

ORIGINAL ARTICLE

A Descriptive Study on Prevalence and Outcome of Human Leptospirosis Case with Various Co-infections at Tertiary Care Hospital, South Gujarat

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ABSTRACT

BACKGROUND AND OBJECTIVES: Leptospirosis, an emerging global public health problem, is endemic in South Gujarat regions. The aim of study was to explore the epidemiological and clinical spectrum of leptospirosis and to examine existence of co-infections. **METHODS:** This was a retrospective, observational and single-centre study. Patients who were admitted with confirmed diagnosis of leptospirosis to our tertiary care centre between January 2012 and December 2014 were retrospectively included in this study. **RESULTS:** A total of 79 patients who were admitted with confirmed diagnosis of leptospirosis to our tertiary care centre are included in this study. Among included patients, rural residents (n=76; 96.2%) and male patients (n=54; 68.4%) were predominant. Majority of the patients belong to age group of 40-59 years (n=41; 51.9%) and 20-39 years (n=30; 38%). All the included patients were admitted during July to October. Chemoprophylaxis (doxycycline 200 mg for 8 weeks) was received by only two (2.5%) patients. A total of 8 patients were co-infected with hepatitis-C virus (n=2), malaria (n=3) and dengue (n=3). Renal failure (serum creatinine >1.4mg/dL) was the commonest complication (n=77; 97.5%) of the disease followed by respiratory failure requiring mechanical ventilation (n=29; 36.7%) and hemorrhagic pneumonia (n=16; 20.3%). **CONCLUSION:** The findings of the present study raise awareness of the physicians about occurrence of parasitic, viral or bacterial co-infections in leptospirosis patients.

Keywords: leptospirosis; epidemiological study; co-infections; complications; zoonotic disease

INTRODUCTION

Leptospirosis, a zoonotic disease, is widespread infection with estimated incidence of 1.03 million cases worldwide.¹ It is endemic in many tropical and subtropical regions and causes large epidemics after heavy rainfall and flooding.² Moreover, global burden of the disease is expected to rise with increasing number of inhabitants residing in urban slums and increased frequency of extreme climate conditions.³ Leptospirosis is caused by spirochetes belonging to different pathogenic species of the genus leptospira.⁴ The life cycle of leptospira involves shedding in the urine, persistence in the ambient environment,

acquisition of a new host (rodents, cattle, dogs) and hematogenous dissemination to the kidneys through the glomerulus or peritubular capillaries.⁵ Hence, the disease is usually transmitted by direct contact with an infected animal or through indirect contact via soil or water contaminated with urine from an infected animal.⁵ The disease occurs in diverse epidemiological settings. However, it imparts greatest burden on resource-poor populations such as rural subsistence farmers and urban slum dwellers. In India, the disease has been recognised since 1931.⁶ According to systematic review performed by Costa et al., leptospirosis is attributed high morbidity in India (19.7 cases [95% CI 6.8–36.8] per 100,000 population per year).¹ It is more prevalent in the western coastal belts from Thiruvanthapuram, Kerala, and Karnataka to south-Gujarat.⁷ The outbreak of the disease are also reported from Tamil Nadu, Andhra Pradesh, West Bengal and Andaman & Nicobar islands.⁸⁻¹⁰ Moreover, recent research reveal co-infection of

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leptospirosis with malaria, dengue, scrub typhus, typhoid fever and viral hepatitis.¹¹Hence, we retrospectively reviewed 79 confirmed cases of leptospirosis to explore occurrence of co-infections in leptospirosis patients.

MATERIALS AND METHODS

This was a retrospective, observational and single-centre study carried out between January 2012 and December 2014. The study included all the consecutive patients who were either admitted to Government Medical College, Surat with the diagnosis of leptospirosis. Patients who were suspected clinically of leptospirosis and presented with a history of fever for more than seven days accompanied with any of the following manifestations were included in the study: severe headache; prostration; severe myalgia; conjunctival suffusion; uveitis; arthralgia; rash; hepatosplenomegaly; haemorrhage; renal failure; icterus; aseptic meningitis; acute respiratory distress syndrome (ARDS); and pulmonary haemorrhage. The study was approved by the Institute ethical committee, Government medical college, Surat. Microscopic agglutination test (MAT) was performed for definitive diagnosis of leptospirosis. The test was performed as per standard procedure using 10 live leptospiral reference strains (belong to serogroups Australis, Autumnalis, Ballum, Bataviae, Canicola, Grippityphosa, Icterohaemorrhagiae, Javanica, Pomona, and Tarassovi) as antigens. MAT was considered positive (1) if single serum MAT titre $\geq 1:400$; (2) a four-fold or greater rise in MAT titre in paired sera sampled 2 weeks apart or (3) seroconversion from negative to positive. Blood smears collected from the patients were tested for malaria. Blood samples were also tested for Hepatitis B virus antigen, typhoid (Widal test); dengue virus infection and scrub typhus (commercial ELISA kits (Dengue Duo cassette, PanBio, France)). Electronic database was investigated to identify patients who were admitted to the hospital with confirmed diagnosis of leptospirosis

during the study period. Detailed information such as, demographic details, clinical manifestations, risk-factors, co-infection and management of the disease were extracted manually from medical record of the patients using pre-defined case-record form. Were done using Medcalc software.

Statistical analysis

Descriptive statistics was performed. Continuous variables are expressed as mean \pm standard deviation (SD) and categorical variables are expressed as frequency (percentages). Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) version 20.

OBSERVATIONS

During the study period of three years, a total of 79 patients with confirmed diagnosis of leptospirosis were admitted to our tertiary care centre. Table-1 demonstrated demographic characteristics of 79 leptospirosis patients. Age of the patients ranges from 16 to 60 years. Men (68.4%) outnumbered women. Among included patients, rural residents (96.2%) were predominant. Chemoprophylaxis (doxycycline 200 mg for 8 weeks) was received by only 2 (2.5%) patients. While evaluating patients for other infections, dengue, malaria and hepatitis B virus infection was found to be present in 3, 3 and 2 patients, respectively. Fever, chills and rigors, nausea/vomiting, headache, myalgia with muscle tenderness, hepatomegaly, splenomegaly, cough and breathlessness were most commonly experienced symptoms. Table-2 showed clinical manifestation of leptospirosis among included patients. Renal failure (serum creatinine $>1.4\text{mg/dL}$) was the commonest complication (97.5%) of the disease followed by respiratory failure requiring mechanical ventilation (36.7%) and hemorrhagic pneumonia (20.3%) (Table-3).

Table 1: Epidemiological pattern and risk factors of leptospirosis patients

Characteristics	Total = 79
Age (years), mean±SD	39.08±9.97
Male gender, n (%)	54 (68.4)
Rural leptospirosis, n (%)	76 (96.2)
Urban leptospirosis, n (%)	3 (3.8)
Age-groups (years), n (%)	
<20	4 (5.1)
20-39	30 (38)
40-59	41 (51.9)
≥ 60	4 (5.1)
Risk factors, n (%)	
Recent rainfall	79 (100)
Occupation	
Farmer	79 (98.7)
Worker	1 (1.3)
Enter water logged area barefoot	32 (40.5)
Open air defecation	68 (86.1)
Alcoholic	9 (11.4)
Smoker	2 (2.5)
Co-infection, n (%)	
Hepatitis C virus	2 (2.5)
Malaria	3 (3.8)
Dengue	3 (3.8)

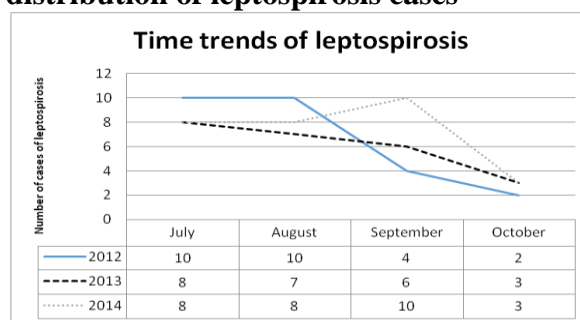
Table 2: Clinical features of leptospirosis patients

Clinical features	n (%)
Fever (≥38C)	
Duration ≤7 days	40 (50.6)
Duration 8-14 days	39 (49.4)
Chills and Rigors	30 (38)
Headache	27 (34.2)
Nausea and Vomiting	44 (55.7)
Abdominal pain	4 (5.1)
Pitting edema	6 (7.6)
Myalgia with muscle tenderness	35 (44.3)
Proteinuria	0 (0.00)
Oliguria	15 (19)
Jaundice	58 (73.4)
Hepatomegaly	39 (49.4)
Spelnomegaly	24 (30.4)
Arthritis	9 (11.4)
Conjunctival suffusion	13 (16.5)
Respiratory symptoms	
Cough	31 (39.2)
Breathlessness	30 (38)
Hemoptysis	11 (13.9)
Neurological involvement	
Altered sensorium	12 (15.2)
Behavioural changes	16 (20.3)
Meningitis	3 (3.8)

Table 3: Complications of leptospirosis

Complications	n (%)
Renal failure (serum creatinine >1.4mg/dL)	77 (97.5)
Respiratory failure requiring mechanical ventilation	29 (36.7)
Hemorrhagic pneumonia	16 (20.3)
Disseminated intravascular coagulation	2 (2.5)
Ascite	1 (1.3)
Myocarditis	1 (1.3)
Neuroleptospirosis	1 (1.3)

Figure 1: Month and year wise distribution of leptospirosis cases



DISCUSSION

Leptospirosis is endemic in South Gujarat region which includes Tapi, Surat, Navsari and Valsad districts. According to the data-analysis demonstrated by Desai et al., a total of 611, 919 and 156 patients were suspected to have leptospirosis and 124, 178 and 26 patients were suspected to die due to leptospirosis in 2010, 2011 and 2012, respectively.¹² Endemic nature of the disease in this region can be explained by favourable environmental conditions (heavy average rainfall, humid climate, high water holding capacity of soil) for survival of leptospirosis, presence of reservoir hosts, behavioural characteristics of population (open defecation in rural area, rodent burrows inside the house, bathing/swimming of man and animals in natural water reservoirs), occupational exposure due to cultivation of high water demanding crops and considerable number of irrigation projects. In our study, all the patients were admitted during July to October (Figure – 1) which reflected the fact that transmission of leptospirosis is seasonal and increases during periods of heavy rainfall. Male gender preference, a well-recognized phenomenon in leptospirosis due to the gender-specific occupational and peridomiliary risk activities, is also echoed in current study. Majority of our patients belonged to age 20-59 years which also support occupational exposure to leptospirosis. Our study pointed out necessity to raise awareness of the importance of chemoprophylaxis as only 2.5% of the included patients received chemoprophylaxis. The clinical

manifestation of leptospirosis vary widely, ranging from mild non-specific influenza like illness (recover without any complications) to fulminant disease with the involvement of multiple organ systems such as acute renal failure, myocarditis, pulmonary haemorrhage, liver failure etc. Being tertiary care centre, our centre was more likely to receive severe cases of leptospirosis. Pulmonary involvement has been observed in 20 to 70% of cases of leptospirosis in previous studies.¹³⁻¹⁵ Predominant pulmonary manifestations leads to delays diagnosis of leptospirosis and thereby optimum treatment. In our study, cough and breathlessness were the most common pulmonary manifestations. One of the most serious complication and commonest cause of death in leptospirosis patients is renal failure.^{16,17} In our study, 97.5% patients experienced renal failure. Infection of leptospirosis leads to cardiac abnormalities, including cardiac rhythm disturbance, myocarditis and endocarditis.¹⁸⁻²⁰ Myocarditis was experienced by one of the included patients. The climate condition of our region (Surat district) predispose populations for acquiring various other infections, such as dengue, malaria, scrub typhus, thyphoid fever and viral hepatitis. Recently, Chaudhary et al. conducted retrospective study in tertiary care centre of New Delhi to explore presence of co-infections in leptospirosis patients.¹¹ The authors reported that out of 107 leptospirosis patients, nineteen patients were found to have co-infections (n=9 typhoid; n=5 dengue; n=4 scrub typhus; n=1 malaria). However, none of the study in this leptospirosis endemic region has explored presence of co-infection in leptospirosis patients. Hence, we designed this study to explore this grey area of research. In our study, among 79 patients admitted between 2012 and 2014, 8 leptospirosis patients were co-infected with either parasitic infection (n=3 malaria; n=3 dengue) or viral infection (n=2 hepatitis B virus). In conclusion, the findings of the study highlights occurrence

of viral, parasitic or bacterial infections in leptospirosis patients. Moreover, it raises awareness among physicians of varied clinical manifestations of leptospirosis.

CONCLUSION

The findings of the present study raise awareness of the physicians about occurrence of parasitic, viral or bacterial co-infections in leptospirosis patients.

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