

Popular Article

Kyasanur Forest Disease -A re-emerging zoonotic disease

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Abstract

Kyasanur Forest disease (KFD) is caused by Kyasanur Forest disease virus (KFDV), a member of the virus family Flaviviridae. KFDV was identified in 1957 when it was isolated from a sick monkey from the Kyasanur Forest in Karnataka (formerly Mysore) State, India. Since then, between 400-500 human cases per year have been reported. Hard ticks (*Hemaphysalis spinigera*) are the reservoir of KFD virus and once infected, remain so for life. Rodents, shrews, and monkeys are common hosts for KFDV after being bitten by an infected tick. KFDV can cause epizootics with high fatality in primates.

Introduction

Kyasanur forest disease (KFD) is a tick-borne viral haemorrhagic fever endemic to South-western part of India. The disease is caused by a virus belonging to the family Flaviviridae. KFDV is transmitted to humans through the bite of infected hard ticks (*Haemaphysalis spinigera*) which act as a reservoir of KFDV.

Signs and symptoms

The symptoms of the disease include a high fever with frontal headaches, chills, severe muscle pain, vomiting, and other gastrointestinal symptoms. Bleeding problems may occur 3–4 days after initial symptom onset. Patients may experience abnormally low blood pressure, and low platelet, red blood cell, and white blood cell count. After 1-2 weeks of symptoms, some patients recover without complication. However, the illness is biphasic for a subset of patients (10- 20%) who experience a second wave of symptoms at the beginning of the third week. These symptoms include fever and signs of neurological manifestations, such as severe headache, mental disturbances, tremors, and vision deficits. The estimated case-fatality rate is from 3 to 5% for KFD.

Transmission

Ticks serve as vectors and main reservoirs of KFDV. In the natural transmission cycle of KFD, the *haemophysalis* ticks transmit the infection to a vertebrate host that is non-human such as bird or mammal. *H. turturis* and *H. spinigera* are the two main vector species of KFDV as a number of isolations of KFDV have been procured from these two species. In a study conducted in Malappuram and Wayanad districts of Kerala. The major vector of the Kyasanur Forest Disease *H. spinigera* is prevalent in the state Karnataka of India (Geevarghese and Mishra, 2011). Ixodes species of ticks is also known to be one of the main disease vectors of humans and animals, therefore, it also acts as an important KFD reservoir. Ticks are able to develop an infection in any phase of their life cycle. Through the transstadial form of transmission, KFDV is delivered to subsequent stages of ticks and is also transovarially transmitted to the mature tick progeny (Ajesh *et al.*, 2017). Another form of transmission- that is the most likely and a more efficient route of transmission of KFDV- is through co-feeding of ticks on a mammal (host) which enables viral transmission between ticks without host infection (Randolph, 2011; Mansfield *et al.*, 2017).

Risk of Exposure

KFD has historically been limited to the western and central districts of Karnataka State, India. However, in November 2012, samples from humans and monkeys tested positive for KFDV in the southernmost district of the State which neighbors Tamil Nadu State and Kerala State, indicating the possibility of wider distribution of KFDV. Additionally, a virus very similar to KFD virus (Alkhurma hemorrhagic fever virus) has been described in Saudi Arabia. People with recreational or occupational exposure to rural or outdoor settings (e.g., hunters, herders, forest workers, farmers) within Karnataka State are potentially at risk for infection by contact with infected ticks. Seasonality is another important risk factor as more cases are reported during the dry season, from November through June.

Pathogenesis

KFDV pathogenesis is not completely understood. Using mouse models, researchers discovered that KFDV replicated primarily in the brain. Other studies have expanded on this by describing neurological changes in infected organisms. Using KFDV-infected mice, the researchers discovered that KFDV caused gliosis, inflammation, and cell death in the brain. They

proposed that KFDV is primarily a neuropathic disease with secondary symptoms caused by this pathogenesis

Diagnosis

Different molecular tests such as real-time RT-PCR, IgG, and IgM capture ELISA [MAC-ELISA] have been developed in the BSL-3 lab for the detection and understanding of KFD (Mourya *et al.*, 2012). Mourya *et al.* (2012) have reported the development of a nested RT-PCR [nRT-PCR] and a TaqMan-based real-time RT-PCR for early KFD diagnosis throughout the acute stage of infection. For the designing of primer, the specific NS-5 non-coding region of flaviviruses was made a target. Palacios *et al.* (2006) established Mass Tag polymerase chain reaction for the differential diagnosis of viruses causing VHF.

Treatment

There is no specific treatment for KFD, but early hospitalization and supportive therapy is important. Supportive therapy includes the maintenance of hydration and the usual precautions for patients with bleeding disorders.

Prevention and Control

- Individual human tick protection, such as protective clothing and the use of repellents, is critical.
- In a field trial in the endemic area, a formalin-inactivated chick embryo fibroblast tissue culture vaccine produced only 59 percent seroconversion. Antibodies to other Flaviviruses, particularly the West Nile virus, appear to interfere with the vaccine's efficacy.
- In mice, a single inoculation of a live vaccine based on an attenuated strain of Langat virus provided 70 to 100 percent protection against large doses of KFD virus for at least 18 months.

Tick Control

Follow these guidelines to avoid tick bites and infection-

- Avoid tick-infested areas, especially in the summer.

- Wear light-colored clothing to make ticks visible.
- Wear a long-sleeved shirt, hat, and long pants, with pant legs tucked into socks.
- To avoid overhanging grass and brush, walk in the center of trails.
- When spending a lot of time outdoors in tick-infested areas, check your body for ticks every few hours. Ticks are typically found on the thigh, arms, underarms, and legs. Ticks can be quite small (no bigger than a pinhead).

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