Serum Gamma Glutamyl Transferase, Alkaline Phosphatase And Amylase In Type II Diabetes Mellitus

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Abstract

The aim of this study is to determine the activity of serum Gamma Glutamyl Transferase (GGT) elevation in first group of 38 patient of type II In Dependant Diabetes Mellitus (IDDM) whose treated with insulin injection second group of 15 diabetic patients were tested for three different activities GGT, Alkaline Phosphatase (ALP) and Amylase, results were compared with control group of 15 normal healthy population ,the results show that there were significant increase in the levels of GGT,ALP and Amylase in diabetic patients in comparison with normal population group.

Keyword: GGT Gamma Glutamyl Transferase, ALP Alkaline Phosphatase, IDDM In Dependent Diabetes Mellitus.

تحديد Amylase ,ALP ,GGTفي مرضى السكري مستوى انزيمات

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الخلاصة

تحديد مستوى انزيمات Amylase ,ALP ,GGT في مرضى السكري يهدف هذا البحث إلى حيث تم اخذ مجموعتين من المرضى شملت المجموعة الاولى على ٣٨ مريض وتم قياس مستوى ومقارنته مع مجموعة السيطرة والتي احتوت ١٤ شخص. اما المجموعة الثانية فشملت GGT في عدد من المرضى ١٥ مريض ومقارنتة مع مجموعة Amylase, ALP , GGT دراسة السيطرة ١٥ شخص. اظهرت النتائج ارتفاع معنوي في مستوى الانزيمات الثلاثة مما يدل على وجود علاقة بين مرض السكري وهذه الانزيمات.

Introduction

Diabetes Mellitus (DM) is a syndrome of disorder metabolism, usually due to a combination of hereditary and environmental causes, resulting in abnormally high blood sugar levels (hyperglycemia) (1).
The most common forms of diabetes are due to either adminished production of insulin (type I) or adminished response by the body to insulin (type II and gestation), both lead to hyperglycemia which largely causes the acute signs of DM, excessive urine production, resulting compensatory thirst and increase fluid intake, blurred vision, unexplained weight loss, lethargy and change in energy metabolism (2). DM likes other systemic disease is often reflected in lesions of the oral cavity, oral mucosal change and sever periodontal destruction (3). GGT is an important predictor for incident type II diabetes in men and women from the general population (4).

This paper involves determination of serum GGT & Amylase in diabetic patients and detection of ALP since there is little information on ALP and DM.

GGT (EC 2.3.2.2) is the enzyme which responsible for the extra cellular catabolism of (GSH-Gamma Glutamyl-Cysteinyl-Glycine), the main thiol intracellular antioxidant agent (5) and the larger function of enzyme is located in the cell membrane and may act to transport amino acid and peptide into the cell across the cell membrane in the form of gamma glutamyl peptidase.
In one study only 32.4% of the patient with high GGT level had hepatobiliary pathology, In addition to pancreatic event, myocardial infraction, diabetes mellitus, chronic obstructive lung disease which can increase GGT level (5).

Some authors found that there was strong dose response between GGT concentration at baseline and incidence of DM which mean there is associated of age and incidence of DM (6).

ALP (EC 3.1.3.1) are a group of relatively non specific enzyme , it is found in all tissue of the body, serum, cell membrane, liver, bile duct, palcenta,chromosomes and intestinal epithelium (7).

Moderate elevation of ALP may be attributed to Hodgin disease, congestive heart failure and abdominal bacterial infection, while high level of ALP occur in case of hepatitis, obstructive liver disease and

DM (8). There is a little information of ALP with diabetic patients; the activity of ALP is moderately increased in case of DM (9).

Amylase (EC 3.2.1.1) found in all types of organs and tissues, it is highest concentrations in saliva and pancreas (10). Blood serum amylase may be measured for purpose of medical diagnosis. Higher concentration may reflect one of several medical conditions, including acute inflammation of pancreas, macroamylasemia, peptic ulcer and mumps (11&12).

Normally, only low level of amylase are found in the blood or urine ,if the pancreas or salivary glands become damaged or blocked, more amylase is usually released in the blood or urine (13). In the blood amylase levels rise for only a short time, but in the urine amylase may remain high for several days.

Exocrine pancreatic function in the course of diabetes have been a subject of numerous studies in recent years especially in patients with insulin dependent DM (14).

Patients & Methods

Fifty three diabetic patients were included in this work. The first group of 38 patients of the both sexes including 20 males of age range 35-70 and 18 female of age range 25-80 year were tested only for the activity of GGT enzyme, compared with a control group of 14 normal healthy individual.

The second group of 15 patient including 10 male of age range 20-50 year and 5 female of age range 27-68 year were tested for three different enzymes activity GGT, ALP & Amylase, compared a control group which derived from 15 healthy subject including 7 male of age range 30-68 year and 8 female of age range 45-56 year, were normal when tested for biochemical investigation and glucose.

The samples of all groups were tested for blood glucose and collected from routine clinical work from different hospitals, collection of the whole blood sample obtained by vein puncture from patients who have been fasting for at least 12 hours, 5 ml of venous blood were taken from each subject.

The samples were centrifuged at 10 rpm at lomin and were separated into serum in plain tube and refrigerated until analysis with 48-72 hrs, if the sample cannot be run within 60 minutes. All patients were treated with insulin injection daily.

Serum GGT activity was determined by kinetic method using special kit (Biolab Reagents-France). Gamma glutamyl group is transported from gamma glutamyl P-nitroanitroanilide to glycylglycine by GGT enzyme leaving the yellow product of P-nitroaniline.

The analytical method was performed at 30C by measuring the absorbance change with spectrophotometer (15). The rate of formation of P-aitroaniline is directly proportional to GGT activity in the specimens, is measured at 405 nm.

Amylase activity was determined by kinetic method using kit (Biolab Reagents-France). Amylase activity in serum was measured by reaction of 2-chloro-4-nitrophenyl malto trioside (CNPG3) by enzyme amylase and formation of chloro-nitro-phenol (CNP), measured by using spectrophotometer.

ALP was estimated by kit (Randox laboratories Ltd., Canada). Phenol is released by enzymatic hydrolysis from phenylphosphate, the librated phenol is measured by spectrophotometer in the presence of 4-aminoantipyrine and potassium ferricyanide.the presence of sodium arsenate in the reagent stops the enzymatic reaction (16).

Fasting blood sugar estimated enzymatically by using kit glucose MR enzymatic clorometric method, by the trinder reaction (17), the glucose is oxidized to D-gluconate by glucose oxidase (GOD) with the formation of hydrogen peroxide. In the presence of peroxidase (POD), a mixture of phenol and 4- aminoantipyrine (4-AA) is oxidized by hydrogen peroxide to form a red quinoneimine dye proportional to the concentration of glucose in the sample.

Statistical Analysis

Statistical analyses selected were M±S, Coefficient of Variation (CV) and correlation and regression unpaired student's test (18).

Results

Serum GGT activity were significantly increase in 38 diabetic patients in comparison with normal group, as shown in table 1 .the level of three different enzymes GGT, ALP& Amylase activity of 15 diabetic patients for both sexes were significantly increase in comparison with 15 normal population group as in table 2 .table 3 shows that there were relationship between GGT, ALP & Amylase in diabetic patients.

Figures 1&2 show that activity and frequency distribution of GGT in diabetic patients, while figure 3 shows the comparison of GGT, ALP & Amylase in diabetic patients with normal population group.

Table (1): The content of enzyme GGT activity in diabetic patients in comparison with normal population group for both sexes.

	M ± SD	
Case	No. of Sample	GGT Activity (U/L)
Normal	14	20.71 ± 5.91 CV % 28.53
Diabetic Patient	38	104.87 ± 29.75 CV% 28.36 t = 10.47 P<0.001

Table (2): The content of enzymes GGT, ALP and Amylase activities in diabetic patients in comparison with normal population group for both sexes.

	M ± SD			
Case	No. of Sample	GGT Activity (U/L)	ALP Activity (U/L)	Amylase Activity (U/L)
Normal	15	24.36± 3.11 CV %12.76	35.18±2.62 CV %7.44	65.88±2.14 CV %3.24
Diabetic Patient	15	146.36 ± 3.82 CV% 2.61 t =12.75 p<0.001	124.29 ± 3.61 CV% 2.90 t =9.16 p<0.001	153.40 ± 3.02 CV % 1.97 t =11.67 p<0.001

Table (3): Correlation of GGT, ALP and Amylase in diabetic patients.

correlation	No. of sample	r-value	t-value	Type of correlation
1.GGT& ALP	15	0.939	9.57	P<0.001
2.GGT& Amylase	15	0.825	5.25	P<0.001
3.ALP& Amylase	15	0.922	8.58	P<0.001

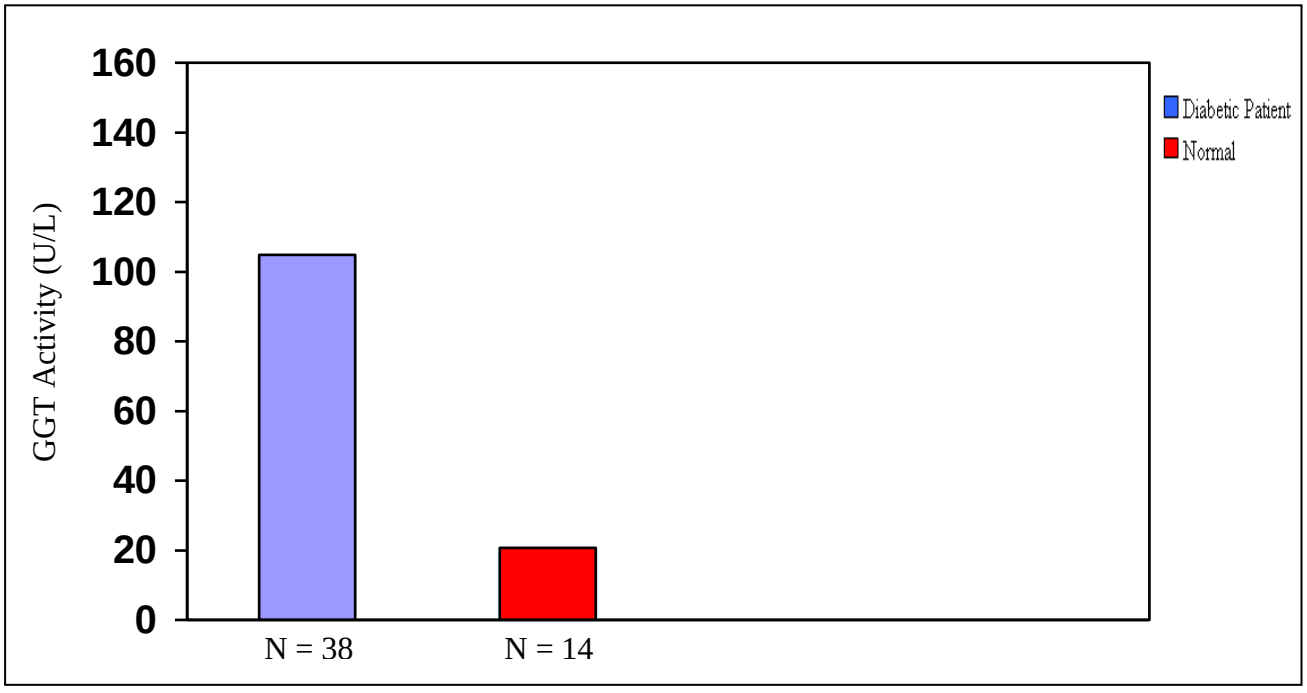

Figure (1): activity of GGT in patients of diabetic disease in comparison with normal population group for both sexes.

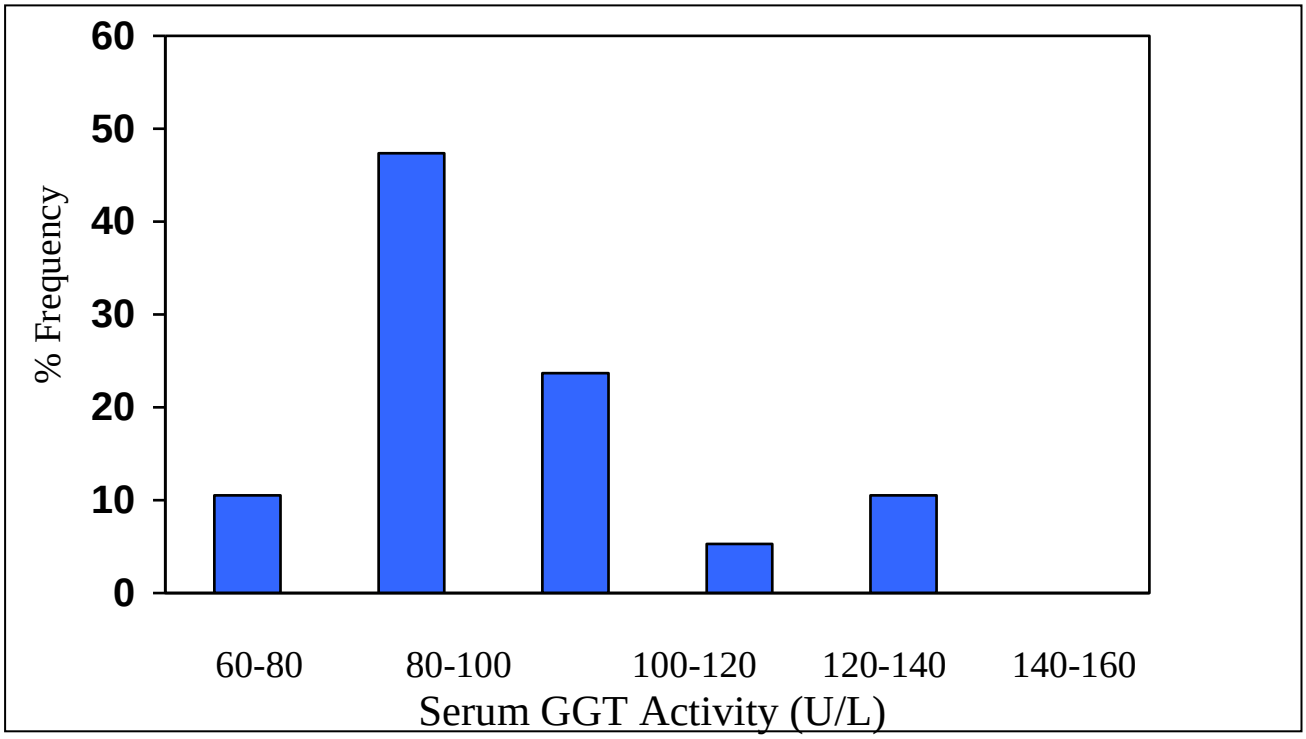

Figure (2): Frequency distribution of GGT Activity in diabetic patients for both sexes.

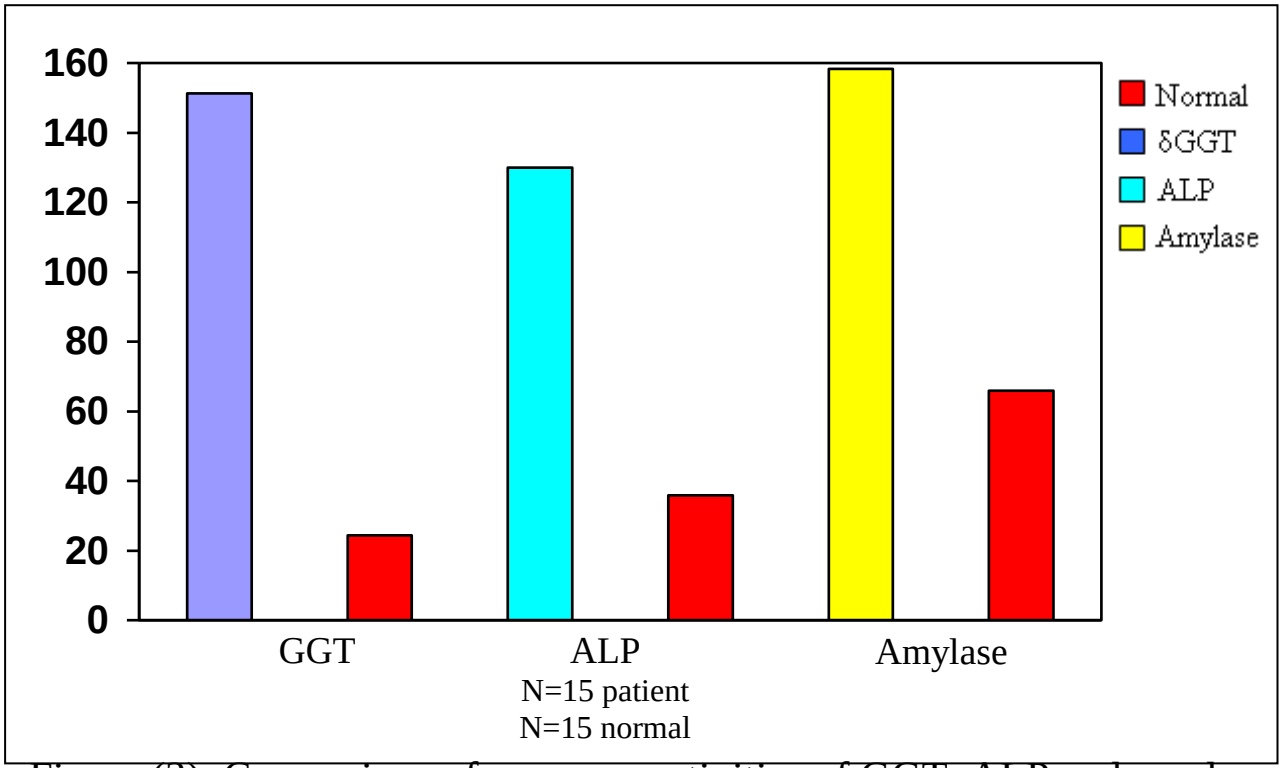

Figure (3): Comparison of enzymes activities of GGT, ALP and amylase in diabetic patients in comparison with normal population for both sexes.

Discussion

In diabetic patients several enzymes activity have been studies. A change in the serum enzymes activity of GGT, ALP & Amylase show statistically significant difference in all diabetic patients in comparison with normal population group. The serum concentration mg\dl in diabetic patients on fasting with M±SD was 365±2.67 and the normal value for non diabetic group was 76±1.13 , the level of serum GGT activity in diabetic patients show significant increase this related to the GGT is a membrane enzyme and it is function is to transfer gamma glutamyl group from donor to the acceptor so it obvious that DM type II had affected metabolism, more over, they had increase the mobilization of fat and amino acid this could be the resin for elevated the activity of this enzyme. Our results agree with (Lee DH, etal 2003) (19) when they found that there was strong dose response between GGT concentration at baseline and incidence of DM in 31% of men with DM this associated with age (20). GGT might therefore be interpreted as a marker for hepatic insulin resistance in the pathogenesis of type II diabetes (21&22).

The activity of ALP is significantly increased in diabetic patients rather than non diabetic persons, it has elevated significantly $P<0.001$, the enhanced activity of this enzyme has been tentatively interpreted as a manifestation in serum of increased phosphatase activity that may occur in tissue of diabetic state. ALP activity was correlated with daily insulin requirement but not with glucose concentration or the non duration of disease (23).

In the present study the activity of serum amylase is markedly elevated this due to carbohydrate metabolism and blood amylase is affected by the anterior pituitary gland and by cortisol. Our result is agreement with (Udani L & Madson DS 2004) (10) who found increase level of amylase and increase urinary extraction of the enzyme due to impairment in renal excretory function which is often present ketoacidosis and presence of relationship between blood amylase and carbohydrate metabolism. Increase level of amylase in diabetic patients result of multiple factors, the most important being

glucagons inhibiting influence and the lack of insulin stimulating on synthesis in exocrine cells (Harding etal 2000) (24).

(Eberhart MS 2007) (5) found that the exact causes and mechanism of rising GGT, ALP & Amylase in diabetic patients occur due to central obesity, fat concentration around the waist in abdominal organs but not to subcutaneous fat. Obesity is found in approximately 55% of patients with DM.

Conclusion

1. The results show that there were strong relationship between GGT, ALP &Amylase and DM.
2. A change in serum enzyme activity of GT, ALP & Amylase show statistically significant increase in the level of GGT, ALP & Amylase in all diabetic patients in comparison with normal population group.

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