Role of CoQ10 and IGFBP-1 in Obese Male Patients with Diabetic Mellitus Type II

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Abstract

Study the role of CoQ10 and IGFBP-1 in obese male patients with diabetic mellitus type 2. ELISA method was used to assay Serum CoQ10 and IGFBP-1. Blood was taken with drawn sample from 30 obese normal patients with age range (40-60) years, 30 diabetic patients with age range (40-60) years at duration of disease (1-5) years and 30 normal healthy patients. The mean difference between T2DM according to CoQ10 (12.5±1.1) was decreased than the mean of IFG (21.8±3.2) (P 0.002) and the mean difference between T2DM according to IGFBPs (0.65±0.06) was decreased than the mean of IFG (3.2±0.3) (P 0.000). While no significant difference between mean age of DM2 patients (55.5±1.06), and IFG (55.6±0.9) (p 0.90), no significant difference between mean BMI of DM2 patients (27.7±0.8), and IFG (27.8±0.5) (p 0.94). there were significant differences in DM and IFG obese groups (G1 and G2) according to age (51.66 ±2.10, 51.80±1.16) P (0.02), however, there were significant differences between DM and IFG in Normal weight groups (G5 and G6) according to age (59.93±0.94, 51.13±1.80) P (0.00), while no significant differences between DM and IFG in Over weight groups (G3 and G4) according to age (54.93±1.17, 58.00±1.73) p(0.21), there were significant differences between DM2 and IFG in obese groups (G1 and G2) according to BMI (33.70±1.20, 31.11±0.37) P (0.01),), no significant difference between overweight (G3 and G4) according to BMI (27.72±0.30, 27.52±0.34) P(0.66), and no significant difference between normal weight (G5 and G6) according to BMI (21.84±0.45, 21.53±0.50) P(0.65). There were significant differences between DM and IFG in obese groups (G1 and G2) according to CoQ10 (7.2±0.4, 4.9±0.4) P (0.002), and IGFBP (0.3±0.02, 1.2±0.19) P (0.005).

Keywords: *CoQ10, Obese patients, Diabetic Mellitus Type 2, IFG.*

Introduction

Diabetes mellitus (DM) is a chronic disease described by elevated of blood glucose. The raised concentration of blood glucose result from the insufficient production of insulin or an imperviousness to the impacts of insulin, a hormone framed by the pancreas [(1).] It is becoming one of the main chronic non- contagious diseases threatening the health of human around the world[(2).] T2DM accounts for between 90% and 95% of diabetes, with highest proportions in low- and middle income countries[(2)]. It is a common and serious global health problem that has evolved in association with rapid cultural, economic and social changes, ageing populations, increasing and unplanned urbanization, dietary changes such as increased consumption of highly processed foods and sugar sweetened beverages, obesity, reduced physical activity, unhealthy lifestyle and behavioural patterns, fetal malnutrition, and increasing fetal exposure to hyperglycemia during pregnancy[(3).] T2DM is most common in adults, but an increasing number of children and adolescents are also affected[(4).] Obesity is a disorder characterized by an unequal increase in body weight in relation to height, mainly due to the accumulation of fat. Obesity is considered a pandemic of the present century by the World Health Organization (WHO) and other international organization[(5).] Obesity is associated with the development of important non-

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communicable chronic diseases, namely, hypertension, metabolic syndrome, type 2 diabetes mellitus (T2DM), cardiovascular diseases (CVD), obstructive sleeping apnea, osteoarthropathies and cancer[6]. Insulin-like growth factor 1 (IGF-1) is a 70-aminoacid polypeptide hormone with endocrine, paracrine, and autocrine effects, which shares structural homology (>60 %) with IGF-2 and proinsulin[7]. It is mainly produced by the liver (accounting for ≈75 % of circulating IGF-1) secondary to growth hormone (GH) and insulin endocrine stimulation in the liver. Conversely, IGF-1 acts to provide an inhibitory feedback signal on GH secretion in the hypothalamus by stimulating somatostatin production in the pituitary(8). IGF-1 is also produced locally in all bodily tissues[9]. IGF-1 availability is tightly regulated by the so-called insulin-like growth factor binding proteins (IGFBPs), which may act by increasing IGF-1 half-life, from minutes to hours (most commonly by forming a tertiary complex with Acid-Labile Subunit and IGFBP3), however blocking its binding to the insulin-like growth factor 1 receptor (IGF-1R)[10].

Materials and Methods

This study performed during period from September 2019 to December 2019 the subject were selected from Teaching Hospital/Medical City. Questionnaires were filled by participants and to get the agreement to participants in this study to collect the information of control and patients group. Blood samples were collected from control and patients group. The sample was drawn from the vein and stored by using (5mL) disposable syringe, all samples were collected in fasting status. The sample was keep into dispensable tubes containing a gel which facilitate the separation processes of serum and allowed to clot at 37˚C approximately at ten-fifteen min and then centrifuged at 2000 Xg for ten-fifteen min then the serum was stored at (-20˚C) until analysis (CoQ10 and insulin-like growth Factor Binding Protein -1).

Subjects (patients and control groups):

Subject were enrolled in this study First group: patients 30 normal obese male with age range (40-60) years. Second group: DM type 2 (30) male with age range (40-60) years the duration of disease (1-5) years. Third group: 30 normal healthy male documented by physician or lab investigation matched in their age in both obese group.

Measurement of Human CoQ10 .

1. Standard wells, a volume of 50µl of the standard solutions were added to the standard wells. Then a volume of 10µl of the sample was added followed by 40µl of sample diluent was added to the testing sample well, in blank nothing to add. Afterword, a volume of 100µl of HRP-conjugate reagent was added to each well and then covered by used adhesive strip followed by incubation for sixty min at 37°C. Next ,the cover on a plate was removed and starting to wash process, the wash process was repeated for four times using 400µl of Wash Solution each time by an auto washer. After that, a volume of 50µl of chromogen solution (A) and (B) was added to each well and mixed gently and followed by incubation period at 37°C for 15 min. This addition should be protected from light. Then, a volume of 50µl Stop Solution was added to each well. The color in the wells converts from blue color to yellow color. If the color in the wells become green or the color change does not appear uniform, the plate should gently coverd to ensure good mixing. Later a microtiter plate reader was used to read the absorption within 15 min at 450 nm. A dose response standard curve was used to evaluate the concentration of CoQ10 in serum.

Measurement of Human Insulin-like growth Factor Binding Protein -1[11].

Standard wells, a volume of 50µl of the standard solutions were added to the standard wells. Then a volume of 10µl of the sample was added followed by 40µl of sample diluent was added to the testing sample well, in blank nothing to add. Next, a volume of 100µl of HRP-conjugate reagent was added to each well and then covered by used adhesive strip followed by incubation for sixty min at 37°C. The cover on a plate was removed and starting to wash process, the wash process was repeated for four times using 400µl of Wash Solution each time by an auto washer. After that, a volume of 50µl of chromogen solution (A) and (B) was added to each well and mixed gently and followed by incubation period at 37°C for 15 min. This addition should be protected from light. After , a volume of 50µl Stop Solution was added to each well. The color in the wells converts from blue color to yellow color. If the color in the wells become green or the color change does not appear uniform, the plate should gently coverd

to ensure good mixing. Later, a microtiter plate reader was used to read the absorption within 15 min at 450 nm. A dose response standard curve was used to evaluate the concentration of (IGFBP-1) in serum.

Statistical Analysis

The version twenty of SPSS was used to complete Statistical analysis. (Means ± SD) were used to represent the variables. The comparison between patients group and control group was done by use student t-test; with a *p*-value of ≤ 0.001 was considered a significant. The method that used to find the relationship between two continuous variables was correlation coefficient (r).

Results

The result showed as in Table (1) and the mean difference between T2DM according to CoQ10 (12.5±1.1) was decreased than the mean of IFG (21.8±3.2) (P 0.002) and the mean difference between T2DM according to IGFBPs (0.65±0.06) was decreased than the mean of IFG (3.2±0.3) (P 0.000). While no significant difference between mean age of DM2 patients (55.5±1.06), and IFG (55.6±0.9) (p 0.90), no significant difference between mean BMI of DM2 patients (27.7±0.8), and IFG (27.8±0.5) (p 0.94).

Table (1): The mean difference between DM2 and IFG patients according to parameters in this study

parameter	DM2 mean± SE	IFG mean± SE	p-value
Age (year)	55.5±1.06	55.6±0.9	0.90
BMI (Kg/M2)	27.7±0.8	27.8±0.5	0.94
CoQ10 nmol/L	12.5±1.1	21.8±3.2	0.02
IGFBP ng/ml	0.65±0.06	3.2±0.3	0.000

Moreover, In Table (2), (3), (4), the mean differences between DM2 and IFG cases in different weight groups (Ob., Ow. and Nw) according to age, BMI, COQ10 and IGFBP were studied, the results showed that, there were significant differences in DM and IFG obese groups (G1 and G2) according to age (51.66 ±2.10, 51.80±1.16) P (**0.02**), however, there were significant differences between DM and IFG in Normal weight groups (G5 and G6) according to age (59.93±0.94, 51.13±1.80) P (0.00), while no significant differences between DM and IFG in Over weight groups (G3 and G4) according to age (54.93±1.17, 58.00±1.73) p(0.21), there were significant differences between DM2 and IFG in obese groups (G1 and G2) according to BMI (33.70±1.20, 31.11±0.37) P (0.01),), no significant difference between overweight (G3 and G4) according to BMI (27.72±0.30, 27.52±0.34) P(0.66), and no significant difference between normal weight (G5 and G6) according to BMI (21.84±0.45, 21.53±0.50) P(0.65). There were significant differences between DM and IFG in obese groups (G1 and G2) according to CoQ10 (7.2±0.4, 4.9±0.4) P (0.002), and IGFBP (0.3±0.02, 1.2±0.19) P (0.005). However, there were significant differences between DM and IFG in overweight groups (G3 and G4) according to CoQ10 (23.2±0.4, 64.5±1.6) P (0.00), and IGFBP (1.2±0.03, 4.1±0.2) P (0.00). In addition to that, there were significant differences between DM and IFG in normal weight groups (G5 and G6) according to CoQ10 (7.2±0.4, 12.8±1.6) P (0.003), and IGFBP (0.3±0.01, 6.2±0.3) P (0.00).

Table (2): The mean difference between DM and IFG cases in different weight groups according to age

Groups	subgroups	age year mean±SE	P-value
Obese	DM/G1	51.66 ±2.10	0.02
	IFG/G2	51.80±1.16	
Over weight	DM/G3	54.93±1.17	0.21
	IFG/G4	58.00±1.73	
Normal weight	DM/G5	59.93±0.94	0.00
	IFG/G6	51.13±1.80	

Table (3): The mean difference between DM2 & IFG cases in different weight groups according to BMI

Groups	subgroups	BMI (Kg/M2)	P-value
Obese	DM/G1	33.70±1.20	0.01
	IFG/G2	31.11±0.37	
Over weight	DM/G3	27.72±0.30	0.66
	IFG/G4	27.52±0.34	
Normal weight	DM/G5	21.84±0.45	0.65
	IFG/G6	21.53±0.50	

Table (4): The mean difference between DM2 & IFG cases in different weight groups according to CoQ10 and IGFBP

Groups	subgroups	CoQ10 nmol/L	P-value	IGFBP ng/ml	P-value
Obese	DM/G1	7.2±0.4	0.002	0.3±0.02	0.005
	IFG/G2	4.9±0.4		1.2±0.19	
Over weight	DM/G3	23.2±0.4	0.00	1.2±0.03	0.00
	IFG/G4	64.5±1.6		4.1±0.2	
Normal weight	DM/G5	7.2±0.4	0.003	0.3±0.01	0.00
	IFG/G6	12.8±1.6		6.2±0.3	

Discussions

These results were agreement with results obtained by Alehagen *et al*.[12] who found that, there were significant differences between T2DM and IFG according to CoQ10 (P < 0.001). Dulskas *et al*.,[13] found that, there were no significant difference between T2DM and IFG according to age (P 0.89), BMI (P 0.74), this result was agreement with results in this study. A study of [14] found that, there were significant differences IGFBP in patients with T2DM. The clinical parameters were studied by [15]found that age and BMI, were no significant differences in T2DM patients, so, these results were agreement with results obtained by [15] who found that, there were significant differences between IFG and CoQ10 (P < 0.005). Wei *et al*., [16] found that, there were no significant difference between IFG and age, BMI P (0.55), while the results in this study were disagreement with study of [17] who found that, there were a statistically significant interaction was found between T2DM and BMI (p<0.0001). The results of [18] found that, the diabetic patients were not associated with obesity (p=0.020) and were independent of age. These results were agreement with results obtained by [19] who found that More than 90% of patients with type 2 diabetes have a BMI ≥25.0 kg/m2. In adult patients with type 2 diabetes, some studies have shown that individuals who lost 9–13 kg had a 25% reduction in all-cause mortality compared to weight-neutral patients. The results were agreement with results obtained by [20] who found that, increased BMI was associated with increased prevalence of diabetes mellitus (p < 0.001). In addition to that (21) found more than 75% of patients had BMI ≥ 25 kg/m2 estimated that prevalence of diabetes mellitus.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq

Conflict of Interest: None

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