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ORIGINAL RESEARCH

Evaluating Biochemical Changes in Liver Function Tests in Liver diseases

Dr. Bhavinkumar Rameshkumar Mevada[1], Dr. Jignesh Maganlal Solanki[2], Dr. K. Swetha[3], Dr. D. Vennela[4]

[1,2]Junior Resident, Department of Surgery, GMERS Medical College& Hospital, Vadnagar, Gujarat, India
[3]Assistant Professor, Department of Biochemistry, Niloufer Children's Hospital, Hyderabad, Telangana, India
[4]Assistant Professor, Department of Biochemistry, MNJ Institute of Oncology & Regional Cancer Center, Hyderabad, Telangana, India

Corresponding Author
Dr. D. Vennela
Assistant Professor, Department of Biochemistry, MNJ Institute of Oncology & Regional Cancer Center, Hyderabad, Telangana, India
Email: dr.venneladasari@gmail.com

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ABSTRACT

Background: Liver diseases in India have experienced a marked increase due to multiple contributing factors, including viral hepatitis, alcohol-induced liver damage, non-alcoholic fatty liver disease, and various metabolic and genetic conditions. Liver function tests (LFTs) are essential diagnostic tools for clinicians, providing critical information about the intricate relationship between liver health and disease pathology. This study aimed to comprehensively analyze the changes in LFT parameters associated with common liver disorders prevalent in India. **Materials and Methods:** This research involved collecting clinical data and samples from 145 patients diagnosed with liver diseases who attended an Indian hospital. Written informed consent was secured from all participants. Venous blood was drawn from each participant following standard venipuncture technique. Hepatitis B surface antigen (HBsAg), Bilirubin levels, Serum glutamate pyruvate transaminase (SGPT), Prothrombin time, Serum protein and albumin-to-globulin (AG) ratio were measured using a combination of fully and semi-automated analyzers. **Results:** The study revealed a 15.86% prevalence of cirrhosis among the participants. Liver diseases were more commonly observed in males, with the most affected age group being 51–60 years. Bilirubin levels were notably altered in conditions such as cirrhosis (73.91%), obstructive jaundice (91.43%), alcoholic liver disease (93.10%), viral hepatitis (75.86%), and other liver disorders (86.21%). **Conclusion:** Changes in LFT parameters are instrumental in identifying the underlying causes of liver diseases. Specific alterations in liver enzymes and HBsAg reactivity were particularly significant in diagnosing cirrhosis and viral hepatitis.

Key Words: Liver Function Tests; Cirrhosis; Bilirubin; Albumin

INTRODUCTION

The prevalence of liver diseases in India has been steadily increasing, driven by factors such as viral hepatitis, alcoholic liver disease, non-alcoholic fatty liver disease (NAFLD), and various metabolic and genetic conditions. These disorders present a significant public health challenge across the subcontinent, necessitating a comprehensive understanding of changes in liver function tests (LFTs) for accurate diagnosis and optimal management. LFTs are critical diagnostic tools, offering clinicians' valuable insights into the intricate relationship between liver health and disease pathophysiology. Given the distinctive etiological profile of liver diseases in India, it is crucial to investigate the specific alterations in LFTs linked to the liver disorders commonly encountered in this region [1].

Hepatitis B and C, which are widespread in several parts of India, often progress to chronic liver diseases, influencing biochemical markers such as alanine aminotransferase and aspartate aminotransferase levels. Additionally, the rising prevalence of NAFLD within the Indian population highlights the importance of understanding the metabolic underpinnings of liver dysfunction and their effects on LFT parameters. Prolonged exposure to hepatotoxic agents, stemming from traditional practices and modern lifestyles, further exacerbates liver injury and necessitates detailed assessment of markers such as alkaline phosphatase (ALP) and gamma-glutamyl transferase. Moreover, the significant burden of gallstones and associated cholestatic liver diseases introduces additional complexity in interpreting LFT results, with direct implications for patient care and clinical outcomes [2-5].

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This study aims to provide an in-depth analysis of LFT changes associated with various liver diseases prevalent in India. By synthesizing the existing body of knowledge, the paper seeks to enhance the diagnostic capabilities of healthcare professionals, ultimately contributing to improved management strategies and patient outcomes in the realm of liver diseases in the Indian context.

MATERIAL AND METHODS

The study included the collection of blood samples from 145 patients diagnosed with liver diseases who sought treatment at an Indian Hospital.

Venous blood was drawn from each participant following the acquisition of informed consent. Standard venipuncture techniques were employed, and the blood was collected in vacutainer tubes. The samples were subsequently transported to the laboratory for further processing. Upon reaching the laboratory, the blood samples underwent centrifugation to separate the serum from the cellular components. The isolated serum was then aliquoted into labeled tubes and stored appropriately until biochemical analysis was conducted.

Comprehensive biochemical evaluations were performed on the serum samples using a combination of fully and semi-automated analyzers. Specific tests included: Hepatitis B surface antigen (HBsAg), Bilirubin levels, Serum glutamate pyruvate transaminase (SGPT), Prothrombin time, Serum protein and albumin-to-globulin (AG) ratio. Stringent quality control protocols were maintained to ensure the accuracy and precision of test results. Regular calibration of the analyzers was performed, and internal quality control samples were analyzed concurrently with patient samples.

Descriptive statistics, including the calculation of means and standard deviations, were employed for quantitative data analysis. P value of<0.05 was taken as significant.

RESULTS

The demographic data presented in Table 1 indicates that the majority of liver disease patients fall within the 51–60 years age group, accounting for 33.79% (49 patients) of the study cohort. The overall age distribution highlights a predominance of middle-aged patients in the study population. Regarding gender, there is a clear male predominance, with 120 male patients (82.76%) compared to 25 female patients (17.24%).

Table 1: Demographics of Liver disease patients under study

Variables	n	%
Age groups (years)		
21–30	20	13.79
31–40	29	20.00
41–50	37	25.52
51–60	49	33.79
>60	10	6.90
Gender		
Male	120	82.76
Female	25	17.24

Table 2 shows the gender distribution for specific liver diseases. Alcoholic Liver Disease was predominantly found in males, with 20 male patients (13.79%) and just 3 female patients (2.07%). Similarly, Liver Cirrhosis showed a significant gender disparity, with 34 male patients (23.45%) compared to only 1 female patient (0.69%). All liver diseases exhibited a male predominance.

Table 2: Gender distribution of liver diseases

Liver Diseases	Male		Female		Total	
	n	%	n	%	n	%
Alcoholic Liver Disease	20	13.79	3	2.07	23	15.86
Liver Cirrhosis	34	23.45	1	0.69	35	24.14
Obstructive Jaundice	17	11.72	12	8.28	29	20.00
Viral Hepatitis	23	15.86	6	4.14	29	20.00
Other Liver Diseases	26	17.93	3	2.07	29	20.00

The age distribution across different liver diseases is further explored in Table 3. Alcoholic Liver Disease primarily affected individuals in the 41–50 years (7 patients) and 51–60 years (6 patients) age groups, suggesting that middle-aged adults are more susceptible to this condition. Liver Cirrhosis, on the other hand, was most common in the 51–60 years age group. Viral Hepatitis showed a similar trend, with the majority of patients spread across the 41–50 years (8 patients) and 51–60 years (9 patients) age groups.

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Table 3: Age distribution of liver diseases

Liver Diseases	Age Groups					Total	
	21–30	31–40	41–50	51–60	>60	n	%
Alcoholic Liver Disease	3	6	7	6	1	23	15.86
Liver Cirrhosis	3	3	10	16	3	35	24.14
Obstructive Jaundice	4	6	6	9	4	29	20.00
Viral Hepatitis	4	6	8	9	2	29	20.00
Other Liver Diseases	6	8	6	9	0	29	20.00

Table 4 presents the frequency of elevated LFTs across various liver diseases. Bilirubin levels were raised in 17 patients with Alcoholic Liver Disease and 32 with Liver Cirrhosis, indicating severe hepatic dysfunction. SGPT levels were elevated in 19 Alcoholic Liver Disease and 13 Liver Cirrhosis patients, suggesting liver injury. ALP levels were increased in 17 Alcoholic Liver Disease and 32 Liver Cirrhosis patients, associated with hepatic cholestasis. HBsAg was elevated in 7 Liver Cirrhosis, 15 Viral Hepatitis, and 1 Other Liver Disease patient, suggesting viral hepatitis involvement. PT was elevated in 29 Obstructive Jaundice and 10 Viral Hepatitis patients, reflecting coagulation impact. The A:G ratio was most altered in 15 Alcoholic Liver Disease patients, indicating significant liver dysfunction.

Table 4: Frequency of elevated LFTs in study participants

Liver Disease	Bilirubin	SGPT	ALP	HBsAg	PT	A:G Ratio
Alcoholic Liver Disease	17	19	17	3	7	15
Liver Cirrhosis	32	13	32	7	7	7
Obstructive Jaundice	27	26	10	3	0	15
Viral Hepatitis	22	17	15	15	29	10
Other Liver Diseases	25	13	9	1	4	4

DISCUSSION

This study is focused on evaluating several key parameters that are indicative of the inflammatory processes, immune responses, and cellular damage associated with liver diseases. The selected biomarkers for this assessment include bilirubin, serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP), hepatitis B surface antigen (HBsAg), prothrombin time, and the albumin-to-globulin (A:G) ratio. These parameters are critical in understanding the extent of hepatocellular damage and the functional status of the liver in various disease states.

The results from our study revealed the prevalence of different liver diseases, with cirrhosis of the liver, viral hepatitis, obstructive jaundice, and alcoholic liver disease being observed in 24.14%, 20%, 20%, and 15.86% of the study population, respectively. This prevalence distribution provides valuable insight into the burden of these conditions in the studied cohort. Notably, a study by Sayal et al. found that alcoholic liver diseases had a significantly higher prevalence of 40% in their population, indicating potential regional or demographic variations in the prevalence of liver diseases [6].

Our findings demonstrate significant elevations in serum levels of bilirubin, SGPT, ALP, HBsAg, prothrombin time, and the A:G ratio across various liver conditions such as obstructive jaundice, viral hepatitis, cirrhosis of the liver, alcoholic liver disease, and other hepatic disorders. The increase in these biomarkers reflects the extent of hepatic injury and dysfunction associated with these diseases. These results are consistent with the observations made by Pradeep et al., who also reported similar alterations in liver function markers in their study [7]. Similar results were reported by previous studies [8-12]

This study provides foundational data on the alterations in liver function associated with a range of hepatic diseases. The results highlight the utility of liver function tests (LFTs) in diagnosing and monitoring these conditions. However, the study was conducted within a limited setting, restricting the ability to generalize the findings across larger populations or diverse clinical environments. To strengthen the validity and applicability of the findings, it is essential to conduct multicentric studies that can evaluate the results on a broader scale, providing more robust and generalizable conclusions. Additionally, such studies would help in exploring regional variations and in refining diagnostic and therapeutic strategies for liver diseases.

CONCLUSION

Alterations in LFTs serve as valuable indicators for identifying the underlying causes of liver diseases. Changes in liver enzyme levels and HBsAg reactivity are particularly significant in diagnosing cirrhosis and viral hepatitis. Elevated alkaline phosphatase (ALP) levels are notably associated with the advanced stages of chronic alcoholic liver disease and obstructive jaundice. Additional parameters, including prothrombin time, albumin-to-globulin (A:G) ratio, and serum bilirubin, provide supportive evidence for accurate diagnosis.

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