International Journal of Community Medicine and Public Health
*Thalva C et al. Int J Community Med Public Health. 2017 Dec;4(12):4738-4743*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20175361

**Original Research Article**

# Socio-demographic, clinical, epidemiological and laboratory profile of cases of leptospirosis at tertiary care hospital: a two year study

**Charitha Thalva[1], Kiran Kumar Desamani[2]***

Department of Community Medicine, [1]Sri Venkateswara Medical College and General hospital, Tirupathi, [2]A.C.S.R Government Medical College and General Hospital, Nellore, Andhra Pradesh, India

**Received:** 17 October 2017
**Accepted:** 11 November 2017

***Correspondence:**
Dr. Kiran Kumar Desamani,
E-mail: doctordachi@yahoo.com



## ABSTRACT

**Background:** Leptospirosis is a worldwide known and prevalent zoonotic disease associated with serious complications and morbidity as well as mortality. In India it should report 0.1-1.0 million cases/year but reported are always <10000. Human cases of leptospirosis in developing countries like India are usually underreported because of lack of awareness among the physicians, atypical presentations and lack of diagnostic facilities which presents a challenging task. The aim of the present study was to estimate the prevalence, epidemiological factors, risk factors, clinical profile and outcome of confirmed cases of leptospirosis in a tertiary care hospital for period of two years.
**Methods:** A prospective cross sectional study was conducted at a tertiary care hospital of south India by department of community medicine in association with department of general medicine. The socio demographic data, clinical data, laboratory parameters and outcome of the confirmed cases were noted and analyzed. Modified faine's score was used to confirm the cases of leptospirosis.
**Results:** The prevalence of leptospirosis in our study was 15.75%, males outnumbered the females. Maximum number of cases was noted in the months of August-October and January. Poor drainage facilities, heavy rainfall were the major epidemiological factors associated with the disease. Majority was farmers and most of the cases were from rural areas. Fever was the most common symptom in all the cases followed by jaundice, vomiting and headache. Hyperbilirubinemia, altered liver enzymes were the most common altered laboratory parameters in the study. Renal failure was the most common complication in the study. Mortality was 6.25% and most commonly associated with acute myocarditis.
**Conclusions:** Leptospirosis is seen mostly in monsoon season more among males. Fever and hepatic dysfunction are common signs with renal failure as the most common complication. Mortality is mostly due to myocarditis. Persons with high risk of exposure should be advised to seek early medical attention in case of febrile illnesses. Poor socio economic and environmental conditions and occupational habits are main determinants of the increased incidence of cases in our country.

**Keywords:** Leptospirosis, Renal failure, Hyperbilirubinemia, Modified Faine's score

## INTRODUCTION

Leptospirosis is a worldwide known and prevalent zoonotic disease associated with serious complications and morbidity as well as mortality. History of Leptospirosis in India is dated to 1931.[1] The incidence of leptospirosis in developing countries is 10-100 cases/ 1,00,000 febrile cases per year. In India it should report 0.1-1.0 million cases/year but reported are always <10000.[2] It has been stated as one of the causes of undifferentiated febrile illness in developing countries. In Indian scenario, leptospirosis accounts for 12.7% of acute

febrile illness.[3] The causative agent Leptospira belongs to family Leptospiraceae, and placed in order Spirochaetales are identified as both pathogenic and saprophytic. In the genus Leptospira, more than 20 serogroups and more than 200 serovars have been identified.[4] The pathogenic spectrum of leptospirosis is wide and ranges from undifferentiated febrile illness to severe multi organ failure resulting in mortality. Humans are only accidental hosts and are infected by contact with infected soil or water contaminated with urine of carrier or infected cattle, rodents and pigs. Exposure of skin or mucous membranes to leptospires can lead to infection. Certain occupational groups like sewage workers, agricultural labourers, animal handlers etc are at high risk for the disease. Human cases of leptospirosis in developing countries like India are usually underreported because of lack of awareness among the physicians, atypical presentations and lack of diagnostic facilities which presents a challenging task. Isolation of the organism is low due to prior indiscriminate usage of antibiotic usage and also difficult and expensive technique. Hence serological diagnosis remains the main cornerstone in diagnosis of leptospirosis.[5]

Most of the studies mentioned earlier have identified the risk factors, clinical profile and epidemiological factors in cases of leptospirosis. The aim of the present study was to estimate the prevalence, epidemiological factors, risk factors, clinical profile and outcome of confirmed cases of leptospirosis in a tertiary care hospital.

## METHODS

A cross sectional study was undertaken at Sri Venkateswara medical college and General hospital for a period of two years from January 2015 to December 2016. All the cases of fever >5 years of age attending the OPD of General medicine department were clinically evaluated and confirmed positive for leptospirosis were enrolled in the study. The demographic data and clinical profile of the cases along with the detailed biochemical investigative reports were noted in a separate proforma. Detailed personal interview was taken regarding the epidemiological risk factors for acquiring leptospirosis and noted. Epidemiological profile like rainfall, contact with contaminated environment, walking bare foot and history of animal contact were collected. Contaminated environment was defined as stagnation of water in nearby area, bathing in lakes or ponds where cattle's are bathed, walking with a bare foot in soiled area or rodent living areas, inefficient garbage disposal. All the patients' clinical signs and symptoms were noted and followed up till the end and outcome was noted. All the other cases which were diagnosed as malaria, urinary tract infection, Dengue and other viral fevers were excluded from the study. Few cases of co infections of Leptospirosis with typhoid, Leptospirosis with dengue, Leptospirosis with viral hepatitis were not included in the study and only pure cases of leptospirosis were included to prevent overlapping of clinical symptoms and biochemical parameters. The study was approved by the institutional ethical committee and all the guidelines of the ethical committee were clearly followed.

### *Diagnosis*

A simple and sensitive macroscopic slide agglutination test MSAT was done and titers ≥2+ was used for early diagnosis. Modified Faine's score 2012 using clinical data (Part-A), epidemiological data (Part-B) and laboratory data (part-C) was made and all cases with score >25 were considered positive for leptospirosis.[6,7] All the cases were performed serological evaluation by rapid immunochromatographic assay method using Leptocheck WB diagnostic kit (Zephyr Biochemicals, India). Microscopic agglutination test was done to obtain single MAT antibody titers using the genus leptospira biflexa serovar patoc strain and a single titre of ≥1:400 was considered positive according to LSEG criteria.[8]

### *Statistical analysis*

Statistical analysis done for numerical parameters in the form of mean, and percentage standard deviation by using Microsoft XL spread sheet.

## RESULTS

**Table 1: Demographic data of confirmed cases in the study.**

| | Number | % |
|---|---|---|
| **Age group in years** | | |
| >5- 10 years | 38 | 9.90 |
| 11- 30 years | 88 | 22.92 |
| 31-50 years | 142 | 36.98 |
| >50 years | 116 | 30.21 |
| **Mean±SD** | 34.6 ±14.6 | |
| **Range** | 8-72 years | |
| **Gender** | | |
| Male | 278 | 72.4 |
| Female | 106 | 27.6 |
| Male : Female ratio | 2.7:1 | |
| **Occupation** | | |
| Labourers | 121 | 31.5 |
| Farmers | 158 | 41.1 |
| Housewives | 56 | 14.6 |
| Students | 33 | 8.6 |
| Unemployed | 16 | 4.2 |
| **Location** | | |
| Rural | 262 | 68.23 |
| Urban | 122 | 31.77 |

In the present study conducted at a tertiary care hospital for a period of two years, 2438 cases of febrile illness suspected of Leptospirosis were identified and recruited in the study. In all we detected and confirmed 384 cases of leptospirosis with 182 cases in 2015 and 202 in 2016.

All the 384 cases were confirmed cases of leptospirosis as per the LERG case definition with MAT positive and titre ≥1:400. All the cases were also positive by Rapid immunochromatographic leptocheck WB diagnostic kit. The prevalence of leptospirosis in the study was 15.75%. During the study period, highest number of cases were reported in the months of August, September and October (>13%) and also in the month of January (>12%), while the lowest number of cases were reported in the months of May and June (<5%). Males were predominant in the study with 72.4% and females 27.6%. Male to female ratio was 2.7:1. Majority of the cases in the study were between 31-50 years (36.98%), followed by >50 years (30.21%) and 22.92% of cases in the age group of 11-30 years. Mean age of the patients was 34.6 (±14.6) years and the range was 8-72 years. 68.23% of cases were from rural areas outnumbering the cases from urban areas with only 31.77%. Most of the cases in the study were agricultural workers/ Farmers (41.1%) followed by labourers (31.5%), house wives (14.6%), students (8.6%) and unemployed accounting to only 4.2% (Table 1 and Figure 1).

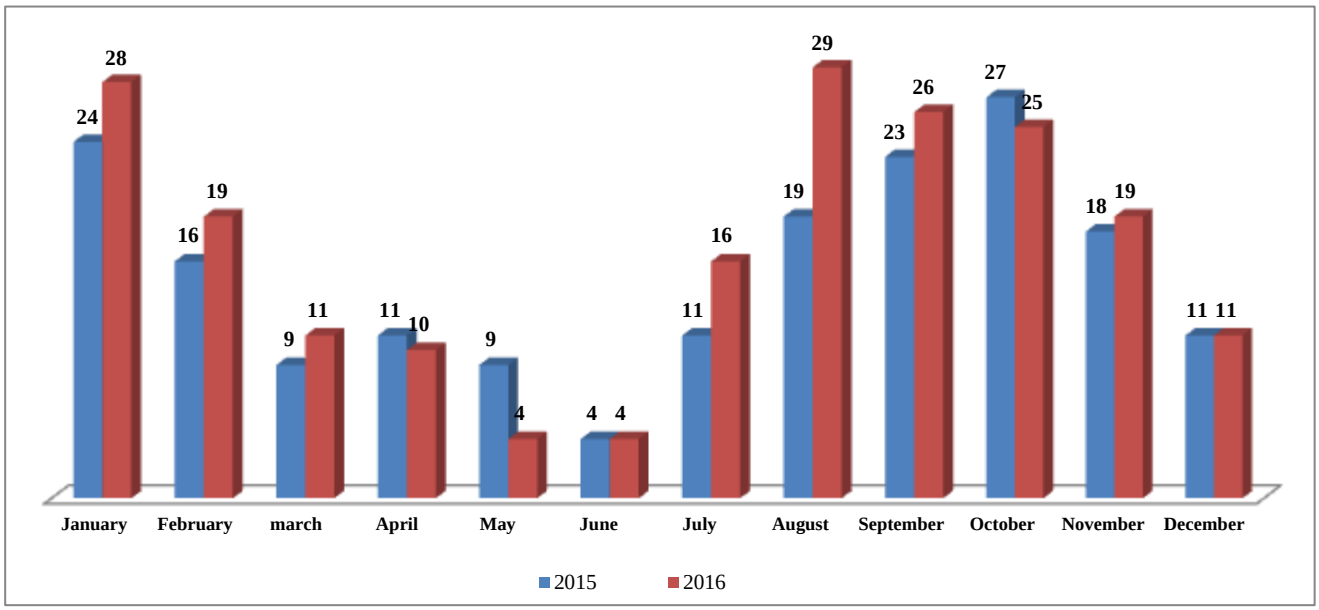


**Figure 1: Seasonal distribution of leptospirosis cases in the study.**

### *Epidemiological risk factors*

Major epidemiological risk factor observed in our study was poor drainage facilities in 51.6% of cases, followed in order by maximum rainfall (32.3%), contact with rodents in fields and domestic areas after flooding (31.8%), poor sanitation (25.5%), bare foot walking (23.2%), contact with domestic cattle observed mostly in rural areas (22.9%) and least was bathing in contaminated water sources like ponds etc (14.1%) (Table 2).

**Table 2: Epidemiological risk factors in cases detected with leptospirosis.**

| Risk factor | Cases | % |
|---|---|---|
| **Rainfall** | 124 | 32.3 |
| **Poor sanitation** | 98 | 25.5 |
| **Bare foot walking** | 89 | 23.2 |
| **Poor drainage facilities** | 198 | 51.6 |
| **Bathing in contaminated ponds etc** | 54 | 14.1 |
| **Contact with Rodents** | 122 | 31.8 |
| **Contact with domestic cattle** | 88 | 22.9 |

### *Clinical profile of cases in study*

Fever was the most common feature observed in all cases of the study, (100%) with 56.77% of cases as intermittent form, 36.46% as chills and rigors and 6.77% as continuous fever. Major (>50%) manifestations in our cases were headache (64.68%), icterus (69.79%) and hepatomegaly (55.21%). Minor manifestations (>25-50%) observed were myalgia (32.29%), abdominal pain (28.13%), vomiting (38.54%) and oliguria (30.47%). Less common manifestations (<25%) were splenomegaly (23.18%), breathlessness (6.25%), conjunctival suffusion (9.90%), lymphadenopathy (7.3%), neurological manifestations, arthralgia, bleeding manifestations, macula-papular rash and pitting edema (Table 3). Most of the patients had multiple signs and symptoms.

The major complications observed in our study was Oliguric renal failure observed in 40.10% of cases, disseminated intravascular coagulation (9.9%), ARDS in 5.21%, Neurological complications in 4.17% and Acute myocarditis in 2.6% of cases. Acute myocarditis was the major cause of death in majority of the cases (Table 5).

Out of 154 cases with renal failure, 24 cases required dialysis and 12 cases were associated with jaundice and 12 without jaundice. All the cases of DIC were treated conservatively. Out of 20 cases of ARDS, 6 cases required ventilator support and were admitted in RICU. 12 cases developed Weil's disease. In 16 cases of neuroleptospirosis, 8 cases developed aseptic meningitis and two each had menigoencephalitis and paraperisis. In cases of acute myocarditis, most of the cases developed ventricular tachycardia and 2 cases developed fibrillations. The overall case mortality was only 6.25% (24 cases) and most of them were due to cardiac complications, renal failure and ARDS.

**Table 3: Clinical features of leptospirosis cases in the study.**

| Clinical Feature | Number | % |
|---|---|---|
| **Fever ( ≥ 38°C)** | | |
| **In any form** | 384 | 100 |
| **Intermittent** | 218 | 56.77 |
| **Chills & Rigors** | 140 | 36.46 |
| **Continuous** | 26 | 6.77 |
| **Headache** | 248 | 64.58 |
| **Myalgia** | 124 | 32.29 |
| **Jaundice** | 268 | 69.79 |
| **Abdominal pain** | 108 | 28.13 |
| **Hepatomegaly** | 212 | 55.21 |
| **Vomiting** | 148 | 38.54 |
| **Breathlessness** | 24 | 6.25 |
| **Spleenomegaly** | 89 | 23.18 |
| **Oliguria** | 117 | 30.47 |
| **Conjunctival suffusion** | 38 | 9.90 |
| **Lymphadenopathy** | 28 | 7.29 |
| **Neurological Manifestations** | 58 | 15.10 |
| **Arthralgia** | 68 | 17.71 |
| **Bleeding manifestations** | 22 | 5.73 |
| **Pitting edema** | 48 | 12.50 |
| **Maculo-papular rash** | 12 | 3.13 |

**Table 4: Laboratory parameters of cases in the study.**

| Laboratory parameter | Number | % |
|---|---|---|
| **Anaemia (Hb< 10g/dl)** | 212 | 55.21 |
| **Leucocytosis (>11000/µl)** | 238 | 61.98 |
| **Thrombocytopenia (<100000/µl)** | 198 | 51.56 |
| **Blood urea (>40 mg/dl)** | 140 | 36.46 |
| **S.Creatinine (>1.5 mg/dl)** | 154 | 40.10 |
| **Hyperbilirubinemia** | 304 | 79.17 |
| **D- dimer Positive** | 44 | 11.46 |
| **Increased Prothrombin time.** | 48 | 12.50 |
| **Raised Liver Enzymes** | 312 | 81.25 |

***Laboratory parameters***

Table 4 summarizes the laboratory investigations in all the confirmed cases of our study. All the confirmed cases were positive by LERG guidelines and definition. Altered liver enzymes (SGOT, SGPT) was the major altered parameter observed in 81.25% of cases in our study followed by hyperbilirubinemia (serum total bilirubin >2-8 mg/dl) in 79.17% of cases of our study. Leucocytosis (>11000/µl) was observed in 61.98% of cases with mean of 13500/µl. Thrombocytopenia (Platelet count <100000/µl) was observed in 51.56%, 55.21% were anemic (Hb<10 g/dl), raised levels of serum creatinine (>1.5 mg/dl) was observed in 40.10% of cases, elevated blood urea (>40 mg/dl) in 36.46% of cases of our study. Laboratory parameters suggestive of increased prothrombin time, D-dimer positivity and lowered platelet count was observed in 38 cases of our study, however D-dimer positivity was seen in 11.46% of cases and increased prothrombin time in 12.5% of cases. Hyperkalemia was noted in cases of ventricular tachycardia and also hyponatremia in few cases of oliguric failure.

**Table 5: Complications of cases in the study.**

| Complications | Number | % |
|---|---|---|
| **Renal failure** | 154 | 40.10 |
| **ARDS** | 20 | 5.21 |
| **Neurological complications** | 16 | 4.17 |
| **DIC** | 38 | 9.90 |
| **Acute Myocarditis** | 10 | 2.60 |

## DISCUSSION

Leptospirosis is an emerging zoonotic disease which is less aware and presents with protean clinical manifestations. The causative agent Leptospira and its different serovars are widely and variably distributed in different regions of the world and in differ in different regions of the same country. In Indian scenario, the most common serogroup is *icterohemorrhagiae* which is widely prevalent in most states. Increase in the number of cases is result of present increased awareness and better diagnostic facilities. This clinical condition is associated mostly with heavy rainfall during the monsoon, flooding during heavy cyclones, contact with rodents and lack of proper drainage and sanitary conditions. Agricultural workers, sewage drainers working with bare hands and foot are at more risk of acquiring the infection.[9,10]

In the present study, the prevalence was 15.75% which correlates well with the study findings of Singh et al.[11] Males outnumbered the females in the study which can be explained by the fact that most of the males are exposed to work in the agricultural lands and are daily wage workers whereas most of the females in the study were house wives and few were exposed due to bare foot walking during rainfall. The disease burden is actually variable from region to region and most of the cases in our study are from rural areas and majority was farmers engaged in active farming during rainfall. This pattern of distribution of cases is variable from region to region and is dependable on multiple factors like rainfall etc.

Majority of cases in our study were between 31-50 years which is similar to the findings of Bharadwaj et al who also reported that two thirds of cases were >30 years which is productive age group.[12] It is thus observed in our study that leptospirosis generally affects the productive age group, mostly farmers and unskilled workers living in urban areas and further leads to loss of work for a period of 2-3 weeks further adding to economic misery and burden to the families.

In our study, maximum number of cases was seen during monsoon season between August-October which in south India is an active farming season and presence of maximum rainfall is noted. A surge of increase was further noted in month of January in our study where there were history of heavy rainfall due to the cyclonic effect and increased cases were seen due to exposure of cases by walking with bare foot and improper and lack of drainage facilities. Similar observation was noted in many studies in and around different states of India indicating high survival of the pathogen in stagnant waters and in fields contaminated with the urine of infected rodents and cattle where the farmers are exposed by walking with bare foot.[13] Major epidemiological risk factors observed in the study was walking bare foot, heavy rainfall and close contact with cattle and rodents which is supported by many studies universally.

In the present study, fever was the universal symptom observed in all the cases followed by jaundice, headache, Hepatomegaly, myalgia and vomiting. Similar pattern was observed in the studies of Sethi et al in his study, but observed fever, myalgia and oliguria as the most common signs and symptoms. But as mentioned earlier, clinical spectrum of disease is variable based on the serotype infected and the age profile and immunological status of the individual.[14] Chouhan et al in his study in sub Himalayan regions reported Jaundice, splenomegaly and breathlessness as the major features in his study.[15] The most common physical findings in our study were icterus, hepatomegaly, pallor, conjunctival suffusion, splenomegaly which are comparable with the finding sin the studies of Chauhan et al, Prabhakar et al and many other studies universally.[16] In comparison with laboratory parameters, in our study Altered liver enzymes (SGOT and SGPT), hyperbilirubinemia were the most predominant alterations followed by Leucocytosis, anemia, thrombocytopenia and altered renal parameters. However different studies have reported different variations in their laboratory parameters and findings of Margarita et al were almost consistent with our findings.[17] But Ittyachen et al in his study observed Leucocytosis as a predominant altered parameter followed by altered renal parameters and liver function tests.[18] A few studies reported hematuria, albuminuria as major altered parameters in their studies.

Acute renal failure was the major complication in our study followed by disseminated intravascular coagulation (DIC) and few cases developed ARDS, neuroleptospirosis and acute myocarditis as complications. Parmar et al in his study also reported renal failure as the most common complication but followed by ARDS and myocarditis.[19] However the complications developed are variable from region to region and is dependable upon preexisting disorders of the cases in the study. But most of the studies reported renal failure as the most common complication of Leptospirosis in their studies. But Sohan et al in their study observed no cases of jaundice in all the cases of leptospirosis.[20] These finding clearly state an altering trend in clinical manifestations among cases of leptospirosis. In our study, the mortality rate was 6.25% which is less than the reports of Panaphut et al who reported 14% mortality in his study and many other studies in Indian and abroad.[21] Major cause of mortality in our study was acute myocarditis leading to ventricular tachycardias and fibrillations whereas few studies report ARDS and renal failure as major cause of death in their studies.

## CONCLUSION

To conclude, leptospirosis is an emerging global health problem mostly associated with developing countries and countries involving farming as a major source of income. Realizing the epidemiological factors involved in transmission and maintenance of the organism in environment persons with high risk of exposure should be created awareness about the infection and clinical features. Persons with high risk of exposure should be advised to seek early medical attention in case of febrile illnesses. Poor socio economic and environmental conditions and occupational habits are main determinants of the increased incidence of cases in our country. Hence nationwide surveillance programmes should be strengthened to increase awareness about the condition. Appropriate management guidelines should be instituted to reduce the mortality and morbidity of the condition.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Sambasiva RR, Naveen G, Bhalla P, Agarwal SK. Leptospirosis in India and the Rest of the World. Braz J Infect Dis. 2003;7:178–93.
2. Report of the Brainstorming meeting on Leptospirosis Prevention andcontrol. Mumbai, 16-17 February 2006. Joint Publication by Office of WHO, Representative to India, New Delhi and Regional Medical Research Centre (ICMR), WHO Collaborating Centre for Diagnosis, Research, Reference and Training in Leptospirosis, Port Blair, Andaman and Nicobar Islands.
3. Sehgal S, Sugunan A, Vijayachari P. Leptospirosis: disease burden estimation and surveillance

networking in India. South East Asian J Trop Med Public Health. 2003; 34(Suppl 2):170–7.
4. Galloway RL, Levett PN. Application and validation of PFGE for serovar identification of Leptospira clinical isolates. PLoS Negl Trop Dis. 2010;4: e824.
5. Sehgal SC. Human leptospirosis – an emerging public health problem in India. Trans R Soc Trop Med Hyg. 1996;90:477-8.
6. Faine S. Guidelines for the control of leptospirosis. Geneva: World Health Organization; 1982: 67.
7. Kumar SS. In: Indian Guidelines for the Diagnosis and Management of Human Leptospirosis. Muruganathan A, editor. India: Medicine Update; 2013: 23–29.
8. World Health Organization. Report of the First Meeting of the Leptospirosis Burden Epidemiology Reference Group. Geneva: WHO press; 2010.
9. Bharti AR, Nally JE, Ricaldi JN, Matthias MA, Diaz MM, Lovett MA, et al. Leptospirosis: A zoonotic disease of global importance. Lancet Infect Dis. 2003;3:757-71.
10. World Health Organization, International leptospirosis Society. Human Leptospirosis: Guidance for Diagnosis, Surveillance and Control. Geneva, Switzerland: World Health Organization; 2003.
11. Singh SS, Vijayachari P, Sinha A. Clinical Epidemiological study of hospitalized cases of severe leptospirosis. Indian J Med Res. 1999;109:94-9.
12. Bhardwaj P, Kosambiya JK, Desai VK. A case control study to explore the risk factors for acquisition of leptospirosis in Surat city, after flood. Indian J Med Sci. 2008;62:431-8.
13. Patel BK, Gandhi SJ, Desai DC. Clinico-epidemiological aspects of leptospirosis in south Gujarat. Indian J Med Microbiol. 2006;24(4):322-6.
14. Sethi S, Sharma N, Kakkar N, Taneja J, Chatterjee SS, Banga SS, et al. Increasing trends of leptospirosis in northern India: A clinico-epidemiological study. PloS Negl Trop Dis. 2010;12;4:e579.
15. Chauhan V, Mahesh DM, Panda P, Mokta J, Thakur S. Profile of Patients of Leptospirosis in Sub-Himalayan Region of North India. J Association Physicians India. 2010;58:354-6.
16. Prabhakar MR, Jayakumar M. Reply from authors. To, Shivakumar S. Leptospirosis in Chennai – Changing clinical profile. J Assoc Physicians India. 2006;54:964–5.
17. Margarita R, Adrian C. Clinical and Laboratory Profile of Leptospirosis: An Analysis of Twenty Six Cases at Quirino Memorial Medical Center Admitted in August 1999. Phil J Microbiol Infect Dis. 2001;30(1):18-21.
18. Ittyachen AM, Krishnapillai TV, Nair MC, Rajan AR. Retrospective study of severe cases of leptospirosis admitted to the intensive care unit. J Postgrad Med. 2007;53:232–5.
19. Parmar G, Kava D, Mehta S, Mallick K, Prasad R, Bansal RK, Rupani M. Socio-demographic,Clinical and Laboratory Profile of Leptospirosis Cases registered at SMIMER, Surat. Natl J Community Med. 2013;4(3):507-11.
20. Sohan L, Shyamal B, Kumar TS, Malini M, Ravi K, Venkatesh V, et al, Studies on Leptospirosis Outbreaks in Peddamandem Mandal of Chittoor District, Andhra Pradesh. J Commun Dis. 2008;40(2):127-32.
21. Panaphut T, Domrongkitchaiporn S, Thinkamrop B. Prognostic factors of death in leptospirosis: A prospective cohort study in Khon Kaen, Thailand. Int J Infect Dis. 2002;6:52-9.

**Cite this article as:** Thalva C, Desamani KK. Socio-demographic, clinical, epidemiological and laboratory profile of cases of leptospirosis at tertiary care hospital: a two year study. Int J Community Med Public Health 2017;4:4738-43.