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KYASANUR FOREST DISEASE: A REVIEW

Veterinary Science

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ABSTRACT

First documentation of Kyasanur forest disease (KFD) was done as a febrile illness in the Shimoga district of Karnataka state in South India. KFD virus (KFDV), a causative agent, is a highly pathogenic member in the family Flaviviridae, leading to a haemorrhagic disease in infected human beings. KFD is a zoonotic disease and has so far been restricted only in a southern part of India. The precise cause of its emergence in the 1950s is unknown. The current understanding about KFDV is that it may be persisting silently in a number of regions of India and that structural and antigenic differences from other tick borne viruses may be related to the characteristic pathogenicity and host specificity of KFDV. However, further investigation is needed to know the exact cause behind the increase in cases of KFD and development of an effective and efficient vaccine is the need of an hour. The changing epidemiology of KFD virus needs attention because it may lead to establishment of the disease in new regions, where the disease has never been reported before.

KEYWORDS

Kyasanur forest disease, history, epidemiology, vaccine

1. INTRODUCTION

Kyasanur forest disease (KFD), commonly called as monkey fever is a zoonotic disease. It is caused by a highly pathogenic tick-borne virus known as Kyasanur forest disease virus (KFDV) which causes haemorrhagic fever. The disease was first identified in 1957 from Kyasanur forest of Shimoga district, Karnataka, India (Work *et al.*, 1957, 1959) and had been confined to five districts of Karnataka state till 2012 (Sreenivasan *et al.*,1986; Pattnaik, 2006). In nature KFDV is maintained by the small mammals, bats, shrews, and monkeys and also ticks (Pattnaik, 2006). It has an exclusive existence in five districts of Karnataka State: Shimoga, Chikmagalur, Uttara Kannada, Dakshina Kannada, and Udupi (Pattnaik, 2006). Between December 2011 and March 2012, 215 suspected cases were discovered in 80 villages of Shimoga District, Karnataka State (Kasabi *et al.*, 2013). Afterwards, the spread of KFD was detected in Mudumalai Tiger Reserve (MTR), Tamil Nadu State and there was a human case in Kerala (Mourya *et al.,* 2013). In recent years, the disease has been observed in extended areas of Karnataka and adjoining states (Mourya *et al.*, 2013, 2014; Murhekar *et al.*, 2015). Moreover, as reported in *The Indian Express,* monkey fever claimed 11 lives in Sindhudurg district of Maharashtra in the year 2017.

2. HISTORY

KFDV was first isolated during an outbreak of febrile illness in 1957 in population living in the Kyasanur forest region of the Shimoga district in the Karnataka state of India (Work and Trapido, 1957; Work *et al.*, 1957). Large number of deaths were noted among local non-human primates provided the first indication of an outbreak of unknown etiology. Investigators from Virus Research Center, Pune found number of cases of severe febrile illness in inhabitants of villages who are close to forest areas where dead monkeys were found (Work, 1958).

Initially, the presence of a life threatening disease in wild primates elevated concerns that, a mosquito-borne flavivirus known as yellow fever virus which causes severe hemorrhagic disease, was introduced into India. However, virus isolation from the suckling mice inoculated with tissues or serum from a black-faced langur found confined in the forest provided the first definitive confirmation that a tick-borne flavivirus is circulating in India (Holbrook, 2012).

3. EPIDEMIOLOGY

KFD outbreak is initially characterized by the spread of the disease to the areas adjoining the original focus of infection. From the first record, the epidemics of KFD have happened repetitively in Shimoga district of Karnataka and in its contiguous areas. However, by the end of year 1973, epizootics and epidemics were documented from several new regions, distant from the original area. Additional to Karnataka state, the principal site of introduction of KFDV, antibodies against KFDV have also been noticed in humans in several parts of Kutch and Saurashtra of Gujrat state which is a semi-arid area, around 1200km away from main focus of KFD and isolated localities like Ramtek, near Nagpur, Kingaon and Parbatpur of West Bengal state of India (Sarkar and Chatterjee, 1962). Surveys in 1988-89 in the Andman Islands, particularly Little Andaman showed the serological evidence of KFDV or a closely related tick-borne flavivirus (Padbidri *et al.*, 2002). KFDV Variants have also been documented in Saudi Arabia and China (Holbrook, 2012).

4. CLINICAL FEATURES

Typically first signs and symptoms begin 3–8 days after exposure, with the onset of sudden fever, chills, headache and myalgia (Pavri, 1989; Webb and Rao, 1961). Also the initial phase may be characterized by local or generalized lymphadenopathy, tint on the conjunctiva, photophobia, petechial hemorrhages on the mucous membranes and bleeding from the nose, mouth or gastrointestinal tract (Pavri, 1989; Work, 1958). However, there is no evidence of significant disruption of the hematopoetic system or loss of vascular integrity (Holbrook, 2012).

Most patients start recovering after 14 days, but in certain cases, a 7–14 day period of reduction is followed by a second phase dominated by neurologic manifestations, which may include severe headache, mental disturbance, tremors, stiffness, photophobia, eye pain and imperfect vision (Anonymous, 1983). Patients recovering from KFD are normally lethargic for quite a few weeks, and in some patients hand tremors or unsteadiness continue to have its effect, which eventually resolves (Wadia, 1975; Work, 1958; Work *et al.*, 1957). Long-term sequelae are rare (Holbrook, 2012).

5. VACCINES

The first KFD vaccine was a formalin-inactivated, mouse-brain preparation of RSSEV produced by the Walter Reed Army Institute of Research at the demand of the Indian Council of Medical Research, with the support of the Rockefeller Foundation (Aniker *et al.*, 1962). RSSEV was identified to be antigenically closely related to KFDV, and therefore was hypothesized to deliver cross-protection. The RSSEV vaccine protected mice against KFDV challenge, and was more efficient than another vaccine prepared from KFDV isolates (Aniker *et al.*, 1962). It was found by investigators that the RSSEV vaccine neither stimulated a strong response against nor it aroused an anamnestic response in people who had previously been exposed to the virus (Pavri *et al.*, 1962). Inactivated by formalin, chick embryo fibroblast vaccine, developed in the initial years of 1990s, is presently licensed and available in India. It is given in a two-dose schedule, followed by routine boosts. The existing vaccine strategy followed in India includes a two-dose vaccine at an interval of one month. The initial dose is followed by a booster at 6–9 months and following boosters every 5 years.

6. SUMMARY

KFD is over all an understudied tick-borne disease that affects hundreds of humans each year in India. The identification of the closely related AHFV in Saudi Arabia and seroprevalence studies

propose that the geographic range of KFD-like viruses may be much broader than previously thought, increasing the possibility that the transportation of infected ticks by birds or in shipments of infected animals could introduce KFDV into new environments. The recent outbreaks in India should pose as a reminder that a number of arboviruses have caused considerable health concerns for many years, yet little is known about them, and there are no therapeutic options for combating these diseases.

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