

Association Between Total antioxidant Capacity and Leptin Levels in Type-2 Diabetic Patients

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Keywords:Type 2 Diabetec,total antioxidants,leptin

Abstract

Diabetes is a long life condition that causes a person's blood sugar level to become too high. Type 2 diabetes occurs when the body doesn't produce enough insulin to function properly, or the body's cells don't react to insulin. This means that glucose stays in the blood and isn't used as fuel for energy. The present study was conducted to investigate the serum total antioxidant capacity ,serum leptin ,blood glucose and lipid profile and its association with the type 2 diabetes mellitus. The study was case control conducted 55 male with Type II diabetes and 17 male volunteers were healthy control group, blood samples collected after 14 h fasting Parameters was measured with special enzymatic kits. The present study show significant decline of serum total antioxidant capacity among diabetic cases compared with control group ($p < 0.001$), serum leptin was and blood glucose significantly high in type 2 diabetes patients group compared with control group ($P < 0.001$) . Serum cholesterol, LDL-C and triglyceride were high but no significant in type 2diabetes patients group than normal control group ($P < 0.001$),while serum HDL-C level was lower non-significant in type 2diabetes patients than control group. We concluded the wasSignificant decline in serum total antioxidant and significant elevations in serum leptin intype2 diabetes in comparison with normal subjects.

Introduction

Diabetes mellitus (DM), metabolic diseases in which there are high blood sugar levels over a prolonged period .The symptoms of DM are frequent urination, increased thirst, and increased hunger[1]. If left untreated, diabetes can cause many complications. Acute complications include diabetic ketoacidosis and non-ketotic hyperosmolar coma. Chronic complications include cardiovascular disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes[2].The severity of Type II diabetes(T2DM) likelihood closely linked with obesity and body mass index (BM[3]. Many people, have no symptoms during the first few years and are diagnosed on routine testing.People with type 2 diabetes mellitus may rarely present with hyperosmolar hyperglycemic state [4] Diagnosis of diabetes is by blood tests such as fasting plasma glucose, oral glucose tolerance test, or glycated hemoglobin[1] .

Antioxidants are substances that have the ability to neutralize free radicals caused by oxidation processes or inhibit the oxidation processes which occur under the influence of atmospheric oxygen or reactive oxygen species also are involved in the defense mechanism of the organism against the pathologies associated to the attack of free radicals. In general there are two types of antioxidants Endogenous antioxidants are enzymes, like superoxide dismutase, catalase, glutathione peroxidase or non-enzymatic compounds, such as uric acid, bilirubin, albumin[5].

The aim of the present study was to investigate the serum levels of total antioxidant capacity and serum Leptin in patients with T2DM and evaluate the correlation between these parameters.

Subjects and Methods

The study was case control conducted during the period (August 2015 - January 2016) were taken random blood samples from 55 male with Type II diabetes the patients attending the Diabetic Consultation Unit at Al-Hussain Teaching Hospital/ Karbala and selected 17 male volunteers were healthy control group age range for patients and control group (35-70)years . Diagnosis was based on medical history and conduct a medical and laboratory examination. Exclusion Criteria for both groups were: Patient with chronic liver disease, patient with thyroid problem (hyper or hypothyroidism), patient on corticosteroid or thyroxin treatment and who take antioxidant. After an overnight fasting (14 hours), about five milliliters of venous blood was aspirated using disposable syringes from all cases and submitted to the laboratory.

Serum total antioxidant capacity and serum leptin were measured by Elase method with standard kits made by Elabscience China , blood glucose, and lipid profile has been done by specified enzymatic kits. We applied student's t-test ($p < 0.001$) to compare the significant of the difference in the mean values of T2DM group and control group was considered statistically significant. The correlation coefficient r-test is used to describe the association between the different studied parameters; $p < 0.001$ was considered statistically significant.

Results and Discussion

Effect of T2DM on Serum total antioxidant capacity

Results of the present study has been significant decreased total antioxidant capacity (TAC) among diabetic cases compared with control group ($p < 0.001$) shown in Table (1). Serum TAC correlates negatively non-significant ($p < 0.001$) with serum leptin ($r = -0.22$), blood glucose (BG) ($r = -0.156$), total cholesterol (TC) ($r = -0.082$), triglyceride (TG) ($r = -0.425$), low density lipoprotein cholesterol (LDL-C) ($r = 0.221$) and positively but no significant ($p < 0.001$) with HDL-C ($r = 0.033$).

There are several studies supporting the theory of increased oxidative stress in diabetes mellitus [6] [6]. This decrease of TAC among diabetic subjects could be attributed to increased oxidative stress. The antioxidant decrease reflects the war of antioxidants against oxidative stress to minimize the oxidative damage. Hyperglycemia in Diabetes generates free radicals [7]. These free radicals induce oxidative stress and in turn impair the endogenous antioxidant defense system [8]. Hyperglycaemia enhances the glycolytic pathway and the tricarboxylic acid cycle, leading to Nicotinamide adenine dinucleotide and flavin adenine dinucleotide overproduction; the resulting increase in proton gradient across the mitochondrial inner membrane leads to electron leakage at complex III and superoxide production [9].

Effect of T2DM on Serum Leptin.

Results of the present study show that serum leptin was significantly high in type 2 diabetes patients group compared with control group ($P < 0.001$) as shown in table (1). Serum leptin correlates positively with FBG ($r = 0.484$), serum CH ($r = 0.35$), TG ($r = 0.09$) and LDL-C ($r =$

0.134) at 0.001 level of significant, . Its level correlates negatively with serum HDL-C ($r = -0.284$).

Results of the present study are in good agreement with previous study reported significant positive associations between plasma leptin levels and diabetes only in men,[10] [11]. Some studies reported that there is no association between plasma leptin levels and diabetes. It is possible that these differences in previous study results may be due to differences in the inclusion or exclusion of one or two important confounding variables in the multivariable model[12]. Leptin level in T2DM could be contributed the elevated insulin level which stimulates leptin expression or release[13]. Obesity is strongly associated with the development of type 2 diabetes, leptin has been implicated in the regulation of body weight and energy homeostasis. Circulating leptin concentrations reflect the amount of adipose tissue in the body[14]. A hypothesis of leptin resistance at the level of the hypothalamus resulting in increased appetite and decrease energy expenditure despite adequate leptin production in the adipocyte [15]. (No feedback inhibition). Serum leptin is found high in diabetics taking oral hypoglycemic (treatment of diabetes with sulfonylureas) has been reported to increase serum leptin levels, sulfonylureas was mediated through changes in body weight or improved insulin secretion[16].

Effect of T2DM on FBG

Results of the present study show that FBG mean value was high significantly in T2DM patients compared with control group ($P < 0.001$) as shown in table(1). FBG correlates positively with serum CH ($r = 0.458$), TG ($r = 0.473$) and LDL-C ($r = 0.474$) at 0.001 level of significant. FBG correlates negatively but non-significantly with serum HDL-C ($r = -0.433$). In patients with T2DM amount of insulin available is insufficient, if cells respond poorly to the effects of insulin (insulin insensitivity or insulin resistance), or if the insulin itself is defective, then glucose will not be absorbed properly by the body cells that require it, and it will not be stored appropriately in the liver and muscles, the net effect is persistently high levels of blood glucose, poor protein synthesis, and other metabolic derangements, such as acidosis[17].

Effects of T2DM on lipid profile

Serum CH, LDL-C and TG were high but no significant in T2DM patients group than control group ($P < 0.001$), while serum HDL-C level was lower non-significant in T2DM than control group as shown in table(1). Serum CH shows a positive correlation with TG ($r = 0.456$) and LDL-C ($r = 0.633$) at 0.001 level of significant and non-significant negative correlation with HDL-Cholesterol ($r = -0.44$), TG shows a positive correlation with LDL-C ($r = 0.93$) and negative correlation with HDL-C ($r = -0.053$), LDL-C has a non-significant negative correlation with HDL-C ($r = -0.066$). These results are in a good agreement with the previous reports[18] [19]. T2DM is associated with vascular changes resulting in accelerated atherosclerosis. This association exists in patients with T2DM in whom plasma insulin levels may be low, normal or even high and is accompanied by changes in plasma lipids and lipoproteins regardless the mode of treatment [20].

Table (1): Mean \pm SD values of TAC, Leptin, FBG, TG, CH, HDL-C, LDLC, in diabetic patients compared with control group

T table on p value (< 0.001) and degree of freedom ($n_1+n_2-2=26$) that (3.707)

Parameters	non-Diabetes (N=18)	Diabetes (N=20)	t value	significancy
TAC (Unt/ml)	23.16 \pm 1.96	14.76 \pm 1.34	13.2	S
Lipten (ng/ml)	0.79 \pm 0.19	2.13 \pm 0.38	-11.9	S
BG(mmol/l)	100.14 \pm 7.37	220.21 \pm 69.1	-6.46	S
CH(mg/dl)	105.14 \pm 8.16	147.42 \pm 42.03	-3.4	NS
TG(mg/dl)	89.29 \pm 6.9	120.28 \pm 37.7	-3.07	NS
HDL(mg/dl)	46.07 \pm 2.84	42.57 \pm 4.32	2.53	NS
LDL(mg/dl)	17.86 \pm 1.38	24.06 \pm 7.54	-3.03	NS

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