



ORIGINAL RESEARCH PAPER

Biochemistry

STUDY OF GGT AND TRANSAMINASES IN TYPE-2 DIABETES MELLITUS

KEY WORDS: Type-2 DM, AST, ALT, GGT

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ABSTRACT

Background: Diabetes Mellitus is one of the most common chronic disorder due to defective insulin secretion, action or both. Liver is the major organ in regulating both lipid as well as glucose metabolism. There is a relationship between diabetes with hepatic injury. Alanine transaminase (ALT) and Aspartate transaminase (AST) enzymes are the markers of liver injury. Serum Gamma Glutamyl Transferase (GGT) is a marker of fat accumulation in hepatic tissues which can result in hepatic insulin resistance. **Objective:** To evaluate and to compare the serum concentrations of FBG, ALT, AST and GGT in Type-2 diabetic patients and healthy controls. **Methodology:** The study includes 50 Type-2 Diabetic patients and an equal number of age & sex matched healthy controls selected from SSIMS & RC, Davangere during the study period from Jan 2019 to Jan 2020. Result: The serum concentrations of FBG, ALT, AST and GGT were increased in Type-2 diabetic patients as compared to healthy controls (P < 0.05). **Conclusion:** This study concludes that GGT and Transaminases are elevated in Type-2 diabetic patients and their routine measurement may be recommended in the management of diabetic patients which helps in early detection and prevention of liver injury.

INTRODUCTION

The rising burden of diabetes in most parts of the world are mainly because of rapid economic development and urbanization.⁽¹⁾ In India the prevalence of diabetes has risen from 7.1% in 2009 to 8.9% in 2019.⁽²⁾ Uncontrolled Diabetes results in a microvascular and macrovascular complications. Apart from this, diabetes is also linked to nontraditional complications such as liver disease, cancer, mental health, and disability.⁽³⁾

Liver plays an important role in regulation of glucose metabolism, both during fasting as well as post prandial period.⁽⁴⁾ The effects of type 2 diabetes on liver includes abnormal liver enzymes, hepatocellular carcinoma (HCC), cirrhosis, non-alcoholic fatty liver disease (NAFLD), acute liver failure.⁽⁵⁾ In type II diabetes mellitus, chronic mild elevation of transaminases is commonly seen.⁽⁶⁾ The markers of hepatic injury such as Alanine transaminase (ALT) and aspartate transaminase (AST)⁽⁴⁾ and marker of hepatic fat accumulation such as serum gamma glutamyl transferase (GGT) which can lead to hepatic insulin resistance and later may lead to type II diabetes mellitus.⁽⁷⁾

In insulin-resistant state there is an excess free fatty acids level which is known to be directly toxic to hepatic tissues. Hyperglycemia at high concentration results in cell membrane disruption, toxin formation, mitochondrial dysfunction and activation and inhibition of key steps of major metabolism.⁽⁸⁾ Other mechanisms in insulin-resistant states for elevated transaminases include peroxisomal beta-oxidation, oxidant stress from reactive lipid peroxidation and recruited inflammatory cells.⁽⁹⁾

In type 2 diabetes, GGT level known to rise. As GGT is a nonspecific marker and it has a positive association other factors such as cigarette smoking, alcohol intake, BMI, coronary heart disease, heart rate, systolic blood pressure, serum triglyceride, uric acid and hematocrit. But it has a negative association with physical activity level exercise. As

GGT increases in diabetes and increases as BMI increases, because of this it has been considered as another marker of insulin resistance.⁽¹⁰⁾

As there are very few studies reported on elevation of liver enzymes in Type-2 diabetes, hence the current study was undertaken to correlate the liver enzymes in Type-2 diabetes patients. A timely diagnosis and management of the abnormal liver parameters may help to minimize liver-related morbidity and mortality in the diabetic population.

METHODOLY:

A case-control study 50 Type-2 diabetic patients with age and sex matched healthy controls from Jan 2019 to Jan 2020 at SSIMS & RC, Davangere. Approval taken from the ethical and research committee.

Type-2 diabetes patients were selected according to American Diabetes Association criteria. Chronic alcoholics, smokers, patients with complications of diabetes mellitus, liver disease and other systemic diseases were excluded from the study. Fasting blood glucose was analysed by Hexokinase method,⁽¹¹⁾ AST,⁽¹²⁾ ALT⁽¹³⁾ and GGT⁽¹⁴⁾ were analysed by IFCC-UV Kinetic method in a fully automated chemistry analyzer, Beckman Coulter AU480.

Statistical Analysis:

SPSS version 20 was used to perform the statistical analysis. Data was subjected to normalcy test (Shapiro-wilk test). Data showed non normal distribution. Hence non-parametric tests were applied.

Mann Whitney U test was applied to test the mean difference between the case and control groups with respect to FBC, GGT, ALT and AST. The level of significance was set at 5%.

RESULTS:

Table 1: Shows comparison of laboratory values with respect to groups

Variables	Groups	N	Mean	Std. Dev	Median	IQR	p value*
FBG (mg/dl)	Case	50	212.8	71.5	198.5	99	0.001
	Control	50	96.0	12.5	100	21	
GGT (U/L)	Case	50	169.0	105.0	133.5	120.57	0.001
	Control	50	27.7	15.1	23.8	20.17	
ALT (U/L)	Case	50	142.8	117.7	120.5	63.45	0.001
	Control	50	24.4	11.1	21.55	17.05	
AST (U/L)	Case	50	153.9	116.4	123.55	76.47	0.001
	Control	50	28.7	12.6	24.1	15.25	

*Mann Whitney U test

The median value of FBG was 198.5 (99) mg/dl and 100 (21) mg/dl and GGT was 105 (133.5) U/L and 15.1 (23.8) U/L in case and control group respectively. The median value of ALT was 120.5 (63.45) U/L and 21.55 (17.05) U/L and AST was 123.55 (76.47) U/L and 24.1 (15.25) U/L in case and control group respectively. Mann Whitney U test showed significant median difference of FBG, GGT, ALT and AST between the case and control groups (P < 0.05).

DISCUSSION:

The type 2 diabetes mellitus patients have been reported to be associated with higher incidence of abnormal liver function tests with increased liver enzymes compared to the individuals without diabetes.

Our study showed that ALT, AST and GGT were significantly elevated in type-2 diabetic patients when compared with control group (p<0.05).

The liver is the major organ which helps to maintain normal blood glucose concentration in the fasting as well as in postprandial states.⁽¹⁵⁾ Resistance to insulin by the liver is mainly because of chronic hyperinsulinemia⁽¹⁶⁾ which results in cell membrane disruption, toxin formation, mitochondrial dysfunction and activation and inhibition of key steps of major metabolism.⁽¹⁷⁾ There is an increase in proinflammatory cytokines such as tumor necrosis factor- α (TNF- α) in the insulin-resistant state, which may also contribute to hepatocellular injury.⁽¹⁸⁾

All the theories explained above attribute elevated transaminases to direct hepatic tissue injury. It is also stated that, transcription of gene for ALT is suppressed by insulin, which indicates an insulin signaling impairment rather than purely hepatic injury.⁽¹⁹⁾

Our findings of the study is in agreement with several other studies like Sangappa Virupaxappa Kashinakunti, et al.,⁽²⁰⁾ Idris et al, 2011⁽²¹⁾, Wang Y-L, Koh W-P, Yuan J-M, et al⁽²²⁾.

CONCLUSION:

This study concludes that GGT and Transaminases are elevated in Type-2 diabetic patients and their routine measurement may be recommended in the management of diabetic patients which helps in early detection and prevention of liver injury.

Limitation of the present study was smaller sample size. Further larger sample size are required for assessment of liver enzymes in diabetic patients.

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