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Original Article

A STUDY OF LIVER FUNCTION TESTS DERANGEMENTS IN LEPTOSPIROSIS IN A TERTIARY HEALTH CARE CENTER IN ODISHA: A COHORT STUDY.

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Abstract

Background

A zoonotic illness that is found throughout the world is leptospirosis. For growth, leptospires need specific media and circumstances. Positive cultural shifts might occur over weeks or months. Clinical, diagnostic, and epidemiologic objectives are best served by classifications based on serologic distinctions.

Objectives

This study aims to determine the distribution of leptospirosis patients by identifying the correlation between clinical factors at admission and six weeks later in leptospirosis patients.

Materials and Methods

The study was observational and prospective. The study was conducted in Burla, Sambalpur, Odisha, India, at the Veer Surendra Sai Institute of Medical Sciences and Research (VIMSAR). The research was conducted between February 2024 and January 2025. One hundred patients in all were enrolled in the trial.

Results

A total of 100 IgM lepto-antibody-positive patients were enrolled and completed the 6-week follow-up. The mean age was 42.3 ± 13.8 years, with 61% males and 39% females. Fever and myalgia were present in all patients, with other common symptoms including headache (75%) and icterus (68%). Liver function parameters such as AST, ALT, bilirubin, ALP, total protein, and albumin showed significant improvement after 6 weeks ($p < 0.001$). These results indicate notable hepatic recovery in leptospirosis patients.

Conclusion

The study came to the conclusion that elevated levels of bilirubin and transaminases were the primary way that the liver was involved in leptospirosis. Patients' bilirubin, AST, and ALT levels were much lower at 6 weeks than they were at admission.

Recommendation

Early diagnosis and regular monitoring of liver function are essential for effective management of leptospirosis. Public health strategies should focus on awareness and timely intervention to prevent hepatic complications.

Keywords- *Liver Function Test (LFT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Serum Glutamate Pyruvate Transaminase (SGPT), Leptospirosis, Duration of Hospital Stay.*
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Introduction

A zoonotic illness that is found throughout the world is leptospirosis [1, 2, 3]. It was once believed to be a sickness that only affected people in rural areas and sewage workers, but it is now resurfacing in metropolitan areas as a potentially fatal condition. Previously believed to be nonexistent in eastern and northern India, leptospirosis has lately been recorded from these regions despite being endemic in southern and western India [4, 5, 6, 7, 8, 9].

The Latin word "spira," which means "coiled," and the Greek word "leptos," which means "thin," are the roots of the phrase "Leptospira." Among the oldest spirochetes, it can be found in both animals and the wild. The family Leptospiraceae and the order Spirochaetales include the spirochetes known as Leptospira species. Autopsy specimens from a patient suspected of having yellow fever were the first to reveal the bacterium [10].

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For growth, leptospires need specific media and circumstances. Positive cultural shifts might occur over the course of weeks or months. Clinical, diagnostic, and epidemiologic objectives are best served by classifications based on serologic distinctions [11].

Clinical signs might range from minor symptoms like headache and myalgia, which are similar to an influenza-like illness, to severe symptoms including jaundice, renal, hepatic, and hemorrhagic diathesis. Among clinical features, jaundice is the most significant. Mild to severe is possible. It begins 4–7 days after the sickness. Rarely does hepatic encephalopathy or hepatic failure result in mortality. Typically, hepatomegaly and right hypochondrial pain are observed. In leptospirosis, abnormalities in liver function tests are prevalent. The levels of serum bilirubin, primarily direct bilirubin, can be significantly higher than those of other liver enzymes.

Leptospirosis should always be suspected in icteric patients with a slight elevation in transaminase. In contrast to viral hepatitis, serum aspartate aminotransferase (AST) is only slightly or moderately increased. When conditions worsen, the leptospirosis's systemic parenchymal cellular dysfunction may develop into widespread cellular necrosis, which would cause severe and widespread cell death in several organs, not just the liver and muscles, and result in an abnormally high AST. A delayed and excessive AST elevation in leptospirosis points to a fulminant illness course with substantial mortality. Therefore, serial transaminase monitoring may offer some indications to forecast the prognosis and severity of leptospirosis in addition to clinical symptoms [12].

Based on indications and symptoms, the study aims to determine the distribution of leptospirosis patients. Identifying the correlation between clinical factors at admission and six weeks later in leptospirosis patients is another goal.

Methodology

Study Design and Setting

This was a prospective observational cohort study conducted at the Veer Surendra Sai Institute of Medical Sciences and Research (VIMSAR), located in Burla, Sambalpur, Odisha, India. VIMSAR is a premier tertiary care teaching hospital in Western Odisha, catering to a diverse patient population across the state and nearby regions, known for its clinical and academic excellence. The research was conducted between February 2024 and January 2025.

Study Population

One hundred patients in all were enrolled in the trial. All patients with IgM lepto-antibody-positive a/c symptoms, patients between the ages of 19 and 79, patients of both sexes, and patients without a history of chronic illness or long-term medication were eligible to participate. Patients with a history of confounding risk factors for elevated liver function tests (LFT), such as chronic liver disease and alcoholism, were excluded.

Bias

To minimize selection bias, all eligible patients who met the inclusion criteria during the study period were consecutively enrolled. Information bias was reduced by using a standardized data collection form, and laboratory investigations were conducted in the same institution to maintain consistency in test methodology.

Study Size

The sample size of 100 participants was based on a pragmatic approach due to the limited duration of the study (12 months), availability of resources, and the incidence of IgM lepto-antibody-positive cases reported at the hospital during the pilot observation period. While formal power calculation was not employed, the sample size was deemed adequate for exploratory statistical comparisons.

Data Collection

Using a structural formula, a thorough history, physical examination, and baseline investigations were recorded. Clinical profiles and case histories were among the strategies employed. LFT-bilirubin, AST, alanine aminotransferase (ALT), alkaline phosphatase (ALP), total protein, and serum albumin were among the laboratory tests that were regularly performed throughout the patients' examination.

Statistical Analysis

SPSS version 24.0 was used to conduct the statistical analysis. After being first input into Microsoft Excel, the data was assessed. The data were displayed as mean±SD or n (%). The p-value was determined using the independent t-test. The p-value was considered significant at less than 0.05.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of VIMSAR. Ethical clearance was obtained on January 25, 2024, with the clearance number.

Results

A total of 134 patients were screened for eligibility during the study period. Out of these, 112 patients were found to be IgM lepto-antibody-positive and assessed further. Twelve patients were excluded due to the presence of chronic liver disease (n=7) or a history of long-term medication use (n=5). Finally, 100 patients fulfilled all inclusion criteria and were enrolled in the study. All 100 participants completed

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the 6-week follow-up period and were included in the final analysis. There were no dropouts or losses to follow up.

The socio-demographic profile of the participants is summarized below. The mean age of participants was 42.3 ± 13.8 years. Among them, 61 were males (61%) and 39 were females (39%). Occupation-wise distribution showed that 34% were farmers, 26% were daily wage laborers, 18% were homemakers, 12% were office workers, and 10% were students or unemployed.

Table 1 represents signs and symptoms observed among patients. Signs and symptoms included tachycardia, icterus, conjunctival congestion, oliguria, hypotension, hepatomegaly, subconjunctival hemorrhage, fever, myalgia, headache, vomiting, abdominal pain, rashes, and arthralgia. All 100 (100%) patients had fever along with myalgia.

Table 1. Signs and symptoms observed among patients

Signs and Symptoms	Value (n=100)
Tachycardia (pulse rate >100)	65 (65%)
Icterus	68 (68%)
Conjunctival congestion	64 (64%)
Oliguria	29 (29%)
Hypotension	25 (25%)
Hepatomegaly	28 (28%)
Subconjunctival hemorrhage	15 (15%)
Fever	100 (100%)
Myalgia	100 (100%)
Headache	75 (75%)
Vomiting	62 (62%)
Abdominal pain	51 (51%)
Rash	41 (41%)
Arthralgia	21 (21%)

Data was presented as n (%)

Table 2 depicts a comparison of parameters among patients at baseline and after 6 weeks. All the parameters, including AST, ALT, total bilirubin, direct bilirubin, ALP, total protein, and albumin, were found to be statistically significant at baseline and after 6 weeks.

Table 2. Comparison of parameters among patients at baseline and after 6 weeks

Parameters	At Baseline	After 6 weeks	p-value
AST	105.8±72.9	38.9±5.9	**<0.001**
ALT	55.9±28.9	22.6±32.9	**<0.001**
Total Bilirubin	4.59±3.7	1.09±2.9	**<0.001**
Direct Bilirubin	2.98±1.8	0.34±0.2	**<0.001**
ALP	138.6±74.3	92.8±18.5	**<0.001**
Total Protein	7.1±0.23	6.5±0.41	**<0.001**
Albumin	3.8±0.19	3.1±0.39	**<0.001**

Data was presented as mean±SD
P-value was considered significant at less than 0.05

Discussion

Key Results

The present study enrolled 100 IgM-positive leptospirosis patients and assessed clinical symptoms and liver function parameters at baseline and after six weeks. Fever and myalgia were the most common symptoms (100%), followed by headache (75%), vomiting (62%), and icterus (68%). Liver function parameters such as AST, ALT, total bilirubin, direct bilirubin, ALP, total protein, and albumin showed significant improvement from baseline to six weeks ($p < 0.001$), indicating clinical recovery.

Interpretation

These findings support the hypothesis that leptospirosis leads to significant hepatic involvement, which gradually resolves over time with appropriate treatment. The age distribution in this study, with 69% of participants in the 20–49 age range, mirrors earlier research by Singh SS et al. [13]. Similarly, the predominance of outdoor workers, particularly farmers, aligns with the findings of MA Muthusethupathi et al. and is consistent with studies conducted during high-rainfall periods, such as those by H. Sahira, R. Jyothi, and J.T. Ramani Bai in Kerala, India [14]. The high prevalence of icterus and elevated liver enzymes aligns with findings from Bhattacharjee K et al. and Tantitanawat S et al., who also reported elevated bilirubin and aminotransferase levels in leptospirosis patients [15,16]. The trend of elevated SGOT and SGPT levels, observed in over 90% of patients, was consistent with Zala DB et al.'s findings [17], underscoring liver dysfunction as a common manifestation. These results affirm that liver involvement in leptospirosis is significant and measurable through biochemical parameters, which tend to normalize with recovery.

Generalizability

This study was conducted in a specific region and may reflect regional occupational and environmental exposure patterns, such as farming and monsoon-related infections. However, the consistency of our findings with other national and international studies suggests a degree of generalizability, particularly in similar tropical or subtropical climates with comparable socioeconomic and occupational contexts. Broader studies across diverse settings could help validate these findings further.

Conclusion

The study came to the conclusion that elevated levels of bilirubin and transaminases were the primary way that the liver was involved in leptospirosis. Patients' bilirubin, AST, and ALT levels were much lower at 6 weeks than they were at admission. Patients who had elevated levels of AST, ALT, and total bilirubin stayed in the hospital for longer.

Limitations

This study was conducted in a tertiary care facility, which may have introduced referral bias. Additionally, the limited duration of the study may have affected the ability to observe long-term outcomes and complications.

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Source of Funding

The authors declare that no external funding was received for the conduct of this study.

Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

[Author A] conceptualized and designed the study. [Author B] collected and analyzed the data. [Author C] contributed to data interpretation and manuscript writing. All authors read and approved the final manuscript.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Recommendations

To determine whether leptospirosis patients may experience any issues in the future, long-term follow-ups are necessary.

List of Abbreviations

LFT- Liver Function Tests
ALT- Alanine aminotransferase
AST- Aspartate aminotransferase
ALP- Alkaline phosphatase
VIMSAR- Veer Surendra Sai Institute of Medical Sciences and Research

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