Original Article

Diabetes Mellitus

To Correlate the Serum Levels of Adiponectin with Fasting and Random Blood Sugars in Diabetes Mellitus and Healthy Individuals

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ABSTRACT

Objectives: To correlate the serum levels of adiponectin with fasting and random blood sugars in diabetic and healthy individuals.

Study Design: Comparative cross sectional study.

Place and Duration of Study: The study was carried out at the Department of physiology B.M.S.I. J.PM.C. in collaboration with Abassi Shaheed Hospital Karachi from August 2007 to July 2009.

Materials and Methods: This study included total 100 subjects, 50 subjects with known case of Diabetes Mellitus and 50 normal healthy age and gender matched controls

Results: A significant negative correlation ($r = -0.65$ and $r = -0.80$) ($P<0.01$) was found between fasting and random blood sugars and serum adiponectin in Diabetics.

Conclusion: This suggests that higher levels of serum adiponectin may be protective against the development of Diabetes Mellitus

Key Words: Diabetes Mellitus, Serum adiponectin

INTRODUCTION

Diabetes mellitus type 2 (NIDDM) is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency. This is in contrast to diabetes mellitus type 1 (IDDM) in which there is an absolute insulin deficiency due to destruction of islet cells in the pancreas[1]. The classic symptoms are excess thirst, frequent urination, and constant hunger. Rates of type 2 diabetes have increased markedly over the last 50 years. Long-term complications from high blood sugar can include heart disease, strokes, diabetic retinopathy where eyesight is affected, kidney failure which may require dialysis, and poor circulation of limbs leading to amputation.[2]

Adiponectin, the most abundant known secreted factor produced by adipocytes, was originally identified by four independent groups in mid 1990´s, in both mice and human.[3] Adiponectin is collagen like plasma protein consists of 247 amino acid long polypeptide chain. The plasma level of adiponectin is about 0.5-30 µgm/ml which is 1000 fold higher than the concentration of other hormones such as insulin and leptin.[4] Plasma level of adiponectin reveals sexual dimorphism, with women having higher level than men. Coordinated alteration in adiponectin expression with changing metabolic status suggests hormonal or metabolic control of adiponectin expression.[5] A prime candidate for such regulation is insulin. Increased circulating adiponectin markedly decreases plasma insulin concentration and modestly reduces blood glucose.[6] A study by Keiffer et al. indicates that there are receptors located on pancreatic β cells; normal functional adiponectin would be able to suppress the secretion of insulin by activating ATP-sensitive K+ channels in the β-cells. Adiponectin may also decrease insulin release by stimulating α-adrenergic receptors in the pancreas via its effect on sympathetic activity.[7] Another possibility is that Adiponectin increases glucose utilization by improving insulin sensitivity in peripheral tissues which enhances glucose disposal in skeletal muscles, fat cells and suppresses glucose output by the liver. [8]

MATERIALS AND METHODS

A total of 100 subjects were recemited in the study, and were divided into 2 groups:-

Group "A" consisting of 50 normal healthy control subjects with no history of Diabetes Mellitus and group "B" included 50 subjects, which were known cases of Diabetes Mellitus. Normal and diseased subjects were from both sexes of age ranging from 40 years to 80 years. The subjects having hypertension, Myocardial infarction and with any other cardiac diseases were excluded from the study.

A written consent was taken from all the participants of the study. Six ml of the venous blood was drawn from the subjects under all aseptic procedures. The blood sample was transferred to the gel tube. After 30 to 60 min the blood was centrifuged for 10 minutes at the speed of 3000 rounds per minutes (rpm). Serum was separated to dry clean aliquot tube and stored at -20 degree centigrade. Before analyzing, the samples were

thawed and allowed to attain the room temperature. Serum adiponectin was measured by enzyme linked immunoassay, using the kit provided by Biosource France.

Statistical analysis was performed using the SPSS version 10. Values were reported as Mean ± S.E.M. The statistical significance of difference between the mean values of the two groups was evaluated by the "t" test. The correlation coefficient was detected by using Pearson Coefficient of Correlation SPSS-10. A P value of <0.05 was considered statistically significant.

RESULTS

Table 1 shows the comparison of mean ages among diabetics and healthy individuals. Mean ages of 2 groups were comparable on average, as the samples were collected from the matched cases. Table 1 also shows the comparison of height among the 2 groups. No significant changes were recorded in the height among the 2 groups. On comparison of weight among the 2 groups, weight in diabetics was significantly increased as compared to control subjects (P < 0.001).

Table No.1: Comparisons of age, height and weight in controls & diabetics

Variables	Group A	Group-B
	Control n = 50	Diabetics n = 50
	Mean ± SEM	Mean ± SEM
Age(yrs)	55.18 ± 1.12	54.17 ± 2.24
Height (meter)	1.60 ± 0.02	1.56 ± 0.02
Weight (kg)	66.0 ± 0.10	73.5 ± 0.19**

n= number of subjects

**P < 0.001 highly significant when compared to controls.

Table No.2: Comparison of fasting and random blood sugar in diabetics and controls

Variables	Group A	Group B
	Control	Diabetics
FBS (mg/dl)	82.50±1.14	142.80±7.66**
RBS (mg/dl)	112.67±1.97	248.93±22.67**

**P < 0.001 highly significant when compared to controls

Table No.3: Values of serum adiponectin in diabetics and control subjects

Variables	Group A	Group B
Serum Adiponectin (µgm/ml)	Control	Diabetics
	Mean±SEM	Mean±SEM
	11.98±0.579	7.10±1.40**

**P < 0.001 highly significant when compared to controls.

Table 2 shows comparison between fasting and random blood sugars among subjects having Diabetes Mellitus and the control group. The fasting and random blood sugars of Diabetic patients show significant increase (p < 0.001) level as compared to control.

Table 3 shows comparison of serum adiponectin concentration among Diabetic subjects and control group. The adiponectin concentration was significantly decreased in Diabetic group than in control group. (P <0.05).

Table No.4: Correlation of serum adiponectin with fasting and random blood sugars in diabetics and control subjects

Variables	Controls	Diabetics
	Serum Adiponectin	Serum Adiponectin
FBS (mg/dl)	r = - 0.65	r = - 0.80**
RBS (mg/dl)	r = - 0.58	r = - 0.75**

****Correlation is significant at the 0.01 level**

Table 4 shows correlation coefficient (r) between fasting and random blood sugars with serum adiponectin in diabetics and control group. A significant negative correlation (r = -0.65 and r = - 0.80) (P<0.01) was found between fasting and random blood sugars and serum adiponectin in Diabetics. In the control group no such correlation was found.

DISCUSSION

Insulin resistant tissues rely more on alternate source of fuel, because glucose uptake is limited due to the impairment of insulin action. High plasma glucose levels result from the decrease glucose disposal and often proceed to the development of diabetes. Adiponectin administration increases fatty acid oxidation in muscle and leads to the reduction of free fatty acid and glucose in the plasma. [9] In our study we found lower plasma adiponectin in patients of type 2 diabetes mellitus than in non-diabetic control subjects. According to the results of our study individuals with higher adiponectin levels are at low risk of developing diabetes mellitus. This is comparable with the study done by Spranger et al.[9] Okamoto et al.[10], and Lindsay et al.[11] who observed in their study that increasing adiponectin concentration is a negative predictor of insulin resistance and type 2 diabetes mellitus.

Our results show strong negative correlation of fasting and random blood sugar with adiponectin in Diabetic patients which explains insulin resistant effects of low serum adiponectin concentration in the body leading to the alteration in the metabolism of glucose resulting in the development of diabetes mellitus. This explanation relates with the observation of Yamamoto et al.[12] and Havel et al.[13] who reported increasing levels of blood sugar with decreasing levels of adiponectin in their case control study.

Results of our study strongly recommend that adiponectin functions to protect against the development of diabetes mellitus by increasing insulin sensitivity which cause increase influx of glucose into the cell moreover it increases intracellular glucose utilization thus decreasing blood sugar level.[12, 14]

Hypoadiponectemia results into decrease glucose disposal causing increase in blood sugar levels leading to diabetes mellitus and this recommendation is in accordance with the evaluation of Nawrocki et al.[14] and Freubis et al.[15] who studied the association between plasma adiponectin and incidence of Diabetes Mellitus and found that increasing adiponectin levels decreases the risk of Diabetes.

CONCLUSION

This study suggests that higher levels of Adiponectin may be protective against the development of Diabetes Mellitus.

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