SERUM GAMMA-GLUTAMYL TRANSFERASE LEVELS IN PREDIABETES AND DIABETES MELLITUS PATIENTS

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ABSTRACT

Introduction: Gamma glutamyl transferase is an enzyme which catabolizes glutathione. Hence increased levels of gamma glutamyl transferase are proposed to be associated with dysfunctions of many systems and can possibly predict the progression of diabetes mellitus. **Methods:** 164 participants who where first degree relatives of patients of type 2 diabetes were taken. Those with co-morbid conditions were not included in the study. Participants were divided into non-diabetics, pre-diabetics and diabetics based on the criteria by American Diabetes Association. Detailed physical examination, GGT levels and glucose tolerance test were performed on the patients. All the information was recorded and then statistical tests were performed. Student's t test was used. P value of <0.05 was considered to be statistical significant. **Results:** The baseline characteristics of all the participants were noted in table 1. Average HbA1c was calculated to be 6.7±1.5. The mean level of GGT in non-diabetics was 19.7±9.7. The mean level of GGT in pre-diabetics was 41.8±9.5 and the mean level of GGT in diabetics was 44.9±11.3 (p value = 0.001). **Conclusion:** Our study shows that measuring the levels of GGT may be useful in assessing the risk of diabetes in first degree relatives of known cases of diabetes type 2.

INTRODUCTION

Gamma-glutamyl transferase is an enzyme whose function is to catabolize glutathione. Glutathione has an antioxidant property and hence increased levels of GGT shows higher oxidative stress. Increased levels of oxidative stress have been associated with B cell dysfunction and reducing insulin function. Hence GGT levels can predict the process of diabetes.[1,2]

There is an increasing rate of diabetes mellitus in the whole world. This is present in all age groups, sexes, and racial and ethnical groups. Many studies have been done that have demonstrated high rates of elevated GGT in diabetics. Such studies are going on since 40 years. A research was also done in 1980s which showed that high serum GGT levels are associated with poor glycemic control. There is an ongoing controversy between many studies. Some studies support that high GGT levels are associated with high prediction of diabetes mellitus.[3,4,5] and some studies don't support this assumption. A systemic review and meta-analysis of 24 cohorts by Kunutsor S et al showed relative risk for T2DM of 1.34 in comparison of extreme thirds of serum GGT levels.[6]

Another study by Lee J et al on Korean population demonstrated a Hazard Ratio of 2.55 for males and 1.90 for females.[7]

However, can serum GGT also be used to assess the risk in first degree relatives of patients of T2DM? Also, can serum GGT levels be used to see the progression of diabetes in prediabetes patients and also tell us about progression of diabetes in already known cases? One way to answer this question would be to relate serum GGT levels in prediabetics with that in diabetics.

In this study, we investigated relationship between serum GGT levels and diabetes by relating the enzyme levels in three groups of participants- non diabetics, pre diabetics and diabetics. Based on the results, we tried to investigate if serum GGT levels can be useful in assessing the risk of diabetes in first degree relatives of known cases of T2DM.

METHODS

In this study, we took 164 participants. All participants were first degree relatives of diabetic patients. Written

consent of all the participants was taken. Detailed information of all the participants like age, family history, past medical history etc. was taken from the participants. Participants were aged between 20-50 years. All participants with co-morbid conditions like myocardial infarction, thyroid, renal disease, inflammatory disease etc. any other disease were excluded from the study. All participants were properly examined by physicians and routine blood workup was done before their registration in the study.

In order to measure the glucose tolerance, all participants were supposed to get the glucose tolerance test.

Glucose intolerance in studied subjects was classified as below based on 2003 ADA criteria.

- **Diabetes:** FPG > 125 mg/dl or 2h-PG > 199 mg/dl.
- **IFG (Pre-diabetic):** 100 mg/dl ≤ FPG ≤ 125 mg/dl and 2h-PG < 140 mg/dl.
- **IGT (Pre-diabetic):** FPG ≤ 100 mg/dl and 140 mg/dl ≤ 2h-PG ≤ 199 mg/dl.
- **Normal glucose tolerance (NGT):** FPG < 100 mg/dl and 2h-PG < 140 mg/dl.

All statistical analysis was done using the student's t test.

RESULTS

All the results of our studies are shown in the tables below.

The baseline characteristics of all the participants are noted in the table below.

Average age of all the participants is 32.5±8.5. Average BMI is 25.7±7.4. Average HbA1c is 6.7±1.5. Average total cholesterol is 97.9±29.4. Average HDL-cholesterol is 45.9±10.8. Average LDL-cholesterol is 121.5±34.4.

Table 1: Baseline characteristics of the participants.

Age	32.5±8.5
BMI	25.7±7.4
HbA1c	6.7±1.5
Total Cholesterol	97.9±29.4
HDL-C	45.9±10.8
LDL-C	121.5±34.4

The mean levels of all the participants are noted in the table below. The mean level of GGT in non-diabetics is 15.7±7.4. The mean level of GGT in pre-diabetics was 37.9±9.7 and the mean level of GGT in diabetics is 42.8±11.5. The p value was 0.001 and hence the difference is statistically significant.

This shows that the as the levels of gamma glutamyl transferase levels increase, there is a higher risk of diabetes.

Table 2: GGT levels in the participants.

	GGT Levels	p-value
Non-Diabetics (N=84)	19.7±9.7	
Pre-Diabetics (N=56)	41.8±9.5	0.001
Diabetics (N=24)	44.9±11.3	

DISCUSSION

Many studies have been conducted which have showed an association of GGT levels in diabetes. There are not many studies that support the hypothesis that high levels of GGT in first degree relatives are associated with an increased risk of diabetes. Hence, in this study, we have tried to study the levels of GGT in first degree relatives of type 2 diabetes mellitus patients. Many studies have also showed an association of gamma glutamyl transferase with cardiovascular diseases, peripheral arterial diseases and hypertension.[8,9,10]

Serum GGT level is also an indicator of alcoholic liver disease. In our study, none of the participants were alcoholic. Hence, we also showed that GGT levels are predictive of diabetes irrespective of the alcohol consumption.

The possible explanation of this is that high levels of GGT represent excess fat deposition in the liver. Excess fat deposition is a sign of insulin resistance and development of diabetes.

CONCLUSION

Our study shows that measuring the levels of GGT may be useful in assessing the risk of diabetes in first degree relatives of known cases of diabetes type 2.

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