day time and hence day time mosquito bite is the main reason for transmission. Over years *Aedes* mosquito has evolved and has adapted itself for effective biting of humans! They even reduce humming of wings while approaching humans. They attack from below so there is minimal detection. This mosquito was usually seen in urban areas, but recently it has spread to many rural areas also. *Aedes* mosquito needs only 2ml of water for breeding and their eggs can lay dormant upto 1 year! Carrier mosquitos can even pass the infection to its next generation! Chikungunya virus is a heat sensitive RNA virus (family is *Togaviridae* and genus is *alphavirus* - Group IV+). There are three major groups of these viruses namely West African, central african and asian. Chikungunya virus requires an agent for transmission and hence direct human to human transmission is not possible. So far no such incidence is reported. Usually transmission occurs when a mosquito bites an infected person and then later bites a non infected person. Chikungunya also affects monkeys and it is also suspected that they are a major reservoir for the virus in africa.

SYMPTOMS

Chikungunya is a relatively rare form of viral restlessness caused by an alphavirus that is to say spread by mosquito bites from *Aedes aegypti* mosquitoes, though recent research by the Pasteur Institute in Paris claims the virus have suffered a mutation that enables it to be transmitted by *Aedes albopictus* (Tiger mosquito). This is the cause of the plague surrounded by the Indian Ocean and a threat to the Mediterranean coast at present, requiring urgent meetings of form officials contained by the region.

Synopsis of Agent Properties	
Causative organism: (Systematic name in 1997)	Chikungunya virus
Alternative names:	Buggy Creek virus
Alternative disease names:	<ul style="list-style-type: none"> • None
ICTV Acronym	CHIKV
Properties:	<ul style="list-style-type: none"> • Family: <i>Togaviridae</i> • Genus: <i>Alphavirus</i> A positive-sense, single-stranded RNA virus.
Vector involvement:	The disease is spread by culicine mosquitoes.

The symptoms of Chikungunya include fever which can achieve 39°C, (102.2°F) a petechial or maculopapular rash usually involving the limb and trunk, and arthralgia or arthritis affecting multiple joints which can be devastating. The symptoms could also include headache, conjunctival injection, and slight photophobia. In the present epidemic in the states of Andhra Pradesh and Tamil Nadu, India, big fever and crippling united pain are the prevalent complaint. The hallucination typically lasts for two days and briskly comes down. However, other symptoms, namely joint cramp, intense headache, insomnia and an extreme degree of prostration end for a variable length, usually for about 5 to 7 days. But, patients hold complained joint pains for much longer time period depending on age of the patient. With younger patients recovering in 5 to 15 days and middle aged recovering in 1 to 2.5 months and more for prehistoric people. It have been observed that the severity of the disease as capably as its duration is less contained by younger patients and pregnant women. No untoward effects of pregnancy is noticed following the infection.

CHIKUNGUNYA PROGNOSIS

Recovery from the disease varies by age. Younger patients recover within 5 to 15 days; middle-aged patients 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. Ocular inflammation from Chikungunya may present as iridocyclitis, and have retinal lesions as well. Pedal oedema (swelling of legs) is observed in many patients, the cause of which remains obscure as it is not related to any cardiovascular, renal or hepatic abnormalities.

SOURCE(S)

Symptoms -- The symptoms of Chikungunya are very similar to those of dengue fever. It is characterized by high fever which can reach up to 104 degree F. There will be a sudden onset of flu-like symptoms, including severe headache, chills, rash, fatigue, nausea, vomiting, myalgia and joint pain.. The joints of the extremities will become swollen and painful to touch.

Preventive measures

The most powerful means of prevention are those that protect against any contact near the disease-carrying mosquitos. These include using insect repellent containing NNDB, DEET or permethrin, wearing long sleeves and trousers (pants), and securing screens on window and doors. It's also important to neglected stagnant water where on earth mosquitoes breed.

SPREAD OF CHIKUNGUNYA

CHIKV is spread by the bite of an infected mosquito. Mosquitoes become infected when they feed on a person infected with CHIKV. Monkeys, and possibly other wild animals, may also serve as reservoirs of the virus. Infected mosquitoes can then spread the virus to

other humans when they bite. *Aedes aegypti* (the yellow fever mosquito), a household container breeder and aggressive daytime biter which is attracted to humans, is the primary vector of CHIKV 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.

PREVENTION

The best way to prevent chikungunya virus infection is to avoid mosquito bites. There is no vaccine or preventive drug currently available. Prevention tips are similar to those for other viral diseases transmitted by mosquitoes, such as dengue or West Nile. The following can help avoid mosquito bites:

- Using insect repellent containing DEET, Picaridin, oil of lemon eucalyptus, or IR3535 on exposed skin.
- Wearing long sleeves and pants (ideally treat clothes with permethrin or another repellent)
- Having secure screens on windows and doors to keep mosquitoes out
- Getting rid of mosquito sources in the yard by emptying standing water from flower pots, buckets, and barrels
- Changing the water in pet dishes and replacing the water in bird baths weekly Drilling holes in tire swings so water drains out
- Keeping children's wading pools empty and turned on their sides when they aren't being used.

Additionally, a person with chikungunya fever can reduce the risk of spreading the fever by limiting exposure to mosquito bites. Mosquito repellents help discourage mosquito bites, as does limiting exposure to mosquitoes (by staying indoors or using screens or mosquito nets).

DIAGNOSIS

Common laboratory tests for chikungunya include RT-PCR, virus isolation, and serological tests.

- Virus isolation provides the most definitive diagnosis but takes 1–2 weeks for completion and must be carried out in Biosafety level 3 laboratories. The technique involves exposing specific cell lines to samples from whole blood and identifying chikungunya virus-specific responses.
- RT-PCR using nested primer pairs to amplify several Chikungunya-specific genes from whole blood. Results can be determined in 1–2 days.
- Serological diagnosis requires a larger amount of blood than the other methods and uses an ELISA assay to measure Chikungunya-specific IgM levels. Results require 2–3 days and false positives can occur with infection via other related viruses such as O'nyong'nyong virus and Semliki Forest Virus.

PROGNOSIS

Recovery from the disease varies by age. Younger patients recover within 5 to 15 days; middle-aged patients 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. Ocular inflammation from Chikungunya may present as iridocyclitis, and have retinal lesions as well. Pedal oedema (swelling of legs) is observed in many patients, the cause of which remains obscure as it is not related to any cardiovascular, renal or hepatic abnormalities.

CHIKUNGUNYA INFECTION--AN EMERGING DISEASE IN INDIA

In India a major epidemic of Chikungunya fever was reported during the last millennium viz.; 1963 (Kolkata), 1965 (Pondicherry and Chennai in Tamil Nadu, Rajahmundry , Vishakapatnam and Kakinada in Andhra Pradesh; Sagar in Madhya Pradesh; and Nagpur in Maharashtra) and 1973, (Barsi in Maharashtra). Thereafter, sporadic cases also continued to be recorded especially in Maharashtra state during 1983 and 2000. Chikungunya is an infection caused by an antiviral which was first isolated from a fever patient in Tanzania in 1953. It has been detected regularly in Asia and Africa, but the first outbreak in India was detected in 1965. The last outbreak was detected in 1973 in Barshi, Solapur, Maharashtra. The outbreak lasts for a few years and then disappears as people develop immunity. The states affected by chikungunya are Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Tamil Nadu, Gujarat & Kerala. The number of suspected chikungunya fever cases reported by these states till 9.8.2006 are given below :-

S.No.	State	No. of suspected Chikungunya fever cases	No. of deaths
1.	Andhra Pradesh	110618	0
2.	Karnataka	670438	0
3.	Maharashtra	216455	0
4.	Tamil Nadu	43580	0
5.	Madhya Pradesh	44966	0
6.	Gujarat	22963	0
7.	Kerala	13	0
	Total	1109033	

Dermatological manifestations observed in a recent outbreak of Chikungunya fever in Southern India includes the following:

- ❖ Maculopapular rash.

- ❖ Nasal blotchy erythema.
- ❖ Freckle-like pigmentation over centro-facial area.
- ❖ Flagellate pigmentation on face and extremities.
- ❖ Lichenoid eruption and hyperpigmentation in photodistributed areas
- ❖ Multiple aphthous-like ulcers over scrotum, crural areas and axilla.
- ❖ Lymphoedema in acral distribution (bilateral /unilateral).
- ❖ Multiple ecchymotic spots (Children).
- ❖ Vesiculobullous lesions (infants).
- ❖ Subungual hemorrhage.

PATHOGENICITY:

Self limiting febrile viral disease; 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; mild hemorrhaging may be present especially in children; inapparent infections are common, immunity is long lasting.

CUTANEOUS MANIFESTATIONS OF CHIKUNGUNYA FEVER

With the current outbreak in India several studies have been conducted on chikungunya fever. One study observed 145 “suspect cases” of chikungunya fever over a 3-month period and focused on the skin manifestations of the disease (Inamadhar et al). Some of their findings are listed below:

- In the majority of cases skin problems developed in the very early stages of the illness. Approximately 73% of patients developed skin lesions during the acute phase of the illness (within 7 days), accompanying high fever and severe muscle and joint pain. 32% developed skin problems after the fever had gone but muscle and joint pain were still present (within 1 month), and a handful of patients (8%) developed skin problems more than 1 month after the acute illness.
- The most common skin problem was a brownish-black colouring over the centre of the face. This appeared as freckle-like spots or as a diffuse, slate-coloured pigmentation. Sometimes skin discolouration would also extend to the trunk, limbs, hands and feet.
- In 24% of patients, all of whom were male, multiple aphthous-like ulcers developed in the groin area. These occurred during the acute illness and were preceded by redness, swelling and pain of the scrotum and groin region. Ulceration on the vulva in women have occasionally been reported in other outbreaks.
- A few infant patients developed vesiculobullous lesions (large blister-like sores) in association with high fever. These ruptured easily but healed without any problems.
- Other skin conditions have included tenderness/edema of hands and feet, fixed drug eruptions, erythema nodosum, erythema multiforme and urticaria.
- Flare-ups of existing skin problems such as psoriasis or lichen planus occurred in a few patients following the acute illness.

MEDICATIONS OF CHIKUNGUNYA FEVER

No vaccine or specific antiviral treatment for chikungunya fever is available. Treatment is symptomatic--rest, fluids, and ibuprofen, naproxen, acetaminophen, or paracetamol may relieve symptoms of fever and aching. Aspirin should be avoided. Infected persons should be protected from further mosquito exposure (staying indoors and/or under a mosquito net during the first few days of illness) so that they can't contribute to the transmission cycle. There is no specific treatment for Chikungunya. Vaccine trials were carried out contained by 2000, but funding for the project was discontinued and in that is no vaccine currently available. A serological test for Chikungunya is available from the University of Malaya surrounded by Kuala Lumpur, Malaysia. Chloroquine is gaining ground as a possible treatment for the symptoms associated next to Chikungunya and as an antiviral agent to combat the Chikungunya virus. According to the University of Malaya, "In unresolved arthritis refractory to aspirin and nonsteroidal anti-inflammatory drugs, chloroquine phosphate (250 mg/day) has given promising results." Research by Italian scientist, Andrea Savarino, and his colleagues contained by addition a French rule press release in March 2006 enjoy added more credence to the claim that chloroquine may be effective contained by treating Chikungunya. The CDC fact sheet on Chikungunya advise against using Aspirin. Ibuprofen, Naproxen and other non-steroidal anti-inflammatory drugs are recommended for arthritic pain and confusion. Infected persons should restrict further exposure to mosquito bites, stay indoors and under a mosquito lattice. Further, "supportive care next to rest is indicated during the acute joint symptoms. Movement and mild exercise tend to amend stiffness and morning arthralgia, but heavy exercise may exacerbate rheumatic symptoms." Arthralgia remains troublesome even after 8 months. Homoeopathy claims to own successful treatment for chikungunya. As they treat on symptomatology and not the diagnosis, they claim to have several medicines successful for prevention and cure of chikungunya.

AYURVEDA TREATMENT OF CHIKUNGUNYA

Since there is no medicine for Chikungunya in allopathy, people increasingly turning to traditional Indian medicines (ayurveda). Ayurveda treatment of Chikungunya uses herbal drugs. Some of the kashayams (concoctions) prescribed are Amrutharista, Mahasudarshana Churna, panchathiktha kashayam, Sudarshan Churnam, Dhanvantaram Gutika and Amruthotharam Kashayam. Ancient ayurveda describes a similar condition called Sandhijwara which is similar to Chikungunya in its symptoms (joint pain). Hence some of the medicines can sooth joint pain. At the same time there are reports of fake medicines in which steroids are added. These can cause severe side effects in long term. Hence the best advice is to take rest and drink plenty of fluid food.

HOMEOPATHIC TREATMENT OF CHIKUNGUNYA



According to homeopathic experts effective drugs are available to prevent as well as to speed up recovery from Chikungunya. In some of the south indian cities this type of treatment is tried out. It is claimed that the medicine Eupatorium perf can prevent Chikungunya infection. Other medicines prescribed for the disease include Pyrogenium, Rhus-tox, Cedron, Influenzinum, China and Arnica.

CHIKUNGUNYA - CONVENTIONAL TREATMENT

Treatment is symptomatic--rest, fluids, and ibuprofen, naproxen, acetaminophen, or paracetamol may relieve symptoms of fever and aching. Aspirin should be avoided. Infected persons should be protected from further mosquito exposure (staying indoors and/or under a mosquito net during the first few days of illness) so that they can't contribute to the transmission cycle.

CHIKUNGUNYA IN PREGNANT WOMEN

The chikungunya virus may be transmitted from the mother to the unborn baby. However, most unborn babies remain unharmed even if the mother gets chikungunya during pregnancy. If the infection is virulent, it could lead to complications like miscarriage and pre-term labor so see your doctor promptly.

CHIKUNGUNYA IN CHILDREN

Chikungunya is a viral infection that is characterised by fever and severe joint pain. The name "chikungunya" is derived from a Tanzanian word meaning "that which bends up". It refers to the stooped posture and painful joints that are characteristic features of this disease. Chikungunya is caused by a virus which is spread by the bite of the female tiger mosquito (*Aedes aegypti*), the same mosquito which causes Dengue. These mosquitoes typically bite during the day and breed in stagnant water. So anyone bitten by the infected *Aedes* mosquitoes may develop the illness. Interestingly, children seem to be less affected than older individuals. In fact there have been cases where infected children have shown no symptoms at all. This is not a contagious disease and the reason it spreads rapidly within an area is probably because infected mosquitoes that breed nearby continue biting humans within the vicinity [1-21].

CONCLUSION

Chikungunya virus is indigenous to tropical Africa and Asia, where it is transmitted to humans by the bite of infected mosquitoes. CHIK fever epidemics are sustained by human-mosquito-human transmission. The word "chikungunya" is thought to derive from description in local dialect of the contorted posture of patients afflicted with the severe joint pain associated with this disease. The main virus reservoirs are monkeys, but other species can also be affected, including humans. Chloroquine is gaining ground as a possible treatment for the

symptoms associated with Chikungunya, and as an anti-inflammatory agent to combat the arthritis associated with Chikungunya virus. The fact sheet on Chikungunya advises against using aspirin, ibuprofen, naproxen and other NSAIDs that are recommended for arthritic pain and fever.

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