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Original Research Article

Clinical and laboratory profile of Kyasanur forest disease in a tertiary care hospital in Goa

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ABSTRACT

Background: Kyasanur Forest Disease (KFD), a tick-borne viral hemorrhagic fever once confined to the Western Ghats of Karnataka, India, has spread to adjacent states, including Goa, in recent years. This study aimed to analyze the clinical profiles of confirmed adult KFD cases at a tertiary care hospital.
Methods: A retrospective observational study was conducted in the Department of Medicine, Goa Medical College, from June 2016 to June 2017. Case records of all RT-PCR-confirmed adult KFD cases were reviewed for demographic, clinical and laboratory data and analyzed using descriptive statistics.
Results: Fifty-seven confirmed adult cases were analyzed (mean age 41.65 years; 63.16% female). The majority of cases arose from Sawantwadi and Dodamarg talukas of Sindhudurg District, Maharashtra, with a seasonal peak in March-April. Fever was universal, followed by myalgia (52.6%), vomiting (52.6%), and diarrhea (50.8%). Lower respiratory tract involvement occurred in 35.1% and pneumonia in 8.8%. Neurological complications were observed in 17.5% of patients, including meningoencephalitis, cerebellitis, and quadriparesis. Hemorrhagic manifestations occurred in 17.5%. Leucopenia was present in 94.7%, with marked leucopenia (<2000 cells/mm3) in 52.6%. Thrombocytopenia was noted in 70.2% and elevated transaminases in 91.2%. Renal involvement was rare (1.75%). One patient died due to pneumonia.
Conclusions: KFD presents with diverse early manifestations, predominantly gastrointestinal, respiratory, hemorrhagic involvement with neurological impairment in some cases associated with marked leucopenia and elevated liver enzymes which may mislead clinicians. Further detailed clinical and epidemiological aspects of KFD need to be explored for better understanding of the disease.

Keywords: Clinical profile, Flavivirus Kyasanur forest disease, Laboratory findings, Thrombocytopenia, Tick-borne viral infection

INTRODUCTION

Kyasanur forest disease (KFD) is a viral haemorrhagic fever endemic to the Western Ghats of India. The causative agent, KFD virus (KFDV) which is a member of the genus *Flavivirus*, family *Flaviviridae*. The disease was first recognized in 1957 when an illness occurred concomitantly in monkeys (*Semnopithecus entellus* and *Macaca radiata*) and in humans.[1]

KFDV is transmitted to the wild monkeys through the bites of infected *H. spinigera* ticks.[1] After infection, KFDV spreads to other ticks feeding on the infected animals. Severe febrile illness develops in some monkeys; when infected monkeys die, ticks drop from their bodies, thereby generating hotspots of infectious ticks that further spread the virus. Humans become infected through the bite of

infected unfed nymphs and present with biphasic illness with fever, sometimes hemorrhagic and/or neurological features.

The alteration in epidemiological profile of the disease in recent years has suggested that it is now time to consider KFD as an emerging tropical disease in India. The disease was limited to the Western Ghats of Karnataka State of India for about seven decades; however, in the last few years cases have been reported from adjacent States of Karnataka including Goa along the course of Western Ghats.[2] Goa has witnessed outbreaks of KFD in Sattari taluka since 2015.[3] Limited data is available regarding the clinical features and complications of Kyasanur Forest Disease. Hence, the current study was conducted to evaluate clinical and laboratory profile of patients diagnosed with Kyasanur Forest Disease for the better understanding of the disease and its management.

METHODS

The present study was a hospital-based observational retrospective study carried out in Department of Medicine of Goa Medical College from June 2016 to June 2017. Institutional Ethics Committee approval was obtained prior to the commencement of the study. Case files and reports of confirmed adult KFD cases admitted in the Department of Medicine from June 2016 to June 2017 were reviewed and analyzed. A total of 57 RT-PCR-confirmed KFD cases fulfilled the eligibility criteria and were analyzed. As this was a retrospective study, all eligible cases available during the study period were included.

Patients aged 18 years and above with laboratory confirmation of KFD by RTPCR were included in the study. Patients younger than 18 years, suspected cases without laboratory confirmation, and cases with incomplete clinical or laboratory records were excluded from the analysis.

Case records and investigation reports of all eligible patients were studied in detail to determine age, gender, region, seasonal distribution, clinical and laboratory profile. Patient data regarding presenting clinical features, duration of illness, and complications were studied. Laboratory parameters like Complete blood count, renal and liver function tests were analyzed.

Case definition of confirmed case of Kyasanur forest disease[4]

Patient of any age presenting with acute fever, headache and myalgia, and a history of exposure to ticks and/or a visit to a forest area and/or living in, a KFD-endemic area, particularly forest in Karnataka.

Detection of KFDV-specific genetic sequence by reverse transcription-polymerase chain reaction (RT-PCR) or real-time RT-PCR from blood or tissues.

RESULTS

A total of 57 confirmed adult cases of Kyasanur Forest Disease were admitted from June 2016 to June 2017. Of these, 36 (63.16%) were female and 21 (36.84%) were male with a male-to-female ratio of 0.58:1. Their ages ranged from 15 years to 79 years with a mean age of 41.65 years. Maximum patients (29.82%) were in 30 to 50 years age group. Geographically, majority of the cases originated from Sawantwadi (n=45) and Dodamarg taluka (n=6) of Sindhudurg District of Maharashtra while the remaining cases were from Sattari taluka (n=4) of North Goa and two from other areas. The peak transmission period was March-April (44 cases, 77.2%) with a smaller cluster in May- June (n=9) and sporadic cases were seen in December (Table 1).

Table 1: Patient demographic data.

Characteristics		Number	Percentage
Age (in years)	<21	7	12.28
	21-30	10	17.54
	31-40	17	29.82
	41-50	9	15.79
	51-60	8	14.04
	>60	6	10.53
Sex	Males	21	36.84
	Females	36	63.16
State	Goa	5	8.77
	Maharashtra	52	91.23

Fever was universal, with a mean duration of 4.29 days at presentation. Myalgia and vomiting were each reported in 52.63% of patients, and diarrhea in 50.8%. Other common symptoms included abdominal pain (22.8%) and headache (24.56%). In this study, 7% of patients exhibited an erythematous maculopapular rash, while conjunctival congestion was noted in 5.2% of cases. Bleeding manifestations, such as rectal bleeding, blood-streaked stools (3.5%), hematemesis (7%), and oral bleeding (5.2%), were observed in 17.5% of patients. Hemoptysis and epistaxis were not observed. Respiratory involvement was documented in 35.8% of patients as lower respiratory tract infection; coarse crepitations were found on auscultation in 20% and cough in 19.2%. Pneumonia occurred in 5 patients (8.75%) by the 5th day of fever. Sore throat was present in 8.7% cases (Table 2 and 3).

Neurological complications occurred in 17% of patients, typically around day 5-6 of illness. These comprised of altered sensorium in 10 patients (17.54%), meningoencephalitis in 5 (8.75%), seizures in 2 (3.5%), coarse tremors in 1 (1.75%), quadriparesis in 1, and cerebellitis in 1. Hypotension and shock were present in 8 patients (14.05%) (Table 2).

Hepatomegaly was noted in 7% of cases and splenomegaly was found in 5.2% of cases. Tachycardia was present in 10% of cases while 3 patients had relative bradycardia at

presentation. Only one patient developed acute kidney injury during the hospital stay (Table 2).

Table 2: Symptoms of Kyasanur forest disease.

Clinical features	Number of cases	Percentage
Fever	57	100
Myalgia	30	52.63
Vomiting	30	52.63
Diarrhea	29	50.8
Headache	14	24.56
Abdominal pain	13	22.8
Cough	11	19.29
Altered sensorium	10	17.54
Conjunctival congestion	3	5.2
Sore throat	5	8.7
Hematemesis	4	7
Rash	4	7
Hepatomegaly	4	7
Lower gastrointestinal bleeding	2	3.5
Oral bleeding	3	5.2
Giddiness	3	5.2
Splenomegaly	3	5.2
Seizures	2	3.5
Dyspnea	2	3.5

Table 3: Clinical syndromes of Kyasanur forest disease.

Clinical syndrome	Number of cases	Percentage
Acute gastroenteritis/ dysentery	30	52.63
Lower respiratory tract infection	20	35.8
Bleeding manifestations	10	17.54
Shock/hypotension	8	14.05
Pneumonia	5	8.75
Meningitis	5	8.75
Cerebellitis	1	1.7
Acute kidney injury	1	1.7
ARDS	0	0

Leucopenia (total leucocyte count <4000 cells/mm^3) was found in 54 patients (94.7%) at admission, with 30 patients having a total leukocyte count below 2000 cells/mm^3, including 8 with severe leucopenia (<1000 cells/mm^3). Absolute neutropenia occurred in 48 patients, and lymphocytosis in 18. Thrombocytopenia was seen in 40 patients (70.17%), 15 of whom had platelet counts below 100,000/mm^3. Anemia was found in 15 patients (26.3%), with 4 having hemoglobin levels under 10 g/dL. Elevated transaminases were noted in 90.2% of cases, predominantly with SGOT elevation. Minimal bilirubin elevation was observed in 2 patients, and only 1 had raised serum creatinine at admission (Table 4).

Table 4: Laboratory features of Kyasanur forest disease patients.

Laboratory parameters	Number of cases	Percentage
Anemia	15	26.3
Leucopenia	54	94.7
Thrombocytopenia	40	70.17
Raised serum transaminases	52	91.22
Raised serum bilirubin	2	3.5
Raised serum creatinine	1	1.7

Majority of the patients improved symptomatically and had improvement of biochemical and hematological parameters. 1 patient succumbed to illness due to pneumonia.

DISCUSSION

In the present study, majority of the patients were females (63.16%) while males formed 36.84% of the study group. Preponderance of female patients can be attributed to the collection of firewood from the forests by them which predispose them to bites by infected ticks.

During 1957-2012, KFD virus activity was limited to Shimoga, Chikmagalur, Uttara Kannada, Dakshina Kannada and Udupi districts of Karnataka State. In 2012, KFD cases were reported in Nilgiris of Tamil Nadu. During 2013-2015, confirmed cases were reported from Wayanad, Malappuram, Palakkad and Nilambur districts of Kerala State. Some cases were reported from Sattari taluka of Goa during 2015.[5] During 2016, KFD cases were reported from Dodamarg and Sindhudurg districts of Maharashtra and Dharbandora taluka of Goa.[2,3] The number of cases increased in 2017 from Dodamarg, Sawantwadi, Sindhudurg districts of Maharashtra and Valpoi, Pernem, Dharbandora taluka of Goa state.[2,3] Since the last seven decades, the virus activity was known only in Karnataka and for the past five years the cases have been reported from adjacent States of Karnataka such as Tamil Nadu, Kerala, Goa and Maharashtra. This is a cause of concern considering the similar ecology of the affected areas, which are all situated in the Western Ghats.[5,6] It is not clear whether these areas are endemic or disease has spread due to movement of monkeys and small rodents (those harbour ticks), which act as reservoirs for the virus.[7]

Earlier data accumulated from the five districts of Karnataka showed the KFD transmission from December to May, when nymphal activities are at peak, thus maintaining wildlife-livestock-human interfaces.[8] However, epidemiological data generated later from the other States suggest that the KFD cases can be detected as early as from October and cease of transmission is noticed

by June.[8] In our study, peak number of cases was seen in March and April months followed by gradual disappearance of the cases by onset of June. This is because humans get exposed to ticks while visiting the forest for farming or grazing livestock animals, collecting dried leaves or dry woods, hunting or trekking, cashew cut forming and disposal of KFD-infected dead monkeys during these months.

The clinical presentation of KFD is usually described as biphasic, but occasionally in four stages.[10] In the first phase, patients usually present with sudden onset of fever, headache and generalized body pain, especially of the neck, upper and lower back and extremities. The second phase comprises of respiratory, hemorrhagic and neurological manifestations. The incubation period of KFDV in humans is 3-8 days.[9]

Besides fever and myalgia common clinical manifestations of KFD included gastrointestinal symptoms like vomiting (52%), loose motions (50%) and abdominal pain which were similarly noted in a study by Kasabi et al during KFD outbreak in Shimoga District of Karnataka in 2011.[4] Conjunctival inflammation was not a predominant feature in the patients in this study (17%) contrary to the previous reports on conjunctival and vitreoretinal involvement in Kyasanur forest disease patients (63%).[11]

A significant number of patients revealed respiratory tract involvement in the form of lower respiratory tract infection and pneumonia associated with gastrointestinal manifestation. The respiratory involvement is probably secondary to hemorrhages causing consolidation. Lower respiratory coarse crepitations were present in 25 percent of patients in the current study with or without symptoms of cough in these patients.

About 17 % of patients developed neurological symptoms in the later phase of illness. Neurological features included drowsiness, transient disorientation, confusion, rarely convulsion and loss of consciousness. We also reported cases of meningoencephalitis and cerebellitis in the current study although no studies have provided clear evidence of meningitis or encephalitis due to KFD in the past.[12,13] According to report by Iyer et al of post mortem findings, virus was not isolated from the brain and there was no evidence of encephalitis.[12] But prominent protoplasmic astrocytes and satellosis in the brain were observed. There have been also reports of muscle twitching, coarse tremors, paraesthesia and generalized shaking due to weakness during the recovery phase.[7,8,12,13] Our study also reported rare features like cerebellar ataxia, quadriparesis, coarse tremors and seizures.

Hemorrhagic manifestations appeared in 17% of patients in the current study. The suppression of maturation in the bone marrow rather than lesions of capillary vessels may account for the haemorrhagic manifestations. Hemorrhages predominantly involved gastrointestinal tract in the current study. Hemetemesis and rectal bleeding was present in 8 % and 5% of cases respectively. This was similar to that observed in Kasabi et al study.[4] Hemoptysis and epistaxis was not observed in the current study although bleeding gums, petechiae, purpura was observed in few cases.

Hematological findings in this study revealed leucopenia in amongst all the cases similar to study by Pavri et al on 26 patients of KFD.[14] Almost half the cases had marked leucopenia less than 2000 cells/mm3 in the current study. This can be attributed to the bone marrow suppression and altered immune response due to proinflammatory cytokines. Thrombocytopenia was also observed in 70% of patients which could be also a manifestation of bone marrow suppression, disseminated intravascular coagulation and nonspecific necrosis of liver and spleen. Raised liver enzymes with minimal rise in serum bilirubin was also seen in majority of the patients probably due to hepatic necrosis which was also observed in study by Pattnaik et al.[8] Renal involvement is usually not seen as depicted in this study.

This study has several limitations. Its retrospective single-centre design and relatively small sample size limit generalizability. Detailed virology, including serology and serial viral loads, were not available. Long-term neurological outcomes could not be assessed from case records.

CONCLUSION

A wide variety of manifestations are observed in the initial phases of Kyasanur Forest Disease which can be misleading to the clinicians in management of the disease. A predominant gastrointestinal, respiratory, hemorrhagic involvement with neurological impairment in some cases is the hallmark of this disease seen in the study. The disease having seasonal distribution in the summer was found to be always associated with marked leucopenia with deranged liver enzymes. The recent spread of the disease to regions of Goa and Maharashtra warrants further research on the epidemiological and clinical aspects for the better management of these patients. The current study contributes to a better understanding of the clinical manifestations of this emerging tropical disease.

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