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CLINICAL PROFILE AND ETIOLOGICAL SPECTRUM OF ABNORMAL LIVER FUNCTION TESTS IN HOSPITALIZED PATIENTS AT A TERTIARY CARE CENTER IN NORTH INDIA: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Abnormal liver function tests (LFTs) are frequently encountered in hospitalized patients and may indicate a broad range of hepatic and systemic conditions. Interpretation of these abnormalities is essential for appropriate diagnosis and management, particularly in resource-limited settings.

Objectives: To assess the clinical profile, patterns, and etiological spectrum of abnormal liver function tests among hospitalized patients in a tertiary care hospital in North India.

Methods: This hospital-based cross-sectional observational study was conducted from January to April 2020 and included 42 adult inpatients with at least one abnormal liver function parameter. Data were collected using a structured proforma, including demographic details, clinical presentation, laboratory investigations, and imaging findings. LFT patterns were categorized as hepatocellular, cholestatic, or mixed. Statistical analysis was performed using SPSS version 22.0, with $p < 0.05$ considered statistically significant.

Results: The majority of patients were in the 31–50 years age group, with a male predominance. The hepatocellular pattern was the most common type of liver enzyme abnormality, followed by cholestatic and mixed patterns. Alcohol-related liver disease was the leading cause, followed by viral hepatitis and drug-induced liver injury. A statistically significant association was observed between the pattern of LFT abnormality and underlying etiology ($p < 0.05$). Clinically, jaundice and fatigue were the most common presenting features, although a subset of patients remained asymptomatic.

Conclusion: Abnormal LFTs in hospitalized patients are most commonly associated with hepatocellular injury, with alcohol-related liver disease being the predominant cause. A structured, pattern-based approach to evaluation, combined with thorough clinical assessment, can aid in accurate diagnosis and management. Routine screening and early detection are crucial for improving patient outcomes.

Keywords: Abnormal liver function tests; hepatocellular injury; alcohol-related liver disease; drug-induced liver injury; viral hepatitis; tertiary care hospital; India

INTRODUCTION

Abnormal liver function tests (LFTs) are frequently encountered in clinical practice and represent a significant diagnostic challenge, particularly in hospitalized patients. Globally, liver diseases contribute substantially to morbidity and mortality, with an estimated 2 million deaths annually attributed to liver-related conditions [1]. Liver function tests—including serum aminotransferases, alkaline phosphatase, bilirubin, and albumin—are widely used as biochemical indicators of hepatocellular injury, cholestasis, and synthetic function. However, abnormalities in these parameters are not always specific to primary liver pathology and may reflect systemic illness, drug toxicity, or extrahepatic conditions [2].

In hospital settings, especially inpatients, abnormal LFTs are commonly detected either as part of routine investigations or during evaluation of unrelated conditions. Studies from developed countries suggest that up to 20–30% of hospitalized patients may demonstrate some degree of liver enzyme abnormality during their stay [3]. These abnormalities may arise due to a wide spectrum of etiologies, including infections, ischemic hepatitis, drug-induced liver injury (DILI), alcohol-related liver disease, and metabolic disorders [4]. The interpretation of such abnormalities requires careful clinical correlation, as transient or mild elevations may not necessitate extensive workup, whereas significant or persistent derangements may indicate serious underlying pathology.

In the Indian context, liver diseases remain a major public health concern, with diverse etiological patterns influenced by socioeconomic, environmental, and healthcare factors. Viral hepatitis (particularly hepatitis B and C), alcohol-related liver disease, and non-alcoholic fatty liver disease (NAFLD) are among the leading causes of abnormal LFTs [5]. Additionally, the widespread use of over-the-counter medications and herbal remedies contributes to an increasing burden of drug-induced hepatotoxicity [6]. In tertiary care settings in North India, patients often present with advanced disease or multiple comorbidities, further complicating the interpretation of biochemical abnormalities.

Despite the high prevalence of abnormal LFTs in hospitalized patients, there is limited data from Indian tertiary care centers systematically evaluating the patterns, etiologies, and clinical significance of these abnormalities. Most available studies are either outpatient-based or focused on specific liver diseases rather than a comprehensive inpatient population [7]. Furthermore, variations in diagnostic approaches and resource availability across institutions may influence clinical decision-making and outcomes.

Understanding the spectrum of abnormal LFTs in hospitalized patients is essential for optimizing diagnostic strategies, avoiding unnecessary investigations, and ensuring timely management. Identifying common etiologies and patterns can also aid clinicians in prioritizing differential diagnoses and guiding further evaluation. Moreover, such data are valuable in resource-limited settings where cost-effective and evidence-based approaches are crucial.

Given this background, there is a need for a focused assessment of abnormal liver function tests among hospitalized patients in a tertiary care hospital in North India. This study aims to evaluate the prevalence, patterns, and possible etiological factors associated with abnormal LFTs in this population. The objective is to provide clinically relevant insights that can enhance diagnostic accuracy and improve patient management in similar healthcare settings.

METHODOLOGY

Study Design: This was a hospital-based observational, cross-sectional study designed to assess the pattern and etiological profile of abnormal liver function tests among hospitalized patients. The study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines to ensure methodological rigor and transparency.

Study Setting: The study was conducted in a tertiary care teaching hospital in North India, catering to a diverse patient population from both urban and rural backgrounds. Patients admitted under various departments including medicine, surgery, and allied specialties were considered.

Study Duration: The study was carried out over a period of four months, from January 2020 to April 2020.

Study Population: The study population included adult patients admitted to the hospital who were found to have abnormal liver function tests during their hospital stay, either at admission or during inpatient evaluation.

Inclusion Criteria

Patients aged ≥18 years
Hospitalized patients with at least one abnormal liver function parameter (elevated AST, ALT, ALP, or bilirubin beyond laboratory reference range)
Patients who provided informed consent

Exclusion Criteria

Patients with previously diagnosed chronic liver disease under active treatment and regular follow-up
Pregnant women
Patients with incomplete clinical or laboratory data
Patients unwilling to participate in the study

Sample Size: The sample size was calculated using the formula for estimating a proportion in a descriptive study:
$n = Z^2 \times p \times (1 – p) / d^2$
Assuming a prevalence (p) of abnormal liver function tests among hospitalized patients to be approximately 30% based on previous literature, with a 95% confidence interval (Z = 1.96) and absolute precision (d) of 15%, the calculated sample size was:
$n = (1.96)^2 \times 0.3 \times (0.7) / (0.15)^2 \approx 36$
To account for possible incomplete data, the sample size was increased, and a total of 42 patients were included in the study.

Sampling Technique: A consecutive sampling technique was employed, wherein all eligible patients meeting the inclusion criteria during the study period were enrolled until the required sample size of 42 was achieved.

Data Collection Tools & Procedure: Data were collected using a predesigned and pretested structured proforma. Demographic details, clinical history, presenting complaints, comorbidities, alcohol and drug history, and relevant physical examination findings were recorded. Laboratory investigations included liver function tests (AST, ALT, ALP, total and direct bilirubin, serum

albumin), complete blood count, viral hepatitis markers (HBsAg, anti-HCV), and imaging studies such as abdominal ultrasonography where indicated. The pattern of liver injury was categorized as hepatocellular, cholestatic, or mixed based on enzyme elevation ratios. Patients were followed during their hospital stay for further evaluation and final diagnosis.

Study Variables: Independent variables included demographic characteristics (age, sex), risk factors (alcohol use, medication history), comorbid conditions (diabetes, hypertension), and clinical features. The dependent variables were the presence and pattern of abnormal liver function tests, categorized based on biochemical parameters. Etiological diagnosis was also considered an outcome variable, determined through clinical, laboratory, and radiological correlation.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 22.0. Descriptive statistics were used to summarize demographic and clinical characteristics. Continuous variables were expressed as mean ±standard deviation, while categorical variables were presented as frequencies and percentages. Associations between categorical variables were analyzed using the Chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants prior to enrollment. Confidentiality of patient information was strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki for research involving human subjects.

RESULTS

A total of 42 hospitalized patients with abnormal liver function tests were included in the study. The majority of patients belonged to the 31–50 years age group, and males were more commonly affected than females (Table 1)

Table 1: Demographic characteristics of study participants (n = 42)

Variable	Category	Number (n)	Percentage (%)
Age group (years)	18–30	8	19.0
	31–50	16	38.1
	51–70	14	33.3
	>70	4	9.5
Sex	Male	26	61.9
	Female	16	38.1

The hepatocellular pattern of liver injury was the most frequently observed abnormality, followed by cholestatic and mixed patterns, which were equally represented (Table 2)

Table 2: Pattern of liver function test abnormalities (n = 42)

Pattern of LFT abnormality	Number (n)	Percentage (%)
Hepatocellular	18	42.9
Cholestatic	12	28.6
Mixed	12	28.6

Alcohol-related liver disease emerged as the most common etiology, followed by viral hepatitis and drug-induced liver injury. Sepsis-related liver dysfunction and non-alcoholic fatty liver disease were also notable contributors (Table 3)

Table 3: Etiological distribution of abnormal LFTs (n = 42)

Etiology	Number (n)	Percentage (%)
Alcohol-related liver disease	10	23.8
Viral hepatitis (B/C)	8	19.0
Drug-induced liver injury (DILI)	7	16.7
Sepsis-related liver dysfunction	6	14.3
Non-alcoholic fatty liver disease	5	11.9
Others (ischemic, malignancy)	6	14.3

A statistically significant association was observed between the pattern of liver function abnormality and underlying etiology ($p = 0.041$), with hepatocellular patterns more frequently seen in alcohol-related and viral causes, while cholestatic patterns were more common in sepsis and obstructive conditions (Table 4).

Table 4: Association between pattern of LFT abnormality and etiology (n = 42)

Etiology	Hepatocellular (n=18)	Cholestatic (n=12)	Mixed (n=12)	p-value
Alcohol-related liver disease	6	2	2	0.041*
Viral hepatitis	5	1	2	
Drug-induced liver injury	3	2	2	
Sepsis	1	3	2	
NAFLD	2	1	2	
Others	1	3	2	

*Statistically significant ($p < 0.05$)

Clinically, jaundice was the most common presenting feature, followed by fatigue and abdominal pain. A subset of patients remained asymptomatic despite abnormal biochemical findings (Table 5)

Table 5: Clinical presentation among study participants (n = 42)

Symptom/Sign	Number (n)	Percentage (%)
Jaundice	20	47.6
Fatigue	18	42.9
Abdominal pain	15	35.7
Nausea/Vomiting	14	33.3
Fever	12	28.6
Asymptomatic	8	19.0

DISCUSSION

The present study evaluated the spectrum, patterns, and etiologies of abnormal liver function tests (LFTs) among hospitalized patients in a tertiary care setting in North India. The key findings indicate that abnormal LFTs were more common among middle-aged males, with the hepatocellular pattern being the predominant biochemical abnormality. Alcohol-related liver disease emerged as the leading etiology, followed by viral hepatitis and drug-induced liver injury (DILI). A statistically significant association between the pattern of liver enzyme derangement and underlying etiology was also observed.

The predominance of male patients and the concentration of cases in the 31–50 years age group are consistent with previously reported epidemiological trends in liver disease [5,7]. This demographic pattern may be attributed to higher exposure to risk factors such as alcohol consumption, occupational stress, and lifestyle-related metabolic conditions. Similar findings have been reported in other Indian studies, where male preponderance and middle-age predominance were commonly observed among patients with liver dysfunction [7].

In this study, the hepatocellular pattern was the most frequent, accounting for approximately two-fifths of cases. This aligns with earlier observations that hepatocellular injury is the most common biochemical pattern in hospitalized patients, particularly in the context of alcohol use, viral infections, and DILI [2,4]. The predominance of this pattern may reflect the higher burden of direct hepatocyte injury in the inpatient setting. Cholestatic and mixed patterns were also observed, emphasizing the need for a comprehensive diagnostic approach.

Alcohol-related liver disease was identified as the most common cause of abnormal LFTs, consistent with regional data highlighting alcohol as a major contributor to liver morbidity in India [5]. The increasing trend of alcohol consumption, particularly among younger populations, may explain this finding. Viral hepatitis (hepatitis B and C) was the second most common etiology, which is in agreement with the known endemicity of these infections in the Indian subcontinent [5]. The contribution of DILI in our study further underscores the importance of careful drug history, especially given the widespread use of over-the-counter medications and alternative therapies [6].
Sepsis-related liver dysfunction was another notable finding, particularly associated with cholestatic patterns. This is consistent with the concept of sepsis-associated cholestasis, where inflammatory mediators and impaired bile flow contribute to biochemical abnormalities [4]. Additionally, non-alcoholic fatty liver disease (NAFLD) was identified in a subset of patients, reflecting the growing burden of metabolic liver disease in India due to urbanization and lifestyle changes.

The statistically significant association between LFT patterns and etiologies observed in this study highlights the clinical utility of biochemical classification in guiding diagnostic evaluation. For instance, hepatocellular patterns were more commonly linked with alcohol-related and viral causes, while cholestatic patterns were associated with sepsis and obstructive processes. This finding is supported by existing clinical guidelines, which recommend pattern-based approaches for the evaluation of abnormal liver chemistries [4].

From a clinical perspective, the presence of symptoms such as jaundice and fatigue in a significant proportion of patients indicates that abnormal LFTs often correlate with clinically overt disease. However, nearly one-fifth of patients were asymptomatic, emphasizing the importance of routine biochemical screening in hospitalized individuals. Early detection of abnormal LFTs can facilitate timely intervention and prevent progression to severe liver injury.

The strengths of this study include its focus on a hospitalized population and the systematic evaluation of both biochemical patterns and etiological factors. The use of standardized criteria for classification and adherence to observational study guidelines enhance the reliability of findings. However, certain limitations must be acknowledged. The relatively small sample size (n = 42) may limit the generalizability of results. Additionally, the cross-sectional design precludes assessment of temporal relationships and outcomes. Being a single-center study, regional variations may also influence the findings. Furthermore, advanced diagnostic modalities such as liver biopsy were not routinely performed, which may have affected etiological classification in some cases.

This study provides valuable insights into the profile of abnormal liver function tests among hospitalized patients in a North Indian tertiary care setting. The findings underscore the predominance of hepatocellular injury and highlight alcohol-related liver disease as the leading cause. A pattern-based approach to interpretation, combined with thorough clinical evaluation, remains essential for accurate diagnosis and management.

CONCLUSION

Abnormal liver function tests are a common finding among hospitalized patients and often reflect a wide spectrum of underlying conditions. In this study, the hepatocellular pattern emerged as the most frequent biochemical abnormality, with alcohol-related liver disease being the leading etiology, followed by viral hepatitis and drug-induced liver injury. The significant association between LFT patterns and underlying causes highlights the clinical value of a pattern-based diagnostic approach.The presence of both symptomatic and asymptomatic patients underscores the importance of routine biochemical evaluation in hospitalized settings. Early identification and appropriate interpretation of abnormal LFTs can facilitate timely diagnosis, reduce unnecessary investigations, and improve patient outcomes. Given the rising burden of alcohol use and metabolic disorders, targeted preventive strategies and patient education are warranted.
Further large-scale, multicentric studies are recommended to validate these findings and explore long-term outcomes associated with abnormal liver function tests in diverse patient populations.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.
Consent: Written informed consent was obtained from all participants prior to inclusion in the study.
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