Assessment of Liver Enzyme Alterations among Patients with Type 2 Diabetes Mellitus in Chennai

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ABSTRACT

This cross-sectional comparative study conducted at A.C.S. Medical College and Hospital, Chennai, assessed selected biochemical parameters in 50 participants, comprising 25 patients with type 2 diabetes mellitus (T2DM) and 25 non-diabetic controls. HbA1c, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) were evaluated using the laboratory analysers specified in the study protocol. HbA1c and ALP were reported to be higher in the diabetic group than in controls, with a statistically significant difference for ALP ($p=0.004$). The HbA1c p-value was displayed as zero in the source results and must be replaced by the exact statistical output or an appropriate threshold (for example, $p<0.001$ only if confirmed). AST and ALT differences were not statistically significant ($p=0.515$ and $p=0.534$, respectively). These findings indicate differences in selected biochemical parameters between the groups; however, an isolated increase in ALP does not establish hepatic dysfunction or identify the tissue source.

Keywords: Type 2 diabetes mellitus; HbA1c; AST; ALT; alkaline phosphatase; liver-associated enzymes; metabolic disorders.

INTRODUCTION

The liver plays a central role in glucose, lipid and protein metabolism, as well as in the biotransformation and clearance of endogenous and exogenous substances. Biochemical tests are used to identify patterns that may indicate hepatocellular injury or cholestasis. AST and ALT are aminotransferases that may increase with hepatocellular injury, whereas ALP can originate from the liver and biliary tract as well as from non-hepatic tissues, particularly bone. An elevated enzyme result should therefore be interpreted alongside the patient's clinical history and other laboratory findings.

Increased liver-associated enzyme activities may occur in viral or alcohol-related liver disease, medication-related injury, biliary disorders and metabolic liver conditions. These enzyme elevations are not specific to a single diagnosis. In particular, an isolated increase in ALP cannot confirm hepatic dysfunction. Correlation with gamma-glutamyl transferase (GGT), bilirubin and other relevant investigations may help clarify whether the increase is hepatobiliary in origin.

Liver-associated biochemical abnormalities are relevant in people with T2DM because diabetes commonly

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coexists with insulin resistance, obesity and altered lipid metabolism. These metabolic factors may be associated with metabolic dysfunction-associated steatotic liver disease and other hepatic conditions. However, diabetes or an abnormal enzyme result alone does not establish a specific liver diagnosis. Clinical history, medication exposure, alcohol intake and additional investigations are important when interpreting results.

MATERIALS AND METHODS

- 3–5 mL venous blood sample
- Plain clot activator and EDTA tube
- Centrifuge
- Beckman Coulter AU 480

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Laboratory Analysis

A comparative cross-sectional study was conducted among 50 participants: 25 patients with T2DM and 25 non-diabetic controls, aged 18–80 years. Blood samples were collected and processed to obtain serum. Biochemical analysis was performed using the Beckman Coulter AU480 and Bio-Rad D-10 analysers, as stated in the study record. The supplied manuscript does not specify the recruitment method, sample-size calculation, detailed sampling procedure or full ethical approval and consent procedures. These details should be completed from the approved study protocol and original records; they should not be assumed.

Blood samples were collected and processed to obtain serum. Biochemical analysis was performed using fully automated analyzers (Beckman Coulter AU480 and Bio-Rad D10) to measure HbA1c, AST, ALT, and ALP levels.

Inclusion Criteria:

• Clot activator blood samples and EDTA samples of type II diabetes patients and Clot activator blood samples and EDTA samples of normal patients.

• Age >18 years of age.

Exclusion Criteria:

• Patient diagnosed with type -I diabetes.

• Pregnant women.

Gender Interpratation

GENDER	TYPE -II DIABETES	CONTROL	TOTAL
FEMALE	20.00%	20.00%	40.00%
MALE	30.00%	30.00%	60.00%

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Descriptive Analysis

	HBA1C %	AST U/L	ALT U/L	ALP U/L
MEAN	10.5	37.9	39.6	121.2
STD	2.76	47.8	39.45	60.4

STUDY FINDINGS

A total of 50 participants were included, comprising 25 patients with T2DM and 25 non-diabetic controls. The study report describes statistically significant differences in HbA1c and ALP between the groups.

The HbA1c p-value is displayed as 0 in the source table; a p-value should not be reported as exactly zero. The exact value or an appropriate threshold must be taken from the original statistical output. The reported ALP p-value was 0.004. AST and ALT differences were not statistically significant (p=0.515 and p=0.534, respectively).

DESCRIPTIVE ANALYSIS DIABETES GROUP

AGE	TYPE -II DIABETES	CONTROL
20-40	4.00%	32.00%
40-60	26.00%	14.00%
60-80	20%	4.00%

Descriptive Analysis Control Group

CONTROL	HBA1C %	AST U/L	ALT U/L	ALP U/L
MEAN	5.18	29.92	25.84	82.56
STD	0.16O	21.81	16.84	39.1
DIABETES		MEAN OF RANK	SUM OF RANK	P - VALUE
HBA1C	TYPE -II DIABETES	38	950	0

	CONTROL	13	325	
AST	TYPE -II DIABETES	24.16	604	0.515
	CONTROL	26.84	671	
ALT	TYPE -II DIABETES	26.78	669.5	0.534
	CONTROL	24.22	605.5	
ALP	TYPE -II DIABETES	31.36	784	0.004
	CONTROL	19.64	491	

Comparison of Biochemical Parameters

RESULTS AND DISCUSSION

The present study compared selected biochemical parameters between 25 patients with T2DM and 25 non-diabetic controls. HbA1c was higher in the diabetic group, consistent with the expected difference in glycemic status. The HbA1c p-value was recorded as zero in the source output; this should be replaced with the exact value or an appropriate threshold based on the original statistical output, because a calculated p-value is not literally zero.

ALP was significantly higher in the diabetic group than in controls (reported p=0.004). This indicates a difference in ALP activity between the groups in this sample. However, ALP is not specific to the liver and may arise from hepatobiliary or non-hepatic sources, including bone. In the absence of GGT, bilirubin, ALP isoenzyme analysis and relevant clinical information, the present result cannot establish that the increase is due to hepatic or biliary disease. AST and ALT differences were not statistically significant (reported p=0.515 and p=0.534). A lack of statistical significance in this relatively small sample does not prove that liver injury is absent; it may also reflect limited statistical power.

CONCLUSION

In this cross-sectional comparison of 25 patients with T2DM and 25 non-diabetic controls, HbA1c and ALP were reported to be higher in the diabetic group, with the ALP difference reaching statistical significance (p=0.004). AST and ALT differences were not statistically significant. The elevated ALP finding should be interpreted cautiously because ALP can originate from hepatic and non-hepatic tissues, and additional tests such as GGT and bilirubin were not reported. The study identifies a biochemical difference but does not establish a specific hepatic diagnosis or prove that diabetes caused the enzyme alteration. Larger studies with clearer recruitment methods, assessment of confounding variables and a broader liver profile are needed.

LIMITATIONS

This study is limited by its small sample size and cross-sectional design. The recruitment and sampling methods, sample-size calculation and several potential confounders are not reported. BMI, duration of diabetes, medication exposure, alcohol consumption and pre-existing hepatic or bone disease should be documented where available. GGT, bilirubin and albumin were not reported, limiting interpretation of the raised ALP. The statistical test, confidence intervals and exact HbA1c p-value also require clarification.

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