

A Study on Epidemiological, Clinical and Laboratory Profile of Patients with Leptospirosis Admitted in a Tertiary Care Centre in Central Kerala, India

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Abstract

Leptospirosis is a worldwide zoonotic infection with a much greater incidence in tropical regions and is one of the emerging infectious diseases. The epidemiology of Leptospirosis has been modified by changes in animal husbandry, climate, and human behaviour. Alappuzha district in the state of Kerala is a water logged place with plenty of rivers, lakes and canals and epidemics of water borne diseases like Leptospirosis are common especially in the monsoon season. The increase in incidence is probably due to the geographical characteristics, continuous moisture of the soil due to irrigation in summer and year-round cultivation making food and cover available to host rodents. Close interaction of humans, animals, soil and water in this region make the spread of Leptospirosis to humans easy. This article deals with epidemiological, clinical and laboratory profile of patients with Leptospirosis admitted in a tertiary care centre in central Kerala, India. This study found significant causal relationship of Leptospirosis patients to agriculture, animals and contaminated water. Calf tenderness, leucocytosis and marked ESR elevation proved to be distinguishing features from other fevers.

Key Words

Alappuzha, Kerala, agriculture, ESR

Introduction

Leptospirosis is a spirochetal zoonosis caused by spirochetes of genus *Leptospira*, common worldwide especially in developing countries like India. It is presumed to be the most widespread zoonosis in the world. (1) Organisms are shed in the urine of infected animals which includes rodents like rats, mice and domestic animals like cattle, pigs and dogs. Humans become infected after contact with infected urine of animals or through contact with contaminated food and water.

Leptospirosis has been under reported and under diagnosed from India due to lack of awareness of the disease and varying clinical presentations. Leptospirosis was considered as a rare zoonotic disease in India with sporadic cases being recorded (2) The disease is endemic in Kerala, Tamilnadu, Gujarat, Andaman, Maharashtra and Karnataka. It has also been reported from Andhra Pradesh, Orissa, West Bengal, UP, Delhi and Pondicherry. (3) Alappuzha district in the state of Kerala is a water logged place with plenty of rivers, lakes and canals and epidemics of water borne diseases like leptospirosis are common especially in the monsoon season. Leptospirosis

resembles many other common febrile illnesses that presents with fever, headache and myalgia and this often creates a diagnostic dilemma in the evaluation of febrile patients. It is a general observation that there are certain epidemiological, clinical and laboratory findings associated with leptospirosis which often helps to differentiate it from other febrile illnesses. There are only few studies on such factors and in this study we are analysing the epidemiological, clinical and laboratory profile of Leptospirosis patients which may be helpful to make an early diagnosis of Leptospirosis. To study the epidemiological, clinical and laboratory profile of patients with Leptospirosis admitted in a tertiary care centre in central Kerala, India

Material and Methods

It was a prospective cohort study and patients admitted with febrile illness of less than seven days duration, at medical college hospital, Alappuzha from June 2013 to December 2013 were included in the study. The patients between 13 and 60 years of age, both inclusive were recruited for the study. Patients with a definite diagnosis

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of fever like typhoid, malaria, UTI, respiratory infection were excluded from the study. Socio demographic and clinical details were collected using a predesigned proforma and a detailed clinical examination was performed followed by relevant laboratory investigations.

In the history as per the proforma the personal details of the patients were taken followed by occupational history, history of contact with animals that includes domestic animals like cattle and pet animals like dogs, history of contact with dirty water, bathing habits and source of drinking water. Under clinical examination a detailed general examination was conducted followed by systemic examination. All the relevant laboratory investigations were done and all the patients had their IgM ELISA test for Leptospirosis and Dengue on the 7th day of fever.

Data were entered in the MS Excel and analysis was done using SPSS-16e

Results

Among the 150 patients 82(54.7%) were females and 68(45.3%) were males. The mean age of the patients was 37.65 and the average duration of fever was 4.58 days. 63(42%) patients had agriculture and fishing as the occupation and 61(40.7%) were homemakers. 30(20%) patients had contact with animal as a part of their occupational and recreational activities and 68 (45.3%) patients had contact with dirty water.

Among the 150 patients under study, 45(30%) had IgM Leptospiral antibody positive by ELISA test and 46(30.7%) had IgM Dengue antibody positive by ELISA. The diagnosis was viral fever in 36 (24%) cases and LRTI in 9(6%) patients and other fevers includes acute pyelonephritis 1(0.7%), cellulitis 1(0.7%), enteric fever 1(0.7%), meningitis 1(0.7%), pneumonia 2(1.3%), sinusitis 3(2%), UTI 1(0.7%) and viral hepatitis 2(1.3%).

Among the 45 patients with Leptospirosis, 25(55.6%) were males and 20 (44.4%) patients were females. In the group of patients with other fevers 62(59%) were females and 43 (41%) were males. Among the 105 patients with other fevers, 42 were in the 41-60 age group (n=72), 37 in the 21-40 age group (n=50) and 26 were in the <20 age group (n=28). In patients with Leptospirosis maximum number of patients were in the 41-60 age group - 30 (66.7%), followed by 13 (28.9%) in 21-40 age group and 2(4.4%) in <20 age group. Agriculture and fishing - 31 (68.9%) was the most common occupation in patients with Leptospirosis followed by home making in 12(26.7%) and 2(4.4%) were students. But for other fevers home making contributed 49(46.7%) of the group followed by agriculture and fishing. Around 22% were students and 1 had office job.

Among the patients with Leptospirosis 24(53.3%) had contact with animals while for other fever cases it was only 6(5.7%). 41(91.1%) patients with Leptospirosis had

contact with dirty water but for other fevers the value was only 27(25.7%). Source of drinking water was public water supply in 31(68.9%) patients with leptospirosis and 14(31.1%) patients used well water for their drinking purpose. Among patients with Leptospirosis 11(24.4%) patients utilised unboiled water for drinking, but the comparable figure for other fevers was merely 3(2.9%).

Symptomatology of Leptospirosis patients were presented in Table 2. Catarrhal symptoms were present only in 5(11.1%) Leptospirosis patients where as it was present in 32(30.5%) of patients with other febrile illnesses.

Gastrointestinal symptoms like nausea, vomiting, and abdominal pain were present in both leptospirosis patients and patients with other febrile illnesses and were statistically not significant. But in the case of diarrhoea, 22.2% of Leptospirosis had the symptom where as the corresponding percentage among other fever cases was only 7.6%. This was found to be statistically significant ($p < 0.012$). Other symptoms like cough, breathlessness, haemoptysis, pleuritic chest pain, palpitation and syncope and were present in few patients of both groups and were statistically insignificant. The first symptom with which the patients with leptospirosis presented includes fever in 40(88.9%) patients, bodyache in 4 (8.9%) patients and headache in 1(2.2%) patient.

On examination jaundice was present in 9(20%) patients with leptospirosis where as it was present only in 5(4.8%) patients with other febrile illnesses. Muscle tenderness was present in 34(75.6%) patients with leptospirosis and 17(16.2%) patients with other fevers. The main groups of muscles affected were calf muscles 13(38.2%), calf and thigh muscles together 9(26.5%) shoulder muscles 1(2.9%) and thigh muscles 1(2.9%). Other clinical examination findings were as shown in the *table 3*.

Blood examination showed leucocytosis in 35(77.8%) patients with Leptospirosis where as in patients with other fevers only 12(11.4%) had leucocytosis. Other blood examination findings were as shown in the *table 4*

ESR was normal (0 to 20 mm/1st hour) only in 1(2.2%) patient with leptospirosis and 6(13.3%) had mild elevation (20 to 50 mm), 25(55.6%) had moderate elevation (50 to 100 mm) and 13(28.9%) had marked elevation (>100 mm) (21). In patients with other fevers 53(50.5%) had normal ESR and only 2 (1.9%) had marked elevation of ESR. ECG showed rate and rhythm abnormalities and ST-T changes in 9(20%) patients with Leptospirosis

Discussion

In this study males are more commonly affected with Leptospirosis (55.6%) similar to a study from Brazil. (1) This may be due to the fact that males are more active than females occupationally and recreationally so that

Table 1. Socio Demographic Features of the Patients with Leptospirosis

Socio demographic features	Leptospirosis (45)	Other fevers (105)	Total (150)	P value
Age (Mean&SD- T test)	43.78 (SD 11.4)	35 (SD 14.6)	37.65 (SD 14.28)	< 0.0001
Age <20	2 (4.4%)	26 (24.7%)	28 (18.7%)	0.002
21-40	13 (28.9%)	37 (35.2%)	50 (33.3%)	
41-60	30 (66.7%)	42 (40%)	72 (48%)	
Gender (Male)	25 (55.6%)	43 (41%)	68 (45.3%)	0.100
Agriculture/Fishing	31 (68.9%)	32 (30.5%)	63 (42%)	< 0.0001
Contact with animal	24 (53.3%)	6 (5.7%)	30 (20%)	< 0.0001
Contact with dirty water	41(91.1%)	27 (25.7%)	68 (45.3%)	< 0.0001
Drinking un-boiled water	11 (24.4%)	3 (2.9%)	14 (9.3%)	< 0.0001

Table 2. Symptomatology of Patients with Leptospirosis

Symptoms	Leptospirosis (45)	Other fevers (105)	Total (150)	P value
Catarrhal symptoms	5 (11.1%)	32 (30.5%)	37 (24.7%)	0.012
Cough	5 (11.1%)	20 (19%)	25 (16.7%)	0.232
Arthralgia	6 (13.3%)	12 (11.4%)	18 (12%)	0.706
Breathlessness	9 (20%)	14 (13.3%)	23 (15.3%)	0.299
Nausea	7 (15.6%)	11 (10.5%)	18 (12%)	0.380
Vomiting	14 (31.1%)	34 (32.4%)	48 (32%)	0.879
Abdominal pain	12 (26.7%)	19 (18.1%)	31 (20.7%)	0.208
Diarrhoea	10 (22.2%)	8 (7.6%)	18 (12%)	0.012

Table 3. Clinical Examination Findings of Patients with Leptospirosis

Physical signs	Leptospirosis (45)	Other fevers (105)	Total (150)	Sig P value
Jaundice	9 (20%)	5 (4.8%)	14 (9.3%)	0.003
Pallor	4 (8.9%)	14 (13.3%)	18 (12%)	0.587
Conjunctival congestion	24 (53.3%)	15 (14.3%)	39 (26%)	< 0.0001
Sub-Conjunctival haemorrhage	8 (17.8%)	2 (1.9%)	10 (6.7%)	0.001
Skin rashes	1 (2.2%)	9 (8.6%)	10 (6.7%)	0.283
Muscle tenderness	34 (75.6%)	17 (16.2%)	51 (34%)	< 0.0001
Hepatomegaly	15 (33.3%)	13(12.4%)	28 (18.7%)	0.002
Tachypnoea	17 (37.8%)	24 (22.9%)	41 (27.3%)	0.060

they have more chance of acquiring the infection due to contact with contaminated environment as shown in a study from Srilanka .(2)

Patients in all age groups from 13 to 60 were affected with Leptospirosis showing that no age group is immune to the infection as in another study from India(3) The majority of patients (61.1%)were in the 41 to 60 years age group as in the study from Brazil(1).

In this study 68.9% patients were engaged in farming, cattle rearing, sewage handling and fishing where as in patients with other fevers only 30.5% were in this category. Mansour-Ghanaei et al found farming as the

most common occupation(60%) causing Leptospirosis.(4) In this study 53.3% had contact with domestic animals like cattle as part of their occupational activities and pet animals like dogs. Leptospirosis is a zoonosis and wide variety of animals was identified as sources of human infection. Rearing domestic animals at home was identified as a risk factor for Leptospirosis in an Indian study. (5)

91.1% patients had contact with contaminated water during their occupational and recreational activities where as in patients with other fevers only 25.7% had contact with dirty water (6). A study from southern Chile shows that leptospire can survive in the peridomestic water

Table 4. Investigation findings of patients with Leptospirosis

Investigations	Leptospirosis (45)	Other fevers (105)	Total (150)	Sig P value
Anemia	14 (31.1%)	28 (26.7%)	42 (28%)	0.578
Leucocytosis	35 (77.8%)	12 (11.4%)	47 (31.3%)	<0.0001
Leucopenia	1 (2.2%)	30 (28.6%)	31 (20.7%)	<0.0001
Neutrophilia	33 (73.3%)	35 (33.3%)	68 (45.3%)	0.0002
Eosinophilia	19 (42.2%)	39 (37.1%)	58 (38.7%)	0.558
ESR				
Mild	6 (13.3%)	40 (38.1%)	46 (30.7%)	<0.0001
Moderate	25 (55.6%)	10 (9.5%)	35 (23.3%)	
Marked	13 (28.9%)	2 (1.9%)	15 (10%)	
Elevated blood urea	24 (53.3%)	12 (11.4%)	36 (24%)	< 0.0001
Creatinine	24 (53.3%)	16 (15.2%)	40 (26.7%)	< 0.0001
Bilirubin	25 (55.6%)	13 (12.4%)	38 (25.3%)	< 0.0001
SGOT	40 (88.9%)	71 (67.6%)	111 (74%)	0.008
SGPT	39 (86.7%)	56 (53.3%)	95 (63.3%)	< 0.0001
Alkaline phosphatase	39 (86.7%)	80 (76.2%)	119 (79.3%)	0.033
Hypoproteinemia	34 (75.6%)	46 (43.8%)	80 (53.3%)	< 0.0001
Hypoalbuminemia	29 (64.4%)	32 (30.5%)	61 (40.7%)	< 0.0001

samples collected from rural households(7) High incidence of Leptospirosis in house wives in our study (26.7%) is also explained by this finding.

Among those who developed leptospirosis, 24.4% were using unboiled water for drinking where as among other fevers only 2.9% were using unboiled water. Consumption of contaminated water may be another source of infection as published by Leptospirosis-fact sheet, WHO, Regional office for south East Asia (8)

In patients with Leptospirosis, catarrhal symptoms were rare and was present in only 11.1% where as it was present in 30.5% patients with other fevers. Similar finding was observed in other studies from Brazil(1), Hawaii(9) and India(10, 11) and hence absence of catarrhal symptoms helps to distinguish Leptospirosis from other febrile illnesses. Oliguria was present in 18.2% of patients and in a study from Brazil(1) and Hawaii(9) 21% had oliguria. Gastro intestinal and respiratory system manifestations were the other symptoms as in studies from Andaman(12) and Brazil(1).

On examination jaundice was present in 20% patients similar to the finding from France(13) and Andaman Islands(12). Hepatic dysfunction is common in patients with Weil's syndrome. Conjunctival congestion 53.3% and subconjunctival hemorrhage 17.8% were important eye findings in patients with Leptospirosis and similar findings were reported from studies in Hawaii(9) and France(13). These characteristic eye findings appear in the septicemic phase and help to differentiate Leptospirosis from other febrile illnesses.

Examination of the skin shows presence of abrasions only in one patient and none has skin ulcers. The main

risk factor identified for Leptospirosis was the presence of the wound or cut in the skin that developed during work in an Indian study.(5) Skin abrasion were identified as a common factor for getting infection in studies from Thailand(14) and France.(13) In the absence of skin abrasions or ulcers, the organisms might be entering to the body through the water logged skin and mucus membrane of eyes, oral cavity, nose or through the minute abrasions over the skin that are invisible to the naked eye as suggested in the fact sheet of WHO(6).

Muscle tenderness was present in 75.6% patients with Leptospirosis in this study similar to a study from India where it was present in 80% of patients.(15) In patients with other fevers, muscle tenderness was present only in 16.2% and so this finding differentiates Leptospirosis from other fevers. Myalgia and muscle tenderness mainly occurs in the septicemic phase of Leptospirosis (16). Muscle tenderness was present mainly in calf muscles and as per the fact sheet of WHO, regional office for south east Asia, muscle tenderness in the calf and lumbar areas is one of the most distinguishing physical findings in Leptospirosis(7) Muscle pains all over the body and severe calf muscle tenderness were recorded in a large proportion of cases in a study from Andaman Islands (12).

Blood examination showed leucocytosis in 77.8% patients and it was mainly neutrophilia, identical to a study from Brazil (1). In patients with other fevers only 11.4% had leucocytosis. Thrombocytopenia was present in 64.4% patients with Leptospirosis in this study similar to studies from Hawaii (66%)(9) France(65.5%)(13) and Brazil(50%)(1). Thrombocytopenia was a characteristic

finding in patients in a study from Iran(18). Immune mediated mechanisms were considered as the factors responsible for thrombocytopenia(17). So in a patient with short febrile illness, haematological findings like leucocytosis, neutrophilia and thrombocytopenia indicates possibility of Leptospirosis and helps to differentiate it from other febrile illnesses.

ESR showed moderate elevation in 55.6% patients and 28.9% had marked elevation where as in patients with other fevers 50.5% had normal ESR and only 1.9% had marked elevation. Another study from India also shows moderate elevation of ESR in 60% of patients with Leptospirosis(15). So marked elevation of ESR in a patient with short febrile illness indicates the possibility of Leptospirosis. High ESR increases the risk of complications in Leptospirosis like multi organ failure.(18)

Blood urea and creatinine were elevated in 53.3% patients with Leptospirosis similar to a study from India(15). In Leptospirosis renal involvement is primarily due to tubular damage(16). Liver function tests shows elevation of serum bilirubin and aminotransferases in patients with Leptospirosis in this study as observed from Hawaii(9) and Brazil(1). Hepatic lesions include mild degenerative changes in hepatocytes, prominent hypertrophy and hyperplasia of Kupfer cells, erythrophagocytosis and cholestasis(16) In a patient with short febrile illness, deranged liver function and kidney function tests indicates the possibility of Leptospirosis and helps to differentiate it from other fevers.

ECG showed several findings like bradycardia, tachycardia, LBBB and T inversion .Studies by P.Vijayachari *et al* from Andaman(12) also showed cardiac involvement in the form of myocarditis and atrial fibrillation. Cardiac involvement can occur in patients with Weil's syndrome and can be fatal(20).

Conclusion

There are certain specific epidemiological, clinical and laboratory factors associated with Leptospirosis which often helps to differentiate it from other febrile illnesses and to make an early diagnosis for timely management.

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