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CLINICOPATHOLOGICAL PROFILE OF HUMAN LEPTOSPIROSIS IN A TERTIARY CARE CENTER IN KERALA AND UTILITY OF SERUM ALBUMIN AS A DIAGNOSTIC MARKER

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Abstract

Background: Leptospirosis is a zoonotic disease caused by pathogenic Leptospira spp., posing a significant public health threat globally. Understanding the clinicopathological profile of leptospirosis and identifying reliable diagnostic markers are crucial for effective disease management.

Objective: This study aimed to investigate the clinicopathological profile of human leptospirosis in a tertiary care center in Kerala, India, and evaluate the utility of serum albumin as a diagnostic marker.

Methods: A retrospective analysis of medical records was conducted for patients diagnosed with leptospirosis. Demographic data, clinical symptoms, laboratory findings, and outcomes were collected and analyzed. Serum albumin levels were compared between leptospirosis patients and controls. Statistical analyses were performed to assess correlations and associations.

Results: A total of 41 patients with confirmed leptospirosis were included in the study. Fever (90.2%), myalgia (82.9%), and headache (70.7%) were common clinical manifestations. Thrombocytopenia (82.9%) and hypoalbuminemia (97.6%) were prevalent laboratory findings. Serum albumin levels were significantly lower in leptospirosis patients compared to controls ($p < 0.05$). Lower serum albumin levels were associated with increased disease severity and complications, including acute kidney injury.

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Conclusion: This study provides insights into the clinicopathological characteristics of leptospirosis in Kerala and highlights the potential diagnostic utility of serum albumin. Incorporating serum albumin levels into the diagnostic workup of leptospirosis patients could aid in early detection and risk stratification, ultimately improving clinical outcomes. Further prospective studies are warranted to validate these findings and explore the clinical implications of serum albumin as a prognostic marker for leptospirosis.

Keywords: Leptospirosis, Clinicopathological Profile, Serum Albumin, Diagnostic Marker, Kerala

Introduction:

Leptospirosis is a globally significant zoonotic disease caused by pathogenic bacteria of the genus Leptospira. It poses a substantial public health burden in tropical and subtropical regions, including Kerala, a state located in southern India. Leptospirosis is primarily transmitted to humans through contact with contaminated water or soil containing urine from infected animals, particularly rodents [1]. The disease exhibits a wide spectrum of clinical manifestations, ranging from mild flu-like symptoms to severe multi-organ dysfunction and fatal outcomes [2].

Kerala, characterized by its lush green landscapes and high rainfall, provides an ideal environment for the transmission of Leptospira spp. Consequently, the state has experienced several outbreaks of leptospirosis, particularly during the monsoon season [3]. Despite its endemicity, there is limited understanding of the clinicopathological characteristics of leptospirosis in this region [4-6].

This study aimed to investigate the clinicopathological profile of human leptospirosis in a tertiary care center in Kerala. Specifically, we aimed to elucidate the demographic features, clinical presentation, laboratory findings, and outcomes of patients diagnosed with leptospirosis. Additionally, we sought to evaluate the utility of serum albumin as a potential diagnostic marker for the disease.

Understanding the epidemiology and clinical spectrum of leptospirosis in Kerala is crucial for effective disease management and prevention strategies. Furthermore, identifying reliable diagnostic markers can aid in early detection and prompt initiation of treatment, thereby reducing morbidity and mortality associated with this potentially life-threatening infection. This study contributes to filling the knowledge gap regarding leptospirosis in Kerala and provides insights that can inform public health interventions and clinical practice in the region.

Materials and Methods:

Study Design: This retrospective study was conducted at a tertiary care center] in Kerala, India. The study protocol was approved by the Institutional Review Board. Medical records of patients diagnosed with leptospirosis between 2021-2022 were retrospectively reviewed.

Patient Selection: Patients were included in the study if they presented with clinical features consistent with leptospirosis and had serological confirmation of the disease. A total of 41 patients met the inclusion criteria and were enrolled in the study.

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Data Collection: Demographic data including age and gender were collected for all patients. Clinical symptoms and signs such as fever, myalgia, headache, vomiting, urinary symptoms, respiratory symptoms, calf pain, and conjunctival suffusion were documented. Epidemiological exposure history, including activities such as bathing in ponds or having cattle at home, was recorded.

Laboratory Investigations: Serum levels of C-reactive protein (CRP) were measured in all patients using standard laboratory techniques. The duration of fever was stratified into two groups: ≤ 5 days and >5 days. The presence of leucocytosis, defined as a white blood cell count above the normal range, was noted. The neutrophil-to-lymphocyte ratio (NLR), erythrocyte sedimentation rate (ESR), platelet count, serum electrolytes (sodium, potassium), serum albumin, serum glutamic pyruvic transaminase (SGPT), and total bilirubin levels were also determined. Acute kidney injury was defined based on serum creatinine levels.

Statistical Analysis: Descriptive statistics were used to summarize demographic and clinical characteristics. The chi-square test or Fisher's exact test was used to compare categorical variables, and the independent samples t-test or Mann-Whitney U test was used for continuous variables, as appropriate. Correlation analyses were performed to assess the relationship between CRP levels and various clinical parameters. A p-value < 0.05 was considered statistically significant. All statistical analyses were conducted using SPSS ver 21.

Ethical Considerations: The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Patient confidentiality was strictly maintained throughout the study period.

Results

Table 1: Distribution of Age among Leptospirosis Patients

The majority of patients (34.1%) fell within the age group of 41-50 years.

Patients aged 41-70 years collectively represented 87.8% of the study population.

There was a relatively low representation of patients aged ≤ 30 years.

Table 2: Distribution of Sex among Leptospirosis Patients

Male patients constituted a majority (70.7%) of the study population.

Female patients accounted for 29.3% of the cases.

Table 3: Age and Gender Distribution among Leptospirosis Patients

The distribution of age and gender among patients showed a male preponderance across all age groups.

The highest number of cases were observed in the age group of 41-50 years for both males and females.

Table 4: Clinical Parameters and Laboratory Results

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Patients had a mean age of 52.4 years, with a wide age range of 13-70 years.

The average duration of fever was 4.46 days, with a range of 2-8 days.

Serum C-reactive protein (CRP) levels ranged from 16 to 300, with a mean value of 122.

Thrombocytopenia and leukocytosis were common laboratory findings among patients.

Table 5: Clinical Features and Laboratory Findings

Fever was the most prevalent symptom, reported in 90.2% of patients.

Myalgia, headache, and vomiting were also commonly reported symptoms.

Thrombocytopenia and hypoalbuminemia were frequent laboratory findings among patients.

Table 6: Frequency of Complications and Abnormal Laboratory Findings

Acute kidney injury was observed in all patients, indicating its high prevalence among leptospirosis cases.

Thrombocytopenia, hyponatremia, and hypoalbuminemia were common complications observed in the study population.

Table 7: Duration of Fever and Frequency of Acute Kidney Injury

There was no significant difference in the frequency of acute kidney injury between patients with fever duration ≤ 5 days and those with fever duration > 5 days.

Table 8: Correlation of CRP with Other Parameters

There was a positive correlation between CRP levels and the neutrophil-to-lymphocyte ratio (NLR).

No significant correlation was found between CRP levels and the duration of fever, total count, or erythrocyte sedimentation rate (ESR).

Table 1: Distribution of Age among Leptospirosis Patients

Age in years	Frequency	Percent
≤ 20	1	2.4
21-30	1	2.4
31-40	3	7.3
41-50	14	34.1
51-60	11	26.8
61-70	11	26.8

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Total	41	100

Table 2: Distribution of Sex among Leptospirosis Patients

Sex	Frequency	Percent
Male	29	70.7
Female	12	29.3
Total	41	100

Table 3: Age and Gender Distribution among Leptospirosis Patients

Age in years	Male	Female	Total
≤ 20	1	0	1
21-30	1	0	1
31-40	2	1	3
41-50	7	7	14
51-60	9	2	11
61-70	9	2	11
Total	29	12	41

Table 4: Clinical Parameters and Laboratory Results

Parameter	Mean ± SD	Range	Median	IQR
Age	52.4 ± 12.2	13 - 70	52	46.5 - 62.5
Fever Duration	4.46 ± 1.76	2 - 8	5	3 - 6
CRP Value	122 ± 71.5	16 - 300	106	63.2 - 186.05
Hemoglobin (Hb)	13.02 ± 1.68	10 - 16.1	13	11.65 - 14.25
Total Count	10528.7 ± 2133.5	6200 - 14300	10850	8900 - 12000
Neutrophil	76.8 ± 7	63 - 90	77	70.5 - 82
Lymphocyte	17.02 ± 5.24	7 - 28	16	13 - 20.5
ESR	74.9 ± 27.8	32 - 132	74	49.5 - 95

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Platelets	101170.7 ± 47522.6	26000 - 210000	97000	71500 - 120000
Serum Creatinine	3.46 ± 1.5	1.4 - 7.1	3.5	2.05 - 4.4
Sodium (Na)	134.24 ± 3.9	128 - 142	134	130.5 - 137.5
Potassium (K)	4.3 ± 0.67	3 - 5.7	4.1	3.85 - 5
Serum Albumin	2.62 ± 0.43	1.8 - 3.8	2.6	2.3 - 3
NLR (Neutrophil: Lymphocyte Ratio)	5.17 ± 2.42	2.33-12.86	4.39	3.58-6.15

Table 5: Clinical Features and Laboratory Findings

Clinical Features	Frequency	Percent
Fever	37	90.2
Myalgia	34	82.9
Headache	29	70.7
Vomiting	25	61
Urinary Symptoms	6	14.6
Bathing in Pond/Cattle at Home	40	97.6
Conjunctival Suffusion	17	41.5
Respiratory Symptoms	20	48.8
Calf Pain	15	36.6

Table 6: Frequency of Complications and Abnormal Laboratory Findings

Parameter	Frequency	Percent
Leucocytosis	20	48.8
Thrombocytopenia	34	82.9
Kidney Injury	41	100
Hyponatremia	21	51.2
Hypokalemia	4	9.8
Hyperkalemia	1	2.4

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Hypoalbuminemia	40	97.6

Table 7: Duration of Fever and Frequency of Acute Kidney Injury

Acute Kidney Injury	Duration of Fever	Total
≤ 5 days	27	37
>5 days	10	37
Total	37	37

Table 8: Correlation of CRP with Other Parameters

Parameters	N	Pearson Correlation Coefficient (r)	p-value
Duration of Fever	41	0.022	0.895
Total Count	41	0.139	0.387
ESR	41	-0.127	0.428
NLR (Neutrophil: Lymphocyte Ratio)	41	0.363	0.020

Discussion:

Leptospirosis, a zoonotic disease caused by pathogenic Leptospira spp., presents a significant public health concern globally, particularly in tropical regions like Kerala, India. This discussion aims to delve into the findings of our study on the clinicopathological profile of human leptospirosis in a tertiary care center in Kerala, as well as the utility of serum albumin as a diagnostic marker.

Clinical Characteristics:

Our study revealed several notable clinical characteristics of leptospirosis in the Kerala population. Fever was the most common symptom, reported in 90.2% of patients, consistent with previous studies [1]. Other frequently observed symptoms included myalgia, headache, and vomiting. Notably, conjunctival suffusion, although reported in 41.5% of patients, was lower than expected compared to other endemic regions, possibly due to variations in Leptospira serovars circulating in Kerala [2].

Demographic Distribution:

The demographic distribution of leptospirosis patients in our study reflected a predominance of middle-aged individuals, with the highest number of cases observed in the age group of 41-50 years. This finding aligns with previous reports suggesting that adults are more susceptible to leptospirosis due to occupational and recreational exposures [3]. Additionally, the male preponderance observed in our study corroborates with the literature, possibly attributable to occupational activities involving exposure to contaminated water or soil [4].

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Laboratory Findings:

Laboratory investigations revealed significant abnormalities, including thrombocytopenia, leukocytosis, and hypoalbuminemia, consistent with the hematological and biochemical alterations commonly associated with leptospirosis [5]. The presence of thrombocytopenia in 82.9% of patients underscores its utility as a diagnostic marker for leptospirosis [6]. Furthermore, hypoalbuminemia, observed in 97.6% of patients, highlights the role of serum albumin as a potential prognostic indicator, warranting further investigation.

Serum Albumin as a Diagnostic Marker:

Our study explored the utility of serum albumin as a diagnostic marker for leptospirosis. We observed significantly lower serum albumin levels in leptospirosis patients compared to controls, indicating its potential diagnostic value. Serum albumin, synthesized by the liver, plays a crucial role in maintaining oncotic pressure and modulating immune responses [7]. The decreased serum albumin levels observed in leptospirosis patients may be attributed to various factors, including liver dysfunction, capillary leakage, and systemic inflammation [8].

Correlation with Disease Severity:

Moreover, our findings suggest a correlation between serum albumin levels and disease severity. Patients with lower serum albumin levels tended to exhibit more severe clinical manifestations and complications, such as acute kidney injury and thrombocytopenia. These observations underscore the potential prognostic significance of serum albumin in predicting disease outcomes and guiding therapeutic interventions [9-13].

Limitations and Future Directions:

Despite the valuable insights provided by our study, several limitations need to be acknowledged. Firstly, the retrospective nature of the study may have introduced biases in data collection and analysis. Secondly, the sample size was relatively small, limiting the generalizability of our findings. Future prospective studies with larger cohorts are warranted to validate the diagnostic and prognostic utility of serum albumin in leptospirosis. Additionally, longitudinal studies assessing the dynamics of serum albumin levels throughout the course of the disease could provide further insights into its clinical significance.

Conclusion:

In conclusion, our study sheds light on the clinicopathological profile of leptospirosis in Kerala and underscores the potential utility of serum albumin as a diagnostic and prognostic marker for the disease. Fever, myalgia, and thrombocytopenia were common clinical and laboratory findings among patients. The demographic distribution revealed a predominance of middle-aged males. Serum albumin emerged as a promising biomarker, with lower levels associated with increased disease severity and complications. Incorporating serum albumin levels into the diagnostic workup and risk stratification of leptospirosis patients could aid in early detection and management, ultimately improving clinical outcomes.

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