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Chikungunya fever: A re-emerging tropical viral disease of public health importance

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Abstract

Chikungunya fever is a mosquito-borne re-emerging viral disease that has been reported from many nations of the world. The disease is caused by Chikungunya virus, a single-stranded RNA Alpha virus. Female *Aedes aegypti* and *Aedes albopictus* are responsible for the transmission of disease in the tropical zone and temperate region, respectively. Due to a lack of efficient treatments and vaccines, significant pain in infected persons, such as headaches, fever, depression, joint pain, and long-term debilitating symptoms, as well as huge economic repercussions, Chikungunya virus disease is of public health relevance. The symptoms can appear within a few days and then subside after a few weeks. The virus is known to cause epidemics after a period of quiescence. Even while immune-competent patients can recover without treatment, the condition can cause mortality in people who have their immunity reduced, such as young and the elderly. Clinical manifestations, epidemiology, and serological tests were used to make the diagnosis. Because the disease is easily transmitted from sick patients to healthy people, mosquito bite prevention, avoiding travel to areas where the disease is present, and other prevention techniques are reviewed.

Keywords: Chikungunya virus, epidemiology, mosquitos, public health importance

Introduction

Emerging and re-emerging zoonoses pose a significant threat to the health of humans and animals, and are responsible for high morbidity as well as mortality (Pal, 2005; Pal, 2007; Pal 2013) [9, 10, 11, 12]. There are several vector borne zoonotic diseases, such as West Nile fever, Yellow fever, Eastern equine encephalitis, Western equine encephalitis, Chikungunya fever, and Japanese encephalitis, which are caused by the Genus *Alpha* virus; which are reported from many nations of the world (Pal, 2007; Pal, 2013; Pal *et al.*, 2014; Pal, 2017; Pal, 2018, Pal and Singh, 2019) [10, 11, 12, 13, 14, 15, 16]. Chikungunya virus disease is a re-emerging disease spread by mosquitos that was first detected in Tanzania in the Eastern Africa in 1952 (Pal, 2007) [10]. The etiologic agent, Chikungunya virus, is a single-stranded positive sense RNA that belongs to the *Togaviridae* family (Larissa *et al.*, 2021) [5]. Female mosquitoes bite the humans, transmitting the disease (Pal, 2007) [10]. Fever, headache, joint aches, myalgia, and rash are some of the symptoms that patients experience after two to seven days. Around 90% of individuals will experience symptoms, which will last for weeks or months (Laurie and Terence, 2017) [6]. After a long duration of infection, clinical signs such as joint discomfort persisted. Even while the fatality rate was low, it was enough to cause death on children, the elderly, and people with impaired immune systems (Appassakij *et al.*, 2020) [1].

The current climate change, as well as global warming, is the primary driver of many diseases spread due to arthropod vectors including mosquitoes (Pal *et al.*, 2013; Dave *et al.*, 2015) [2, 11, 12]. *Aedes aegypti* mosquitoes are responsible for tropical regions with hot climates, while *Aedes albopictus* mosquitoes are widely spread and responsible for temperate regions (Vaishnavi *et al.*, 2017) [18]. Because the mosquitoes that spread Dengue and Zika are the same, and their clinical manifestations are comparable, a provisional diagnosis proved difficult to make. The disease was diagnosed based on symptoms and a history of travel to the location where the disease occurred, which was confirmed by a blood test (Johnson *et al.*, 2016) [3]. It is mentioned that epidemics of Chikungunya fever are linked to climate change (Pal *et al.*, 2013) [11, 12]. Moreover, climate change pose a great risk of vector borne diseases including Chikungunya fever to human beings (Dave *et al.*, 2015) [2].

Currently, there is no effective vaccine or therapy for the disease.

Even if the mortality rate is low due to the disease's self-limiting nature, epidemics can have a significant economic impact, as well as acute pain and high morbidity in the country's tropical regions (Larissa *et al.*, 2021) ^[5]. As a result, where the disease may arise, control and prevention were critical. Insecticide use, personal protection during outbreaks, and avoiding travel to areas where disease was widespread were all vital for disease control and prevention (Larissa *et al.*, 2021) ^[5]. The purpose of this communication is to present an overview on the public health importance of Chikungunya fever, a re-emerging metazoosis.

Etiology

Chikungunya virus is a single-stranded positive sense RNA virus that belongs to the family *Togaviridae* and the genus *Alpha* viruses (Silva and Dermody, 2017) ^[17]. E1, E2, E3, Capsid protein, 6K, and non-structural proteins 1, 2, 3, and 4 are all found in the virus genome. There are less than 12000 nucleotides in the virus (Mascarenhas *et al.*, 2018) ^[8].

Transmission

Chikungunya virus is spread by the bite of *Aedes* mosquito (Madariaga *et al.*, 2016) ^[7]. Two of the most well-known transmission methods are the sylvatic and urban cycles. Because the transmission took place between nonhuman primates and mosquitoes, the sylvatic cycle was intermittent and limited. When female mosquitoes feed between humans in an urban cycle, the disease is spread from diseased humans to healthy ones. Vertical transmission is also a possibility. During transplants, blood transfusions, or pregnancies from mother to foetus, the disease can spread from one person to another (Larissa *et al.*, 2021) ^[5].

Clinical manifestations

Fever, itchy rash, joint pain, headache, myalgia or muscle ache, conjunctivitis, fatigue, weakness, and gastrointestinal symptoms, such as abdominal pain, nausea, vomiting, hemorrhagic disorders, are the most common clinical signs of Chikungunya virus disease. The disease is self-limiting, but chronic arthritis and neurological symptoms have been observed after a long period of disease (Khouri and Camilo, 2016) ^[4].

Epidemiology

Chikungunya virus disease was found throughout the world, but it was most prevalent in India and Africa. It is mentioned that after a latency period of about 30 years, Chikungunya fever has re-emerged in India. Around 1.25 million cases of Chikungunya fever were recorded from India (Pal, 2007) ^[10]. Humans are the primary hosts during disease outbreaks; however animals, such as monkeys, birds, and rodents are also virus hosts. During epidemics, the virus can infect 30% to 68% of the population (Vianna and Pablo, 2016) ^[19]. The host range of Chikungunya virus is humans, nonhuman primates, rodents, reptiles, bats, wild birds, farm animals, and domestic pets (Pal, 2007; Mascarenhas *et al.*, 2018) ^[10, 8]. The virus was mostly spread by forest-dwelling mosquitoes and non-human primates like crab-eating macaques, vervet monkeys, patas monkeys, and Guinea baboons (Wahid *et al.*, 2017) ^[20]. The impact of climate change on the emergence and re-emergence of vector borne diseases including Chikungunya fever is

described earlier (Pal *et al.*, 2013; Dave *et al.*, 2015) ^[2, 11, 12].

Diagnosis

The diagnosis is based on clinical signs and symptoms as well as virus isolation and identification (Johnson *et al.*, 2016) ^[3]. Samples were obtained from the corneas, oral secretions, gastrointestinal fluids such as peritoneal, gastric, saliva, urine, and sperm (Mascarenhas *et al.*, 2018) ^[8]. The isolation can be attempted in tissue culture (Vero cell line) or suckling mice (Pal, 2007) ^[10]. Immunological techniques such as complement fixation and haemagglutination inhibition are also helpful in the diagnosis of disease (Pal, 2007) ^[10]. Molecular test (RT-PCR) can be employed for the rapid diagnosis of Chikungunya fever (Pal, 2007) ^[10].

Treatment

Although there is no cure for the disease, supportive care, such as rest and therapy with analgesics, steroids, and non-steroid anti-inflammatory medicines can help to alleviate the discomfort (Laurie and Terence, 2017) ^[6].

Prevention and control

Presently, no vaccine is commercially available to protect the susceptible population of the endemic regions. The best method to reduce disease-related public health hazards is to prevent the infection through personal protective measures and the implementation of effective vector control strategies. The availability of diagnostic tools and infrastructure should be prioritized. To prevent future transmission of disease, sick people should be advised to avoid being bitten by the infected mosquitoes. Pregnant women should exercise caution, particularly in areas where illness outbreaks are occurring (WHO, 2017) ^[21]. It is advised to focus on the environmental sanitation that plays a key role in prevention of arthropod diseases (Pal, 2007) ^[10].

Conclusion

Chikungunya fever is a vector-borne viral disease that can have serious public health consequences due to widespread epidemic spread and patient misery. The causative agent is a heat-sensitive single-stranded positive sense RNA virus. Clinical manifestations of the disease include headaches, myalgia, dermatitis, and other disorders. There are no viable vaccinations or treatments for illness available today. As a result, the most effective methods are controlling vectors using effective insecticides and other measures employed to regulate the environment that was favourable to them, as well as preventing mosquito transmission from sick people to healthy people. It is emphasized to develop a safe, potent and low cost vaccine that can be easily affordable by the poor resource nations to immunize the susceptible population.

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Contribution of authors

All the authors contributed equally. They read the final version, and approved it for publication.

Conflict of interest

The authors declare that they do not have any conflict of interest.

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