



## Review Article



## Kyasanur Forest Disease –A Review

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## Abstract

Kyasanur Forest disease (KFD) is a tick borne viral hemorrhagic infection endemic to South Asia. First case of KFD was reported in 1957 from Kyasanur Forest in Karnataka, India from a sick monkey. Every year, it affects 400-500 humans. The wild monkeys *Semnopithecus entellus* and *Macaca radiata* gets the disease through the bites of infected ticks. Most of the monkeys died due to severe febrile illness. When infected monkeys die, the ticks drop from their body, thus, generating "hot spots" of infectious ticks that further results in disease spread. Humans got the infection by infected tick bite or by direct contact with an infected animal. Domestic animals like cows, goats and sheep may become infected with KFD but play a limited role in disease transmission. There is no human-to-human transmission. However, people with recreational or occupational exposure to rural or outdoor settings (e.g., hunters, herders, forest workers, farmers, laboratory workers) are more prone to infection by contact with infected ticks.

**Keywords:** Kyasanur, Monkey, Tick, Hot Spot.

## Introduction

Kyasanur forest disease (KFD) is an important re-emerging zoonotic disease which is caused by Kyasanur forest disease virus (KFDV) belonging to the genus *flavivirus* and family *Flaviviridae*. It derives its name from the Kyasanur forest range where the virus was first isolated. It results in unexplained deaths in monkeys hence, it is given the name of "monkey disease/monkey fever.

## Epidemiology

The KFD was first discovered in March 1957 from Kyasanur forest area in Shimoga district of Karnataka state in southern India. Subsequently, KFD spread centripetally to other districts of Karnataka viz., Chikkamagalore, Uttara Kannada, Dakshina Kannada, Udupi, Chamarajanagar district in 2012 and most recently to Belagavi district in 2016. The KFD virus was initially gave the suspicion of Russian spring-summer (RSS) complex of viruses. As of now, KFD is only found in India. The KFDV has got resemblance with Omsk hemorrhagic fever virus in Siberia, Alkhurma virus in Saudi Arabia and Nanjianyin virus in China.

The disease is transmitted to man by bite of infected ticks. Ticks are obligate haemato-phago-secto parasites of mammals, birds and reptiles. The hard ticks belonging to family Ixodidae of the genera *Haemaphysalis* act as the reservoirs as well as vectors of the virus. The major vector ticks *Haemaphysalis spinigera*, a forest tick and *H. turturis*.

Many forest dwelling small mammals such as rodents, shrews, insectivorous bat and birds play a significant role in maintaining natural enzootic cycle of the virus in the forest ecosystem. Wild primates, black faced langurs (*Semnopithecus entellus*) and red faced bonnet monkeys (*Macaca radiata*) are commonly affected by tick bite. Man is an incidental dead end host. Cattle play important role in maintaining tick population.

The KFD virus is transmitted from infected larva to nymph to adult maintain the transovarial and transtadial transmission of virus in the ecosystem. Humans got the infection by the bite of infected unfed nymphs which seem to be more anthrophilic compared to mature ticks.

Most of the cases usually encounter in the month of October or November whereas, peaks are observed from January to April followed by a sudden decline in May and June. The reason of high epidemic/ outbreaks in October or November is due to high nymph activity. Case fatality is 2-10%. More fatality is noticed in elderly people and in patients suffering from co-morbid illness like hepatic disorders.

## Clinical Picture

The incubation period of KFD ranges from 3-8 days after the bite of infected tick. The disease occur in two stages, The first one is febrile phase which is manifested by high grade fever of 104 °F, which lasts for about 12 days, frontal headaches, myalgia, prostration, nausea, vomition, diarrhea, photophobia with occasional coughing. In some cases hemorrhagic symptoms may be noticed in the form of bleeding from gums, nose, intestine and faeces. In rare cases, cervical, axillary and epi-trochlear lymphadenopathy is also observed. If left untreated, convulsions, coma and death are the unavoidable outcome. Few cases show a biphasic picture of illness. The second phase of illness starts after febrile phase from day 8 onwards and manifested by giddiness, neck stiffness, tremors, poor reflexes, severe headache, intense prostration with involvement of central nervous system as meningo-encephalitis. Haemorrhagic symptoms can be observed in both of these phases which ultimately result in shock and death.

## Diagnosis

Diagnosis of KFD is based upon history of exposure to tick bites and unexplained deaths in monkeys, clinical picture and serological tests like real time RT-PCR or IgM ELISA. Human blood, monkey viscera viz. brain, lungs, heart, liver, kidney and ticks at nymph stage collected from the field are some of the preferred samples to make the diagnosis.

The disease can be differentially diagnosed with typhoid, malaria, dengue/DHF, rickettsial infections, leptospirosis and other viral hemorrhagic fevers.

## Treatment

There is no specific treatment option available for KFD. Nevertheless, prompt symptomatic and supportive therapy which involves hydration therapy, hemodynamic stability and management of neurological symptoms can decrease morbidity and mortality.

## Prevention and Control

Effective surveillance strategies, tick control and vaccination are some of the methods that can be employed to control KFD. Surveillance strategies can be divided into (1) Human surveillance (2) Monkey surveillance (3) Tick surveillance. Human surveillance involves early detection of patients, prompt laboratory diagnosis and proper management of patients. Monkey surveillance involves unusual deaths of monkeys in endemic as well as non-endemic areas in collaboration with Forest and Veterinary Department. Tick surveillance involves tick mapping, hotspots identification and tick incrimination studies in KFD prone areas. Application of repellants like Dimethylphthalate (DMP), NN-Diethylm-Tolumaide (DEET) etc. are mandatory for the people living /visiting forest areas. Vector control may be done by dusting with Malathion or by spraying with pyrethroids. Additional preventive measures like protective clothing and controlled burning of dry neem leaves in tick endemic areas can help. KFD vaccine is available in India which is a formalin inactivated tissue culture vaccine manufactured at Institute of Animal Health & Veterinary Biologicals, Hebbal, Bengaluru for Department of Health & Family Welfare, Government of Karnataka. However, Karnataka government has successfully used KFD vaccines in few affected districts in outbreak situation.

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