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# ECOLOGY AND DIFFUSION OF KYASANUR FOREST DISEASE IN NILAMBUR VALLEY, WESTERN GHAT

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**Abstract:** *The geographic distribution of disease is neither casual nor consistent but these diseases vary spatially. Diseases that are always present (endemic) in certain locations are often completely misplaced in others. The disease ecology structure provides an explanation for this irregular geographic distribution of diseases. Within the last few decades, the huge amount of infrastructural and environmental changes associated with population growth, human migration, and economic development have catalyzed the emergence and re-emergence of many communicable diseases worldwide, especially in the underprivileged populations.A new public health problem detected in the kysannur forest region of Karnataka state in 1957. It is diffused as tick borne virus which affect human and certain wild monkeys. Kyasanur Forest disease virus (KFDV), a member of the virus family Flaviviridae, when it was isolated from a sick monkey from the Kyasanur Forest in Karnataka (formerly Mysore) State, India..Transmission to humans may occur after a tick bite or contact with an infected animal, most importantly a sick or recently dead monkey. After an incubation period of 3-8 days, the symptoms of KFD begin suddenly with chills, fever, and headache. Severe muscle pain with vomiting, gastrointestinal symptoms and 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 counts. After 1-2 weeks of symptoms, some patients recover without complication. The present paper focused the nature and characteristics of the KFD infected people in the Nilambur valley.KFD has historically been limited to the western and central districts of Karnataka State, India. But the diffusion of this is identified in north eastern parts of the Nilambur valley in Western ghat in May 2014. The samples from humans and monkeys tested positive for KFDV in the Kerala State which neighbours Tamil Nadu State, indicating the possibility of wider distribution and diffusion of KFDV.*

***Key words:*** *Ecology, Kyasanur Forest disease, diffusion, Western ghat, Cholanaickar, tribe*

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## INTRODUCTION

Conventionally disease ecologists resolute on the impact of the natural environment on disease, and these contacts continue to attract interest among geographers. The earliest work on environmental controls on health has been traced out by French geographers Maximilien Sorre (1933) and Jacques May (1950) who wrote of the geographical influences on disease and the pathological aspects of geographical regions. A significant new public health problem in India was documented in March, 1957, when Kyasanur Forest Disease (KFD) was first described in Shimoga District of Mysore State. The general terrain is hilly, covered by intermittent tropical evergreen and deciduous forest which is contiguous north and south for hundreds of miles along the Western Ghats.

The forest is combined with open, low-lying areas where rice and other crops were cultivated. Villages are usually situated adjacent to the forest at the edge of the cultivated areas. Large numbers of wild monkeys of two species, black-faced Presbytis entellus and red-faced Macaca radiata, inhabit the forest. It was from blood of a Presbytis entellus found moribund in Kyasanur Forest that the first isolation of KFD virus was obtained in India.But recently the same symptom of the Kyasanur Forest Disease infected to the Cholanaicker tribes in the Nilambur valley in the western Ghat in Kerala on May 2014. The diffusion of the Kyasanur Forest Disease is analysed in detail.

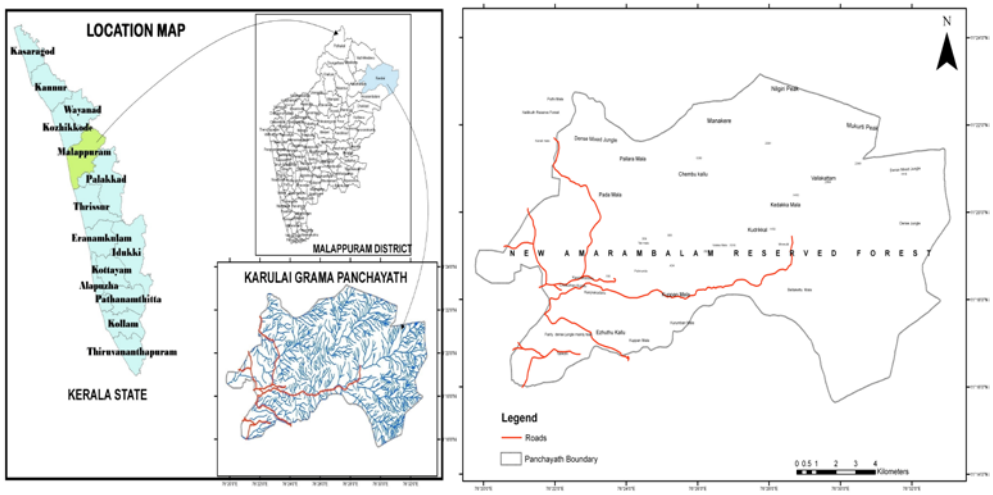
## STUDY AREA

The presence of Western Ghats gave an evergreen appearance to this area. Karulai situated in between the 11° 14′ 0′′N to 11°24′ 0′′N latitudes and 76°20′0′′ E to 76°32′0′′E longitudes. It lies in the southern part of Nilambur valley. Karulai boundered by Karimpuzha in the North, Amarambalam Panchayath in the South, Tamil Nadu in the East and Nilambur municipality in the west.Formerly, Karulai was a part of Amarambalam Kovilakam and becomes a Panchayath in 1968. Karulai consist 15 wards. The entire area under this Panchayath is 36sqkm. Majority of this area includes in reserved forest. Karulai is a part Western Ghats and lies in the eastern part of Malappuram district. It is an area of evergreen forest with wide variety of flora and fauna species.

The Cholanaickan are traditionally lived as hunter – gatherers and most vanishing tribes of Kerala. Today, the only surviving primitive tribes found in the Karulai and Chungathara

forest ranges of Nilambur in Malappuram district. They are one of the last remaining hunter-gatherer tribes of South India, living in rock shelters or crude huts beside brooks. The Cholanaickan, known as 'the Cavemen of Kerala' is considered to be an offshoot of the Kattunaickan. They found mainly in 10 colonies of Karulai, i.e. Kuppamala, Mailadippotti, Enikkol – Poochappara, Mancheeri and Mannala colonies in Karulai and the remaining colonies found in Vazhikkadavu and Amarambalam.

**Figure 1.1 Lacation and distribution of Cholanaickar Colony in Nilambur valley**




The Cholanaickan is an exacting types of tribes found mainly in Malappuram district. The process of taking census of this community is very difficult task, because they are in a semi nomadic life.In 2008 census the population of Cholanaickan tribes is 387. They mainly lived the following colonies.

Table 1.1 Colony wise Population and Number of Families of Cholanaickan Tribes.

| Name of the colony | Number of families | Number of person |
|---|---|---|
| Kuppamala | 9 | 35 |
| Mancheri(Mailadippotti) | 10 | 41 |
| Enikkol, Kannikai | 9 | 36 |
| Makkivariala | 8 | 34 |
| Mannala | 10 | 45 |
| Achanala | 6 | 20 |
| Minmutti | 9 | 38 |
| Vilakkamala | 7 | 30 |
| Poochapara | 7 | 21 |
| Varichilmala | 3 | 17 |
| Valkketmala | 4 | 11 |
| Panappuzha | 1 | 5 |
| Thalippuzha | 4 | 15 |

| | | |
|---|---|---|
| Valiyathody | 4 | 8 |
| Puttala | 6 | 19 |
| Nagamala | 3 | 11 |
| Alakkal | 1 | 1 |
| Total | 101 | 387 |

Source: Census report 2008

As the Cholanaickan is considered as sub group of Kattunaickan, separate census figure of them are not available though they are enlisted as Primitive tribes of India. The Cholanaickan was included under the Scheduled Tribe list of the state of Kerala only in 2002. Prior to that they have been enumerated under Kattunaickan. The total there is 101 families in this community. There are 9 single member families and 41 nuclear families (5 - 6 members). The 94 families are lived in reserved forest areas.

## METHODS

### Study design and sample

This exploratory study included Men and women KFD infected in Nilambur valley. The study was conducted between May 2014 and June 2014 and included people seeking medical advice for their family in the mobile clinics of Nilambur Hospital, that offer medical health services to the population of Nilambur valley especially Cholanaickan community.

### Data collection and analysis

A schedule is used to collect the present and past medical status of the people inhabited in the Nilambur valley especially Cholanaickan community. The schedule was administered by the researchers via a face-to-face interview, which had the advantage of ensuring that it was understood and fully completed. It included 3 sections. The first explored the socio demographic data of the cholanaickan and details about their personal status diet history. The second addressed the factors that might have contributed to the awareness of the disease, and the last section enquired about the govt role to tackle the incident of disease occurrence. Simple statistical technique was used for data analysis. Descriptive statistics were generated for demographic factors, used to compare categorical data

## RESULT AND DISCUSSION

The Cholanaickan are traditionally lived as hunter – gatherers and most vanishing tribes of Kerala. The Cholanaickan, known as 'the Cavemen of Kerala' is considered to be an offshoot of the Kattunaickan.

Cholanaickan are generally of short stature with well-built sturdy bodies. The complexion varies from dark to light brown. The faces are round or oval with depressed nasal root, their bridge being medium and the profile straight, lips are thin to the medium, hair tends to be curly. Males and females are short in nature and they have long curly hair.They live in rock shelters called 'Kallu alai' or in open campsites made of leaves. They are found in groups consisting of 2 to 7 primary families in the forest.

**Figure 1.2 Diffusion of KFD in Nilambur Valley**

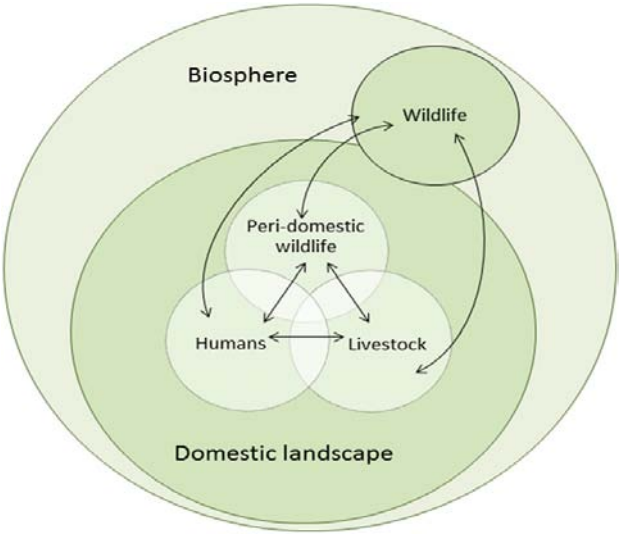



Figure1.2 indicated the interaction and diffusion of KFD .The interaction between wildlife and the human is the main reason for the spread of the disease. So it is mainly observed in the boarder of the domestic landscape. Cholanaickar lived in the forest and typically interacted with the natural environment for their livelihood especially food and shelter. This interaction influenced the spread of the disease in the Nilambur valley. Here the component of the transmitters is the humans and the wildlife animals.

**Transmission and diffusion of KFD**

Transmission to humans may occur after a tick bite or contact with an infected animal, most importantly a sick or recently dead monkey. No person-to-person transmission has been described. Large animals such as goats, cows, and sheep may become infected with KFD but play a limited role in the transmission of the disease. These animals provide the blood meals for ticks and it is possible for infected animals with viremia to infect other ticks, but transmission of KFDV to humans from these larger animals is extremely rare. Furthermore,

there is no evidence of disease transmission via the unpasteurized milk of any of these animals.

**Signs and Symptoms of KFD**

After an incubation period of 3-8 days, the symptoms of KFD begin suddenly with chills, fever, and headache. Severe muscle pain with vomiting, gastrointestinal symptoms and 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 counts. 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.

**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 neighbours 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.

**Diffusion Kyasanur Forest disease in the Nilambur valley**

Table 1.2 shows the recent detection and diffusion of Kysanur forest disease identified in the region of Karnataka, Tamilnadu and Kerala State. Detection and the spreading of the disease is very rapidly in the forest covered regions .It is mainly observed from the people they have constant contact with the forest and wild animals especially monkeys. The interaction between man and the animals are the main cause for the diffusion of the disease.

**Table 1.2 Diffusion of Kyasanur forest disease**

| Date of sample collection | Location of sample collection | No. samples positive/no. total | | |
|---|---|---|---|---|
| | | Human | Monkey | Tick pool |
| 2013 November | Maddur Forest Range, Bandipur Tiger Reserve, Chamarajanagara District, Karnataka State | 4/6 | 3/7 | |
| 2013January | Chamarajanagara District, Karnataka State | 7/13 | | 0/7 |
| 2013 January | Nilgiri Tamilnadu | 0/1 | 1/2 | 0/5 |
| 2013 May | Wayanadu, Kerala | 1/1 | | |
| 2014 May | Nilambur, Kerala State | 4/4 | - | - |

Source : Compiled by the author

Table 1.3 shows the Diffusion of the Kyasanur Forest Disease infection is identified from the Cholanaickan tribes inhabited Mancheri colony, Varichimala and alakkal colony in the Nilambur valley. In the mancheri colony and Virichimala colony 1 person each infected. But in the Nagmala 2 person were infected the disease. First case of Kyasanur Forest Disease is diagnosed detected from the Nagamalai colony in the 31 May 2014. While within limited span of time the diffusion of the disease is identified from the Varichimala and Alackal colony in the Nilambur valley. Diagnosis can be made in the early stage of illness by molecular detection by PCR or virus isolation from blood. Later, serologic testing using enzyme-linked immunosorbent serologic assay (ELISA) can be performed.

**Life style and Kyasanur Forest Disease (Monkey fever)**

The Cholanaickan way of life is integrated with their environment. The small size of Cholanaickan communities enables them to continue their traditional hunting and gathering without depleting the land's resources. The Cholanaickan are semi nomadic and they lived as group is called 'Chemmem' and headed by an elderly male member called 'Chemmakkaran' generally as master of the house who controls the Chemmem. During summer season all are move closer to river banks, where during monsoon they migrate far away from river banks. Their ecology played a dominant role in their food habit and culture. They eat the meat of both wild and domesticated animals. Among them, the most important are iguana, wild deer, bison, monkeys, wild fowls, pigs, goats, rabbits and birds. This may be the reason for the spread of the Kyasanur Forest Disease one person to the.

**Table 1.3 Spatial distributions of Cholanaickan Tribes and Kyasanur Forest Disease infection**

| Name of the colony | Number of families | Number of person infected disease |
|---|---|---|
| **Kuppamala** | **9** | **-** |
| **Mancheri(Mailadippotti)** | **10** | **1** |
| **Enikkol, Kannikai** | **9** | **-** |
| **Makkivariala** | **8** | **-** |
| **Mannala** | **10** | **-** |
| **Achanala** | **6** | **-** |
| **Minmutti** | **9** | **-** |
| **Vilakkamala** | **7** | **-** |
| **Poochapara** | **7** | **-** |
| **Varichilmala** | **3** | **1** |
| **Valkketmala** | **4** | **-** |
| **Panappuzha** | **1** | **-** |
| **Thalippuzha** | **4** | **-** |
| **Valiyathody** | **4** | **-** |
| **Puttala** | **6** | **-** |
| **Nagamala** | **3** | **2** |
| **Alakkal** | **1** | **-** |
| **Total** | **101** | **4** |

Source: Primary survey 2014

**Sex wise distribution of Kyasanur Forest Disease infection in Nilambur valley**

Table 1.4 shows Kyasanur Forest Disease is infection reported from both male and female in the Nilambur valley. Male people belongs to Mancheri and Nagamala colony. While female belongs to Nagamala and Varichimala in the Nilambur valley in the Westernghat.

**Table 1.4 Sex wise distribution of Kyasanur Forest Disease infection in Nilambur valley**

| Sex | No of infection | Percentage of infection |
|---|---|---|
| Male | 2 | 50 |
| Female | 2 | 50 |
| Toal | 4 | 100 |

Source: Primary survey 2014

**Age wise distribution of Kyasanur Forest Disease in Nilambur valley**

Table 1.5 shows nearly 50 percent of the infected people belong to 0-20 year age group that is identified from the Nagamala colony and Varichimala. While 20-40 age group infected person identified from the Varichimala. Whereas > 40 age group infected person are identified in the Mancheri colony in the nilambur valley in the Westernghat.

**Table 1.5 Age wise distribution of Kyasanur Forest Disease in Nilambur valley**

| Age group | No of infection | Percentage of infection |
|---|---|---|
| 0-20 | 2 | 50 |
| 20-40 | 1 | 25 |
| >40 | 1 | 25 |
| Total | 4 | 100 |

Source: Primary survey 2014

**Signs and symptoms of KFD infected Cholanaickar**

The Kyasanur Forest Disease infected Cholanaickar tribal people are suffer the following disease with in the incubation period of 3-8 days, the symptoms of KFD begin suddenly with chills, fever, and headache. Severe muscle pain with vomiting, gastrointestinal and bleeding problems occurred 3-4 days after the initial symptom of the onset of disease.

**Awareness and Knowledge about (KFD) Monkey fever**

Knowledge and awareness about the about the monkey fever is very less among the cholanaickar tribes .While considering the nature and custom of the tribal people in the Nagamalai, Varichimalai and Mancheri in the Nilambur valley, one of the noticeable point is that 90% are the people are illiterate and they lived in the forest region.

**Treatment**

There is no specific treatment for KFD, but early hospitalization and supportive therapy is important to the infected people. Supportive therapy includes the maintenance of hydration and the usual precautions for patients with bleeding disorders. A vaccine does exist for KFD and is used in endemic areas of India. Additional preventative measures include insect repellents and wearing protective clothing in areas where ticks are endemic.

## CONCLUSION

As prehistoric time, major changes in human disease burden, spatial distribution, and pathogen types have arisen largely owing to human activity. The change from small hunter gatherer to large agricultural communities was associated with the emergence of human contagious diseases, many of which are of animal origin. The Cholanaickan way of life is mainly depend on the environment. The small size of Cholanaickan communities enables them to continue their traditional hunting and gathering without depleting the land's resources. Their interaction towards the wildlife animals for food is the main route of the transmission of the disease. The affected people suffered intensive headache, severe

muscle pain with vomiting gastrointestinal symptoms and bleeding problems may occur 3-4 days after onset of the disease. After 1-2 weeks of symptoms, all patients recovered without complication.

Major findings confirm that the diffusion of the KFD has occurred outside the districts in Kerala State where KFDV is known to be endemic. The presence of KFD diffusion becomes noticeable when enzootic infections occur and sentinel animals, like monkeys, start dying. Source and diffusion of KFDV in Chamarajanagara District in Karnataka, Nilgiri in Tamil Nadu State, and finally Nilambur forest areas in Kerala State indicates the presence of the virus in many evergreen and semi-evergreen forest areas of India. Lack of an organized surveillance system is required to tackle the problem in the grass root level. In addition, to prevent additional human infections, epidemiologists recommended establishment of a health education campaign and the use of protective clothing and tick repellents, especially by persons frequently interacting in the forested areas.

## REFERENCES

1. Boshell J. Kyasanur Forest Disease: Ecologic Considerations. *American Journal of Tropical Medicine and Hygiene*. 1969; 18(1): 67-80.
2. Kasabi GS, Murhekar MV, Sandhya VK, Raghunandan R, Kiran SK, et al. (2013)Coverage and Effectiveness of Kyasanur Forest Disease (KFD) Vaccine in Karnataka, South India, 2005–10. PLoS Negl Trop Dis 7(1): e2025. doi:10.1371/journal.pntd.0002025
3. May , J.M. ( 1958 ) *The Ecology of Human Disease* . MD Publications , New York .
4. Mehla R, Kumar SR, Yadav P, Barde PV, Yergolkar PN, et al. (2009) Recentancestry of Kyasanur Forest disease virus. Emerg Infect Dis 15: 1431– 1437.
5. Mourya DT, Yadav PD, Mehla R, et al. Diagnosis of Kyasanur forest disease by nested RT-PCR, real-time RT-PCR and IgM capture ELISA. *Journal of Virological Methods*. 2012; 186: 29-54.
6. Narasimha Murthy, D. P. New Virus Disease-Kyasanur Forest Disease. J. Indian M. A. 31:125-126, 1958.
7. Pattnaik P (2006) Kyasanur forest disease: an epidemiological view in India. Rev Med Virol 16: 151–65.

8. Smorodintsev,A. A. Tick-Borne Spring-Summer Encephalitis.Ibid. 1:210-248. Karger, Basel/New York, 1958.
9. Sreenivasan MA, Bhat HR, Rajagopalan PK (1986). The epizootics of Kyasanur Forest disease in wild monkeys during 1964 to 1973. Trans R Soc Trop Med Hyg 80: 810–814.
10. Sorre , M. ( 1962 ) The geography of diet . In P.L. Wagner and Mikesell , M.W. (eds) *Readings in Cultural Geography* . University of Chicago Press , Chicago , pp. 445 – 56
11. Telford h. work, F. R. Roderiguez, , and p. n. Bhatt,. virological epidemiology of the 1958 epidemic of kyasanur forest disease vol. 49. no. 7. A.J.P.H.
12. Trapido, H.; Rajagopalan, P. K.; Work, T. H.; and Varma, M. G. R. Kyasanur Forest Disease VIII: Isolation of Kyasanuir Forest Disease Virus from Naturally Infected Ticks of the Genus Haemaphysalis. Indian J. Med. Res.
13. Work TH. Kyasanur forest disease. A new virus disease in India. Summary of preliminary report on investigations of the Virus Research Center on an epidemic disease affecting forest villagers and wild monkeys of Shimoga District, Mysore. *Indian Journal of Medical Sciences*. 1957; 11:341-342.
14. Work TH, Trapido H, Narasimha MDP, et. al. Kyasanur forest disease III. A preliminary report on the nature of the infection and clinical manifestations in human beings. *Indian Journal of Medical Sciences*. 1957; 11:619-645