RESEARCH PAPER

Evaluation of Liver Function Test Abnormalities in Newly Diagnosed Versus Chronic Type 2 Diabetes Mellitus

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ABSTRACT

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder of global significance, characterized by persistent hyperglycemia resulting from insulin resistance and relative insulin deficiency. In addition to well-known microvascular and macrovascular complications, increasing evidence highlights the liver as a major target organ affected in diabetes. Hepatic involvement, particularly in the form of non-alcoholic fatty liver disease (NAFLD), is highly prevalent among diabetic patients and contributes significantly to morbidity and disease progression. Liver dysfunction in T2DM is often asymptomatic in early stages and can only be detected through biochemical investigations such as liver function tests (LFTs).

The present study was conducted to evaluate and compare liver function test abnormalities in newly diagnosed and chronic type 2 diabetes mellitus patients, with the aim of understanding the impact of disease duration on hepatic function. This hospital-based cross-sectional observational study included a total of 100 patients diagnosed with T2DM, who were divided into two groups: newly diagnosed patients (≤6 months duration) and chronic patients (>5 years duration), with 50 patients in each group. Venous blood samples were collected under aseptic conditions, and serum levels of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and total bilirubin were measured using standard automated biochemical methods. Statistical analysis was performed using appropriate tests, and a p-value of less than 0.05 was considered statistically significant.

The results of the study demonstrated a statistically significant elevation in serum ALT and AST levels among chronic diabetic patients compared to newly diagnosed patients ($p < 0.001$), indicating progressive hepatocellular injury with increasing duration of diabetes. In contrast, ALP and total bilirubin levels did not show statistically significant differences between the two groups, suggesting that cholestatic dysfunction may occur later in the disease course. The frequency of abnormal liver enzyme levels was also higher in chronic patients, further supporting the association between prolonged hyperglycemia and hepatic damage.

In conclusion, the findings of this study emphasize that liver dysfunction is a common and progressive complication of type 2 diabetes mellitus, particularly in patients with longer disease duration. Routine monitoring of liver function tests, especially ALT and AST, is essential for early detection of hepatic abnormalities and prevention of advanced liver disease. Incorporating regular LFT screening into the clinical management of diabetic patients can significantly improve patient outcomes and reduce long-term complications.

Keywords: Type 2 Diabetes Mellitus, Liver Function Tests, ALT, AST, NAFLD, Hepatic Dysfunction.

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INTRODUCTION

Type 2 diabetes mellitus is one of the most rapidly increasing metabolic disorders worldwide and poses a significant burden on healthcare systems. It is characterized by insulin resistance and impaired insulin secretion, leading to chronic hyperglycemia. While the

classical complications of diabetes include microvascular and macrovascular damage, liver involvement has emerged as an important but often under-recognized complication.

The liver plays a central role in maintaining glucose homeostasis through glycogenesis, glycogenolysis, and gluconeogenesis. In T2DM, insulin resistance leads to increased hepatic glucose output and lipid accumulation within hepatocytes. This results in the development of non-alcoholic fatty liver disease, which can progress to steatohepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma if left untreated.

Liver function tests are widely used to assess hepatic health. Alanine aminotransferase and aspartate aminotransferase are markers of hepatocellular injury, while alkaline phosphatase and bilirubin indicate cholestatic and excretory functions. Elevated liver enzymes are frequently observed in diabetic patients and are associated with disease duration and severity.

Despite the growing recognition of hepatic involvement in diabetes, there is limited data comparing liver function abnormalities between newly diagnosed and chronic T2DM patients. Understanding this relationship is essential for early intervention and prevention of long-term complications.

MATERIALS AND METHODS

Study Design and Setting

This study was designed as a hospital-based cross-sectional observational study conducted over a period of six months in the Department of Pathology at Balvir Singh Tomar Institute of Medical Science and Research, Jaipur. The study aimed to evaluate and compare liver function test abnormalities in newly diagnosed and chronic type 2 diabetes mellitus patients.

Study Population and Sample Size

A total of 100 patients diagnosed with type 2 diabetes mellitus were included in the study. The participants were divided into two groups based on duration of disease:

- **Group I:** Newly diagnosed T2DM patients (≤6 months duration) — 50 cases
- **Group II:** Chronic T2DM patients (>5 years duration) — 50 cases

Patients were selected from outpatient and inpatient departments using a purposive sampling method.

Inclusion Criteria

- Patients aged 30 years and above
- Confirmed diagnosis of type 2 diabetes mellitus
- Willing to participate and provide informed consent

Exclusion Criteria

- History of chronic liver disease
- Alcohol consumption
- Viral hepatitis (HBV, HCV)
- Use of hepatotoxic drugs
- Pregnancy
- Type 1 diabetes mellitus

Clinical Evaluation

Detailed clinical history was obtained from all participants, including duration of diabetes, medication history, lifestyle factors, and associated comorbidities. A thorough physical examination was performed, and relevant clinical findings were recorded.

Sample Collection

Venous blood samples (5 mL) were collected from each patient under aseptic conditions. Samples were collected after an overnight fast to minimize variability in biochemical parameters.

Blood samples were collected in plain vacutainers and allowed to clot at room temperature. Serum was separated by centrifugation at 3000 rpm for 10 minutes and used for biochemical analysis.

Biochemical Analysis

Liver function tests were performed using standard automated biochemical analyzers. The parameters analyzed included:

- Alanine aminotransferase (ALT)
- Aspartate aminotransferase (AST)
- Alkaline phosphatase (ALP)
- Total bilirubin

All tests were performed using commercially available reagent kits following manufacturer protocols.

Quality Control Measures

Internal quality control (IQC) procedures were followed daily using control sera to ensure accuracy and reliability of results. External quality assurance (EQA) programs were adhered to as per laboratory standards.

Calibration of instruments was performed regularly, and all reagents were checked for expiry and proper storage conditions before use.

Statistical Analysis

Data obtained from the study were entered and analyzed using **IBM SPSS Statistics (version 25)**.

- Continuous variables were expressed as **mean ± standard deviation (SD)**

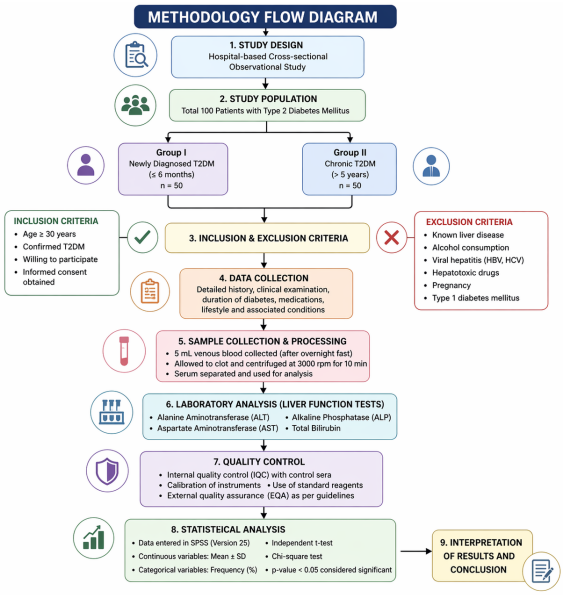
- Categorical variables were expressed as **frequency and percentage**
- Comparison between groups was performed using:
  - **Independent t-test** (for continuous variables)
  - **Chi-square test** (for categorical variables)

  A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to inclusion in the study.

Confidentiality of patient data was strictly maintained, and all procedures were carried out in accordance with ethical guidelines.



RESULTS

Table 1: Liver Function Test Comparison

Parameter	Newly Diagnosed	Chronic	p-value
ALT	32.4 ± 8.2	58.6 ± 12.5	<0.001
AST	29.1 ± 7.5	52.3 ± 11.8	<0.001
ALP	110 ± 20	118 ± 25	0.182
Bilirubin	0.8 ± 0.2	0.9 ± 0.3	0.210

Table 2: Frequency of Abnormal LFT

Parameter	Newly (%)	Chronic (%)	p-value
ALT	30%	60%	0.003
AST	24%	50%	0.007
ALP	18%	22%	0.621
Bilirubin	10%	14%	0.540

Figure 1: Pie chart showing distribution of elevated ALT levels between newly diagnosed and chronic diabetic patients.

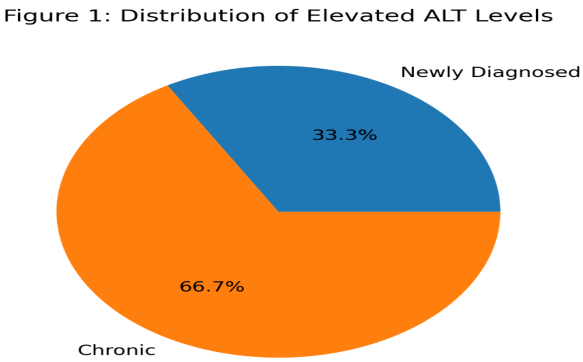


Figure 2: Bar graph comparing elevated ALT levels, showing significantly higher prevalence in chronic patients (p = 0.003).

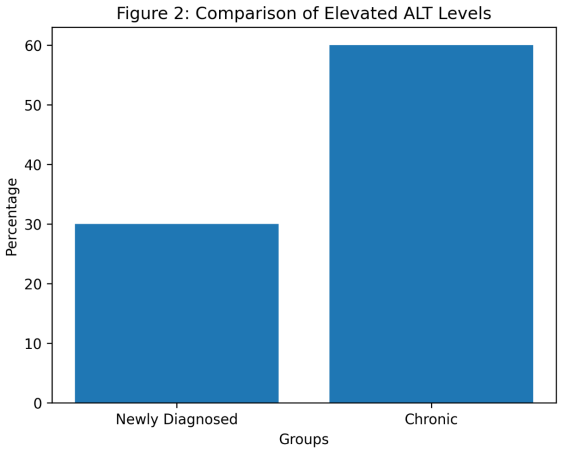


Figure 3: Pie chart showing distribution of elevated AST levels.

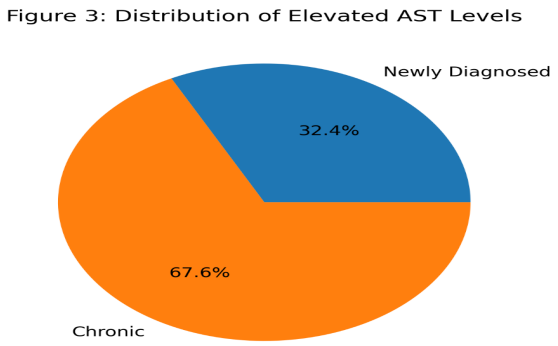
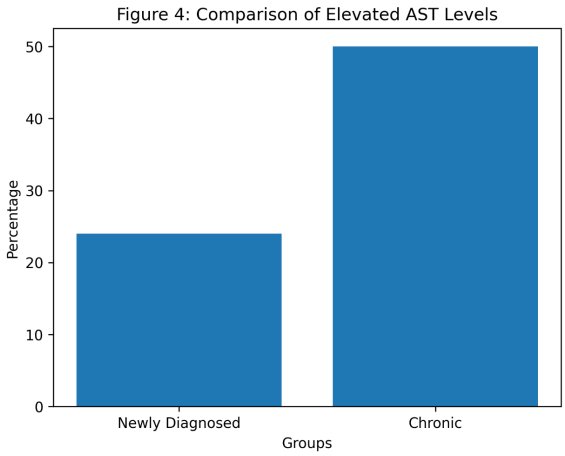


Figure 4: Bar graph comparing AST levels between groups, indicating significant increase in chronic patients (p = 0.007).



DISCUSSION

The study findings demonstrate a clear association between the duration of diabetes and liver dysfunction. Chronic diabetic patients showed significantly higher levels of ALT and AST, indicating ongoing hepatocellular injury.

The results support previous studies linking insulin resistance and hepatic steatosis with elevated liver enzymes. Early detection of liver abnormalities is crucial to prevent progression to advanced liver disease.

CONCLUSION

Chronic type 2 diabetes mellitus is associated with progressive liver dysfunction. Liver function tests, particularly ALT and AST, should be routinely monitored in diabetic patients for early detection and management of hepatic complications.

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