

Seroprevalence Of Human Leptospirosis In A Coastal Town Of South India

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Abstract: *Leptospirosis is an emerging zoonoses caused by pathogenic Leptospira sps. It causes acute febrile illness in tropical regions. Usually the infection is underdiagnosed due to lack of awareness, varied clinical spectrum of diseases and difficult diagnostic methods. The present study aimed to explore the seroprevalence and clinical features of leptospirosis in patients presenting with an acute febrile illness. This was a cross sectional study undertaken at the microbiology department over a 12-month period. That included 597 people with more than 7 days with acute febrile illness. Those patients were tested using the IgM ELISA for leptospirosis. Of these 597 patients, 18.25% were seropositive for anti-leptospira-specific immunoglobulin (IgM) antibodies. Preponderance of male (n=77) was observed compared to females (n=32). Majority of leptospirosis patients were belonged to occupation fishing and related activities 37 (33.94%) followed by agriculture workers 21(19.27%). Myalgia(92.67%), Jaundice(83.49%) and headache were found to be the common clinical presentations. Coinfection was observed in 15.60% of patients. In our study, the seroprevalence of leptospirosis was found to be 18%. Preponderance of leptospirosis was observed among people involved in fishing and related activities followed by agricultural workers.*

Keywords: *Leptospirosis, IgM ELISA, Coinfection*

Introduction:

Leptospirosis is an infectious disease caused by pathogenic leptospire that spreads directly or indirectly from animals to humans.¹ Rodents are the main natural reservoir of the bacteria, but certain herbivores can serve as a reservoir, too. Leptospirosis was first recorded from the Andaman Islands in 1929, and has since infected all areas of India.² Over one million cases of leptospirosis exist worldwide, with more than 10 percent mortality. It may be the cause of up to 20 per cent fever cases of unknown origin.³ Multiple epidemics from southern and western parts of India have been recorded over the last few of decades.⁴ The majority of leptospirosis outbreaks in India are reported from the states' coastal regions including Andaman islands. Highest levels occur in these parts between October and November which correspond with the monsoon season

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Occupations more associated with leptospirosis are farming, fishing, and automotive repair.⁵The disease is responsible for a variety of clinical symptoms ranging from subclinical infections to fatal pulmonary hemorrhage and Weil's syndrome, therefore, presents challenging scenarios to the clinicians.⁶ Due to its broad range of clinical presentations, the laboratory tests support the diagnosis, but these tests are not always available, particularly in developing nations. For these reasons leptospirosis in certain parts of the world is neglected and swept under the rug.

While the outbreak and prevalence of leptospirosis in India have been highlighted in studies,⁷ records of human leptospirosis from the research area are rare. Therefore, we intended to examine the seroprevalence and clinical characteristics of leptospirosis in patients with acute febrile disease at a hospital of tertiary care situated along the coastal plain.

Materials and methods: This was a cross sectional observational study conducted in the department of microbiology over one year. The study had been approved by the institutional Ethics Committee. All the patients received written, informed consent.

A detailed history was taken and examination was done in all adult patients (>14 years of age) presenting to our institution with an acute febrile illness of >7 days. About 5 ml of venous blood without anticoagulant was collected during the acute phase from all patients taking aseptic measures. As per normal practice the serum has been isolated. ELISA was rendered with ELISA kit Lepto-M Leptospira Microwell Serum. The test procedure was carried out in accordance with the protocol given along with the package. The findings were viewed as per instructions from the supplier. With cut-off, negative and positive controls were determined, and findings were reported as positive; negative, and equivocal as per the supplier's guidelines provided along with the kit. Samples showed equivocal interpretation was again tested by collecting blood samples with a gap duration of 14 days. Blood samples were also tested for other infectious diseases such as typhoid (WIDAL test), dengue, malaria and Hepatitis B and C. Rapid kits were used for the detection of dengue fever, hepatitis B and hepatitis C. Peripheral smear was used for the detection of malarial parasites. A simple percentage method was used to analyze the data.

Results: A total of 597 patients with acute febrile illness for more than seven days were included in the study. One hundred and nine patients were found to be seropositive for leptospira antibody IgM and accounted for 18% of seroprevalence. All patients' age was ranged between 14-70. Out of these 109 patients, a preponderance of males (n=77) was observed compared to females (n=32). A higher number of patients among males were 46-55(28.58%) years followed by 36-45(27.27%) years. Among females preponderance was noticed in the age group of 36-45(53.12%) years. (Table.1)

Age and sex-wise distribution of leptospirosis patients (Table.1)

Age in Years	Male (n=77)	Female (n=32)
14-24	2(2.60%)	-
25-35	14(18.18%)	11(34.38%)
36-45	21(27.27%)	17(53.12%)
46-55	22(28.58%)	3(9.38%)
>55	18(23.38%)	1(3.12%)

In the present study, the majority of leptospirosis patients have belonged to occupation fishing and related activities 37 (33.94%) followed by agriculture workers 21(19.27%).In our study few leptospirosis patients based on occupation were collectively categorized under others (7.33%) which comprises students, office employees, and homemakers.

Distribution of leptospirosis patients based on occupation. Table.2

Occupation	Number (%)
Fishing	37(33.94%)
Agriculture	21(19.27%)
Laborers	17(15.60%)
Sewage/Garbage cleaners	15(13.76%)
Business	11(10.09%)
Others	8(7.33%)

All patients presented with fever. In our study, myalgia(92.67%), Jaundice(83.49%), and headache were found to be the common features. Conjunctival suffusion (11%) was found to be the least common feature observed among patients with leptospirosis.

Distribution of clinical features Table.3

Clinical feature	Number (%)
Fever	109(100%)
Myalgia	101(92.67%)
Jaundice	91(83.49%)
Headache	88(80.73%)
Chills/Rigor	65(59.63%)
Hepatomegaly	41(37.61%)
Oliguria	39(35.78%)
Abdominal pain	28(25.69%)
Conjunctival suffusion	12(11%)

Coinfection was observed in 15.60% of patients. Surprisingly, coinfection due to typhoid fever(6.42%)was found to be common followed by dengue fever (4.59%), hepatitis B (3.67%), and hepatitis C(0.92%). In our study, no malarial parasites were associated with leptospirosis.

Discussion:

The seroprevalence of leptospirosis in this area is deficient in details. The seroprevalence of leptospirosis has been found to be 18 percent in this study. This is similar to the study conducted by Ganesan Arumugam et al. in which Seroprevalence rate was 20%.⁷Our study results are not in agreement with the study conducted by Rathnam et al. reported the prevalence rate as 32.9%.⁸ShaheenR and Shah reported exceptionally low prevalence (2.8 per cent). This may be attributed to various reasons like sample size and testing criteria.⁹ Climate conditions may have also contributed to the results.

Male patients were predominantly affected due to leptospirosis in our study. This finding is in line with the studies conducted previously.¹⁰ Classically, the link between becoming a male and leptospirosis has been clarified by the fact that males are typically more amenable to water, and are more likely to participate in leptospirosis-prone occupational or outdoor behaviors. Gender immunity variations, influencing both natural and adaptive immune responses, lead to variations in the pathogenesis of infectious diseases between males and females.¹¹ However a study carried out by Joshi et al, showed the preponderance of females.¹²

In the present study, a preponderance of leptospirosis was seen in patients associated with fishing and its activities. The study carried out in a tertiary care teaching hospital located on the seashore which is surrounded by fishermen community. Predominantly the services of our hospital are being utilized by this population. This could be the reason for the preponderance leptospirosis among fishermen and related occupations. The second common occupation associated with leptospirosis in the present was agriculture workers. In this region, a small portion of people involves in agricultural activities, even though they are from the fishermen community. Longer work life was strongly linked with developing leptospirosis; this may be attributed to extended exposure. The extent of high-risk work and extended access to potentially polluted conditions plays a significant role in the transmission of leptospirosis.¹³

In a cross-sectional hospital-based study conducted in Malaysia, leptospirosis seroprevalence among the general population was 8.4 percent.¹⁴ The incidence of leptospirosis in the general population is responsible for many causes. Improper disposal of plastic covers contributes to drainage network blockage which allows the polluted water from *Leptospira* to flood on the roads or streets particularly during the rainy season and makes the general population susceptible to infection.

In this analysis the seasonal variability was noted, we found a higher seroprevalence rate of leptospirosis during the monsoon phase, which is compatible with some of the earlier studies and could entail a higher risk of infection during the monsoon season.¹⁰

In our study, the commonest presentation was myalgia 101(92.67%) followed by jaundice 93(83.49%) and headache 88(80.73%). These results are similar to the study conducted by Agarwal et al.¹⁵ As per Agarwal et al, the commonest presentation was fever with or without rigors followed by jaundice in 80% of patients. However a study by Barau et al,¹⁶ headache as predominant symptom followed by fever. Liver, kidney, pulmonary, cardiac, and central nervous system involvement may be present in any combination. In our study, no complications were observed.

In our study dual infection was noticed in 15.60% of patients. Surprisingly, coinfection due to typhoid fever (6.42%) was found to be common. The anamnestic response was ruled out after repeating the WIDAL test with the gap duration of 10 days to check the sustainability of *Salmonella* antibodies. However, the gold standard method of blood culture for enteric fever was not performed. Coinfection due to leptospirosis and enteric fever was recorded during non-monsoon unlike dengue fever that was recorded during monsoon. Enteric fever and leptospirosis coinfection is an unusual occurrence also in areas where all of these diseases are prevalent. Although the clinical symptoms are unspecific and similar, differentiating between these two pathogens is very difficult. A previous study reported 2% of coinfection due to enteric fever and leptospirosis.¹⁷ Dengue fever (4.59%) was the next common combination observed followed by hepatitis B (3.67%) and hepatitis C(0.92%). In our study, no malarial parasites were associated with leptospirosis. As per Deodhar, M. John,¹⁸ coinfections with dengue in 17.5% of patients. A

study by Chandrasekaran.¹⁹, Coinfection of leptospirosis and hepatitis B was found in 22 per cent of cases. These co-existing infections may present diagnostic dilemmas.

Our study has a few limitations. A single serum sample for the detection of IgM antibody by ELISA test was used. Because of a referral disparity in patients visiting a tertiary level hospital, our research would underestimate the population incidence of leptospirosis. In this study, the gold standard test for the diagnosis of leptospirosis was not performed. Because of various issues. Many of the existing methods are expensive, time consuming, skilled labour-intensive and require advanced and costly facilities only accessible in a few centers. However, serological tests such as ELISA are useful and effective for the study of seroprevalence, particularly in resource-limited countries, to determine problem load.

Conclusion: In our study, the seroprevalence of leptospirosis was found to be 18%. While the identification of antibodies is by itself no indication of a current infection, serological methods are always the most suitable means of diagnosis. To the best of our awareness, this is the first report to record seroprevalence in this location. Sensitizing the medical practitioners about leptospirosis seroprevalence helps to increase patient safety, minimize spread, change social conditions, and enhance hygienic procedures. Further studies have to be carried out towards species level identification of *Leptospira* in this region.

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