

Predictors of Severity in Assessing Outcome in Leptospira Infection - An Observational Study

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ABSTRACT

BACKGROUND

Leptospirosis is a zoonotic disease caused by pathogenic *Leptospira* species. It may present with wide spectrum of clinical manifestations ranging from asymptomatic infection to fulminant disease that may prove fatal at times. The objectives of the study are to evaluate the clinical profile of leptospirosis patients and identify the predictors of severity in outcome in leptospira infection.

METHODS

A total of 50 patients seropositive for IgM leptospira admitted in a tertiary care hospital from 1st July 2017 to 31st December, 2018, were included in the study and evaluated for various clinical and laboratory parameters.

RESULTS

Out of 50 patients, majority of whom were male, the common symptomatology included fever followed by headache, myalgia, nausea and vomiting. The various complications that developed were acute kidney injury (AKI), meningitis, pneumonia, arrhythmia, dyselectrolytemia etc. The total mortality observed was 10%.

CONCLUSIONS

Oliguric AKI, elderly subjects, sepsis and electrolyte disturbances may adversely affect the outcome in a patient with leptospirosis and thus is a pointer to the need for early intervention.

KEYWORDS

Leptospirosis, Asymptomatic, Oliguric AKI, Pneumonia

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DOI: 10.18410/jebmh/2020/71

Financial or Other Competing Interests:
None.

How to Cite This Article:
Paul N, Bhattacharjee K, Roy S, et al.
Predictors of severity in assessing
outcome in leptospira infection- an
observational study. J. Evid. Based Med.
Healthc. 2020; 7(7), 333-336. DOI:
10.18410/jebmh/2020/71

Submission 27-01-2020,
Peer Review 28-01-2020,
Acceptance 03-02-2020,
Published 17-02-2020.



BACKGROUND

Leptospirosis is caused by pathogenic leptospira species that belong to the order *Spirochaetales* and family *Leptospiraceae*. Its resurgence has made it a globally important zoonotic disease that has a wide spectrum of clinical manifestations from asymptomatic presentation to severe and life-threatening infection.¹ The main reservoir of leptospira are rodents especially rats, although other domestic and wild animals may harbour the organism. Human get infected via direct or indirect contact with animals.¹ In leptospirosis, the pathogenesis involves a septicaemic phase that last for about a week which is subsequently followed by the immune phase. It is characterized by the development of antibodies and disposition of leptospira in the urine. During this phase leptospira may localize in various tissues of the body and subsequently leads to many complications.²

Most leptospira infections are asymptomatic or manifest as flu like illness with fever, headache, myalgia, pain abdomen, conjunctival congestion etc. However, around 1% of the infection may be severe, manifesting as multiorgan failure with jaundice, altered mentation, acute kidney injury (AKI), pancreatitis, hypotension, repolarization abnormalities and various rhythm disturbances. Patients may also have various bleeding manifestations like petechiae, ecchymosis, epistaxis, melena, pulmonary haemorrhage, hematuria etc. Severe leptospirosis may lead to a case fatality ranging from 1 to 50%.¹

The study was done to evaluate the clinical profile of patients with leptospirosis and identify the predictors of severity in outcome in leptospira infection.

METHODS

It is a prospective hospital based observational study conducted in Silchar Medical College and Hospital, Silchar over a period of 18 months from 1st July 2017 to 31st December, 2018. A thorough history and clinical examination were performed with special reference to anaemia, jaundice, hydration status, mentation etc. All febrile cases aged ≥12 years and subsequently found to be reactive for IgM leptospira were included in the study whereas cases diagnosed as malarial fever, enteric fever, scrub typhus etc. were excluded from the study. The laboratory investigations including complete blood count and differentials, renal function test, liver function test, blood sugar, ECG, serum lipase etc. were performed as required in those included for the study. The subjects were evaluated and taken care of during the in hospital stay and evaluated for the subsequent development of various complications. Statistical analysis was performed using SPSS version 20. Continuous variables were presented as mean (± standard deviation). Chi-square test was used for comparing proportions and t test for comparing means. The value p <0.05 was considered statistically significant.

RESULTS

A total of 50 cases of leptospirosis with 28 (56%) males and 22 (44%) females were included in the study. Commonest age group affected was 31 to 45 years that constituted 32% of the study subjects. This was followed by age group 12 to 30 years, 46 to 60 years and age >60 years. Most of the cases presented with fever (88%), myalgia (82%) and headache (70%). These were followed by redness of eye, jaundice, nausea and vomiting, reduced urine output, loose motion and altered mental status that were present in 50%, 44%, 42%, 22%, 8% and 6% respectively. The various clinical signs were raised body temperature, conjunctival congestion, icterus, pallor, dehydration, signs of meningeal irritation, tachycardia and bradycardia that occurred in 90%, 54%, 50%, 40%, 48%, 2%, 32% and 16% of the study subjects respectively (Table 1).

Gender	Number (%)
Male	28 (56%)
Female	22 (44%)
Age group	Number (%)
12 – 30 years	15 (30%)
31 – 45 years	16 (32%)
46– 60 years	14 (28%)
Above 60 years	5 (10%)
Symptomatology	Number (%)
Fever	44 (88%)
Myalgia	41 (82%)
Headache	35 (70%)
Nausea and Vomiting	21 (42%)
Redness of Eye	25 (50%)
Jaundice	22 (44%)
Reduced Urine Output	11 (22%)
Altered Mental Status	3 (6%)
Loose Motion	4 (8%)
Clinical Signs	Number (%)
Raised Body Temperature	45 (90%)
Conjunctival Congestion	27 (54%)
Icterus	25 (50%)
Pallor	20 (40%)
Dehydration	24 (48%)
Signs of Meningeal Irritation	1 (2%)
Tachycardia	16 (32%)
Bradycardia	8 (16%)

Table 1. Demographic and Clinical Profile of Study Subjects

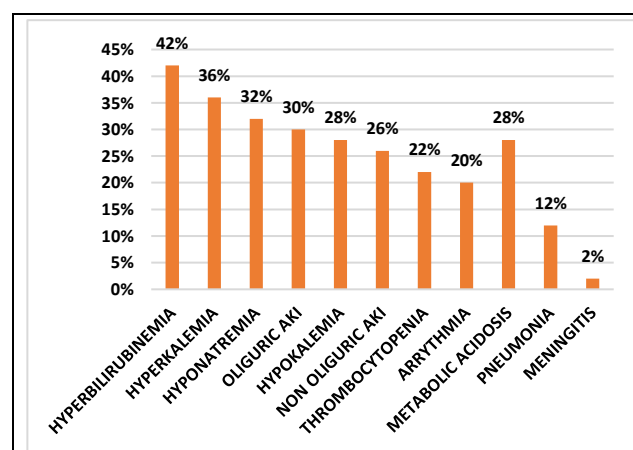


Figure 1. Complications in Study Subjects

	HD	Other Treatment	P value
Mean duration of hospital - stay (in days)	9.17 ± 1.57	6.5 ± 0.96	0.008883

Table 2. Contributors to Longer Hospital Stay

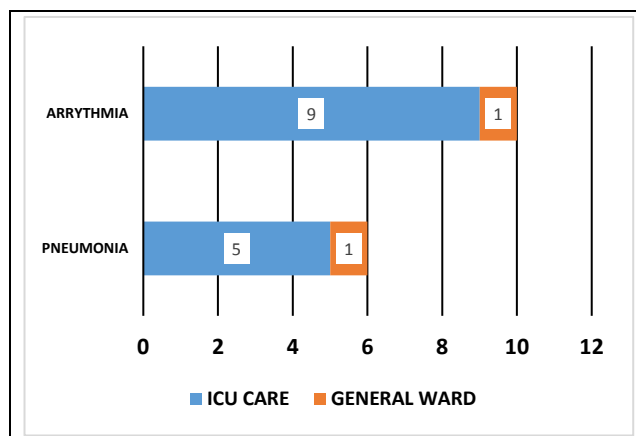


Figure 2. Complications Requiring ICU Care in Study Subjects

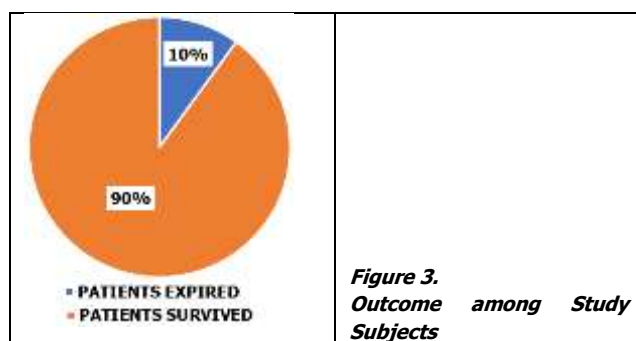


Figure 3. Outcome among Study Subjects

Parameters	Expired	Survived	p value
Serum creatinine (mean ± SD)	6.22 ± 2.75	3.03 ± 0.58	0.009
Serum potassium (mean ± SD)	6.24 ± 0.23	3.97 ± 0.99	0.001
pH (mean ± SD)	7.04 ± 0.10	7.46 ± 0.05	0.000074
Serum sodium (mean ± SD)	124.4 ± 1.02	125 ± 1.10	0.45
Serum bilirubin (mean ± SD)	2.98 ± 0.64	2.96 ± 2.34	0.98
Platelet count (mean ± SD)	1.94 ± 0.30	1.71 ± 0.67	0.54
Age >60 years	3	2	0.001674
Pneumonia	1	4	0.884660

Table 3. Comparison of Various Parameters with Mortality

The various complications that developed among the study subjects during the hospital stay were pneumonia in 6 (12%), oliguric AKI in 15 (30%), non- oliguric AKI in 13 (26%), metabolic acidosis in 14 (28%), thrombocytopenia in 11 (22%), hyperbilirubinemia in 21 (42%), hyperkalemia in 18 (36%), hypokalemia in 14 (28%), hyponatremia in 16 (32%), arrhythmia in 10 (20%) and meningitis in 1 (2%) (figure 1). As a part of conservative treatment among those who developed AKI, 16 patients underwent haemodialysis (HD) (12 oliguric AKI and 4 non oliguric AKI). The mean duration of hospital stay was significantly high among patients who required HD. Intensive care unit admissions were significantly higher among patients with pneumonia and arrhythmia with p value 0.046543 and 0.000618 respectively (table 2 and figure 2). A total of 5 (10%) of the study subjects expired and 45 (90%) recovered and subsequently discharged (figure 3). Out of 5 patients who expired, 4 patients had oliguric AKI and 1 patient had pneumonia. Among 4 oliguric AKI patients who succumbed to ailment, 1 received haemodialysis (HD) and 3 expired before they could be put for HD.

On evaluation, it was found that the mean serum creatinine, mean serum potassium and acidotic blood picture were significantly higher among those who expired

compared to the survivors. Also, those aged >60 years contributed significantly to mortality. Serum sodium, bilirubin and platelet count, presence of pneumonia and meningitis did not vary significantly between the two groups (Table 3).

DISCUSSION

In the present study, a total of 50 cases of leptospirosis with 28 (56%) males and 22 (44%) females were included. Similarly, males predominated the picture in the study of Dr. Dayamani B et al³ who observed that out of total 104 cases, 52.88% were males and 47.11% were females. In the present study, 32% of the study subjects were aged between 31 to 45 years, 30% were in age group 12 to 30 years, and 28% were in 46 to 60 years age group whereas only 10% were aged more than 60 years. The findings of this study corroborated with the observations by Dr. Dayamani B et al³ where the most common age group to be affected was 31 to 40 years and it contributed to 27.88% of the study subjects. In the present study, most of the cases presented with fever (88%), myalgia (82%) and headache (70%) followed by redness of eye, jaundice, nausea and vomiting, reduced urine output, loose motion and altered mental status. In study by V. Chauhan et al,⁴ fever was the most common presentation and was found in 100% of the cases. Jaundice was present in 10 (77%), conjunctival suffusion in 7 (54%), meningism in 7 (54%), myalgia in 10 (77%), headache in 12 (92%) cases.

In the present study, the various clinical signs were raised body temperature, conjunctival congestion, icterus, pallor, dehydration, signs of meningeal irritation, tachycardia and bradycardia that were present in 90%, 54%, 50%, 40%, 48%, 2%, 32% and 16% of the study subjects respectively. However, Padmakumar B et al⁵ in their study observed jaundice in 20%, pallor in 8.9%, conjunctival congestion in 53.3%, tachypnoea in 37.8%, skin rashes in 2.2%, and muscle tenderness in 75.6% and hepatomegaly in 33.3% of the cases.

The various complications that developed among the study subjects during the hospital stay were pneumonia in 6 (12%), oliguric AKI in 15 (30%), non- oliguric AKI in 13 (26%), metabolic acidosis in 14 (28%), thrombocytopenia in 11 (22%), hyperbilirubinemia in 21 (42%), hyperkalemia in 18 (36%), hypokalemia in 14 (28%), hyponatremia in 16 (32%) and meningitis in 1 (2%). In the present study AKI was present in 28 (56%) of the subjects, out of which 53.57% had oliguric AKI and 46.43% had non oliguric AKI. Kallol Bhattacharjee et al⁶ in their study observed the prevalence of AKI as 55.35% of which oliguric AKI and non-oliguric AKI were 68% and 32% respectively. The observed prevalence of AKI was higher in the present study compared to that of Kallol Bhattacharjee et al.⁶ A higher prevalence of thrombocytopenia, hyperkalemia and hyponatremia was observed in the present study as compared to study by Virendra C. Patil et al⁷ where thrombocytopenia, hyperkalemia and hyponatremia were present in 13.04%,

26.08% and 8.69% of the study subjects respectively. Metabolic acidosis and hypokalemia were lower in the present study when compared to observations by Virendra C. Patil et al⁷ where metabolic acidosis and hypokalemia were seen in 43.47% and 30.43% respectively. Hyperbilirubinemia was present in 42% of cases in the present study and was lower as compared to the study by Padmakumar B et al⁵ where hyperbilirubinemia was present in 55.6% of the subjects.

In the present study, AKI requiring HD contributed to longer hospital stay and the need for ICU care was more in subjects with pneumonia and arrhythmia ($p < 0.05$). The mortality observed was 10%. Elderly patients, raised serum creatinine and potassium and low arterial blood pH were significantly high among those who expired. The predictors of severity and mortality varied in other studies. Similar to the present study, Kallol Bhattacharjee et al⁶ in their study observed a mortality of 10.7% and among those who expired, oliguric AKI was significantly high as compared to non-oliguric AKI. In another study by Sompong Tantitanawat et al,⁸ thrombocytopenia, raised creatinine and bilirubin, raised liver enzymes, tachycardia and hypotension were associated with severe leptospirosis and mortality. However, in the study done by Hua-Kung Wang et al⁹ presence of haemorrhage, arrhythmia, shock, jaundice, pulmonary involvement, need for dialysis and ventilation, prior steroid use contributed significantly to mortality. Although AKI was more common among non survivors the result was insignificant.

CONCLUSIONS

Leptospirosis contributes to morbidity and mortality with a multitude of complications. Early recognition, appropriate institution of antibiotics, ICU care and treatment of complications, HD and maintaining adequate hydration may lessen the severity. Encouraging at risk population for use of protective footwear, eyewear etc. at the workplaces is beneficial. Vaccination for agricultural and companion animals should be encouraged.

Limitations

The present study is a single centered one, conducted over a smaller sample size in a fixed geographical area and

undertaken for a shorter duration of time. A multicentric study covering a wider geographical area, among different ethnic groups, for a longer duration of time is required to validate the findings of this study.

REFERENCES

- [1] Wagenaar JFP, Goris MGA. Leptospirosis. Chap- 179. In: Jameson JL, Fauci AS, Kasper DL, et al, eds. Harrison's principles of internal medicine. 20th edn. New York: McGraw-Hill Education 2018:1290-1293.
- [2] Levett PN. Leptospirosis. Clin Microbiol Rev 2001; 14(2):296-326.
- [3] Dayamani B, Manjunath J, Mohammed S. Clinical profile of patients with leptospirosis requiring hemodialysis and intensive care. IOSR Journal of Dental and Medical Sciences 2018;17(9):35-38.
- [4] Chauhan V, Mahesh DM, Panda P, et al. Profile of patients of leptospirosis in sub-Himalayan region of North India. J Assoc Physicians India 2010; 58:354-356.
- [5] Padmakumar B, Kumari Jayageetha PB, Libu GK, et al. A study on epidemiological, clinical and laboratory profile of patients with leptospirosis admitted in a tertiary care centre in central Kerala, India. JK Science 2016;18(4):216-220.
- [6] Bhattacharjee K, Thakur CP, Das D, et al. Focus into the role of acute kidney injury in leptospirosis: an observational hospital- based study in north eastern India. Asian Journal of Science and Technology 2018;9(4):7942-7946.
- [7] Patil VC, Patil HV, Agrawal V. Clinical profile and outcome of leptospirosis at tertiary care centre in western Maharashtra. Journal of Academy of Medical Sciences 2012;2(1):30-37.
- [8] Tantitanawat S, Tanjatham S. Prognostic factors associated with severe leptospirosis. J Med Assoc Thai 2003;86(10):925-931.
- [9] Wang HK, Lee MH, Chen YC, et al. Factors associated with severity and mortality in patients with confirmed leptospirosis at a regional hospital in northern Taiwan. J Microb Immunol Infect 2018. DOI: 10.1016/j.jmii.2018.05.005