

**IMPORTANCE OF THE ASSESMENT OF GAMMA GLUTAMYL
TRANSFERASE IN TYPE 2 DIABETES MELLITUS****SANJEEDA TABASUM.M****Shri JJT University Vidyanagari, Churu Jhunjhunu Road,
Chudela District- Jhunjhunu, Rajasthan-333001***ABSTRACT**

Aim & Objective: To evaluate the importance of Gamma Glutamyltransferase in type 2 Diabetic population for the diagnostic role via oxidative stress. **Materials & Methods:** A total of 302 subjects were included in case control study, consisting of 198 diabetic and 104 controls that were sex and age matched. Serum total cholesterol, triglyceride and HDL Cholesterol were measured using Siemens kits and GGT was measured using Avecon kit on Chem 200 analyser. **Results & Discussions:** Patients were gender matched with p-value .273. Sugar parameters with significant results of p value 0.001** and the mean value of FBS being 169.09±82.44 mg/dL, PPBS mean value is 267.17±102.75 mg/dL compared to control group. Lipid parameters have shown total cholesterol mean of diabetic group 294.94±110.48 mg/dL and 202.36±50.48 mg/dL with the p value 0.001** and triglyceride mean being 273.77±148.27 mg/dL, control mean 112.05±39.16 mg/dL with the p value 0.001**. HDL: LDL has also shown significant value of p 0.001**. SGOT mean of diabetic group 127.22 ±10.26 U/L and normal control 25.23±U/L and SGPT mean of diabetic group 30.29±11.22U/L and control mean 26.65±7.5U/L the p-value 0.003**. Gamma glutamyltransferase significant levels of the liver enzyme in diabetic population mean 46.63±15.41U/L showing significance of $p < 0.001^{**}$

Key words: GGT-Gamma glutamyltransferase, ROS-Reactive Oxygen Species**SANJEEDA TABASUM. M**Shri JJT University Vidyanagari, Churu Jhunjhunu Road,
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INTRODUCTION

Diabetes Mellitus is one of the main threats to human health in 21st century. The past two decades has seen an explosive increase in the number of people diagnosed with diabetes Worldwide. The World Health Organization (WHO) estimated that, there were 135 million diabetics in year 1995 and this number would increase to 300 million by the year 2025. Serum gamma glutamyltransferase (GGT) is an ectoplasmic enzyme responsible for the extracellular catabolism of glutathione, which is synthesized in epithelial cells of intrahepatic duct. It's distributed in different cells with various secretory or absorptive activities¹. Gamma glutamyltransferase (GGT) has an important role in glutathione homeostasis by initiating the breakdown of extracellular glutathione and turnover of vascular glutathione²⁻⁴. Considering the antioxidant activity of glutathione, increased level of GGT may be linked to greater oxidative stress. Increased oxidative stress has B-cell dysfunction and reducing insulin action^{5,6}. Therefore, serum GGT activity could reflect several different processes relevant to diabetes pathogenesis. Many epidemiological studies, have demonstrated high rates of elevated GGT among diabetic patients over past 40 years¹. The association between serum GGT and poor glycaemic state was also documented in 1980s⁷. Recent prospective studies have indicated that baseline serum GGT activity predicts occurrence of future diabetes, stroke and cardiovascular diseases^{8,9}. Hypercholesterolemia causes focal activation of endothelium by infiltration and retention of LDL-cholesterol in arteries causing inflammatory response and activation of reactive oxygen species (ROS)¹⁰. Modification of LDL, through oxidation and enzymatic activity causes LDL oxidation, ox-LDL when recognised by macrophages is converted to

foam cells which is a key event in atherogenesis.

METHODOLOGY

This comparative case-control study was conducted in Biochemistry Laboratory, National Institute of Unani Medicine Hospital, Bangalore. A total of three hundred and two subjects, comprising of 198 diagnosed patients of diabetes type 2 and 104 control with age and sex matched healthy subjects were included after informed consent. The patients suffering from other serious illness or diseases, hypothyroidism, hepatitis, taking hormone replacement therapy (HRT), anti-inflammatory drugs or statin, pregnant patients, alcoholics and smokers were excluded. Blood samples were drawn following overnight fast and the assays were performed adhering to the standard protocols and quality control procedures. Glucose was estimated by GOD/POD method (Siemens). Serum Cholesterol and Triglyceride by enzymatic colorimetric method (Siemens). Estimation of HDL-Cholesterol by phosphotungstate method (Siemens). Estimation of SGOT (AST) and SGPT (ALT) by UV Kinetic (IFCC). Estimation of Alkaline phosphatase by PNPP method (Siemens). Estimation of Gamma Glutamyltransferase by UV KINETIC (IFCC) (Avecon kit). All the analysis was done in Chem200 fully Automated Random Access Biochemistry Analyser. Diabetes was defined as a serum fasting glucose concentration of more than 126mg/dL or the use of diabetes medication.

RESULTS

The study was conducted among 198 diabetic cases and 104 normal subjects. Patients were gender matched with 115 males and 83 females with the p-value of 0.273.

Table 1
Gender distribution of patients studied

Gender	Group I		Group II	
	No	%	No	%
Male	115	58.0	53	50.9
Female	83	41.9	51	49.0
Total	198	100.0	104	100.0

Samples are gender matched with P = 0.273

Table 2
Comparison of sugar parameters of patients studied

Sugar parameters	Group I	Group II	P value
FBS mg/dl	169.09±82.44	92.35±15.84	<0.001**
PPBS mg/dl	267.19±102.75	119.07±16.11	<0.001**

Table 3
Comparison of lipid parameters of patients studied

Lipid parameters	Group I	Group II	P value
Total cholesterol mg/dl	294.94±110.48	202.36±50.48	<0.001**
Triglycerides mg/dl	273.77±148.27	112.05±39.16	<0.001**
HDL mg/dl	38.87±7.14	52.82±11.06	<0.001**
LDL mg/dl	201.51±96.68	127.13±45.69	<0.001**
HDL:LDL mg/dl	0.24±0.15	0.55±0.71	<0.001**

Table 4
Comparison of Biochemical parameters of patients studied

Biochemical parameters	Group I	Group II	P value
SGOT U/L	27.22±10.26	25.23±8.77	0.094+
SGPT U/L	30.29±11.22	26.65±7.5	0.003**
Alkaline phosphatase U/L	113.68±28.63	111.73±25.34	0.560

Table 5
Comparison of GGT U/L in two groups of patients studied

GGT U/L	Group I		Group II	
	No	%	No	%
<40	72	36.3	69	66.3
>40	126	63.6	35	33.6
Total	198	100.0	104	100.0
Mean ± SD	46.63±15.41		38.2±13.94	

*GGT U/L is significantly higher in Group I with P=<0.001***

Comparison of the sugar parameters of the patients for FBS and PPBS studied has shown significant results of p-value 0.001** (significance being < 0.05) and the mean value of FBS being 169.09±82.44 mg/dL and PPBS mean value being 267.17±102.75 mg/dL compared to control

group 2 having FBS mean 92.35±15.84 mg/dL and 119.07±16.11 mg/dL for FBS and PPBS. Hence the significance value of p being 0.001** as in table 2. These two groups were further analyzed for lipid parameters and have shown total cholesterol mean value of diabetic group and control group mean 294.94±110.48

mg/dL and 202.36 ± 50.48 mg/dL respectively with the p value being 0.001^{**} (significance being < 0.05) and triglyceride mean 273.77 ± 148.27 mg/dL compared to control 112.05 ± 39.16 mg/dL with the p value of 0.001 (significance being < 0.05). HDL mean of test group 38.87 ± 7.14 and control group 52.82 ± 11.06 and LDL mean 201.51 ± 96.68 , control group being 127.13 ± 45.69 . HDL: LDL has also shown significant value of $p=0.001^{**}$ (significance being < 0.05) with mean of 0.24 ± 0.15 and control mean of $0.55.71 \pm 0.71$ as in table 3. Comparison of the other Biochemical parameters have also shown very significant results with SGOT (AST) mean of diabetic group 127.22 ± 10.26 U/L and normal group being 25.23 ± 0.94 with $p=0.094^*$. SGPT (ALT) mean of diabetic group being 30.29 ± 11.22 U/L and control group mean being 26.65 ± 7.5 U/L and $p=0.003^{**}$ and hence very significant in diabetic population as in table 4. The studies on Gamma glutamyltransferase (GGT) in table 5 have shown highly significant levels of the liver enzyme in diabetic population with the mean value of 46.63 ± 15.41 U/L in comparison with control group mean 38.2 ± 13.94 U/L with the p value showing significance of $p < 0.001^{**}$ which is highly significant.

DISCUSSIONS

A comparative case control study was being carried out for the urban population of Bangalore where there is a lot of stress among the age groups of 20-60 years. Hence

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our study may help in understanding the importance of the testing of this liver enzyme in assessing the level of oxidative stress among the diabetic population and to advise the patients in preventing the further deterioration of health conditions. In addition, GGT can be considered a biomarker for oxidative stress associated with glutathione regulation and degradation and possibly a proatherogenic marker because of its indirect relationship in the biochemical steps leading to low-density lipoprotein oxidation¹¹. Besides being an early subclinical marker of fatty liver, GGT may act as a marker of oxidative stress and exposure to environmental chemicals¹². It has thus been suggested that increased GGT levels may be linked to cardiovascular disease via different biological processes such as oxidative stress or lifestyle behaviour¹³. In conclusion, based on the previous epidemiological and experimental studies, we can suggest the estimation of serum GGT within its laboratory normal range can also be an early and sensitive marker for oxidative stress. Measurement on stability of serum GGT, the activity of the enzyme was essentially unchanged in repeated tests during 40 weeks when frozen-stored samples were thawed and then frozen again after each testing. The earlier studies have suggested that there is an increased inflammatory and oxidative damage of coronary vessels in type 2 diabetic patients¹⁴. This supports our studies suggesting oxidative damage and increased risk of cardiovascular events.

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