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STATUS OF SOME TRACE ELEMENTS IN IRAQI DIABETIC WOMEN AND ITS RELATIONSHIP WITH LIPID PROFILE

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ABSTRACT
Trace elements are tiny molecules that play important roles in our bodies; their metabolism has been reported to alter in diabetes mellitus and might have specific roles in the pathogenesis and progress of this disease. The aim of the present study was to investigate the serum level of copper (Cu), zinc (Zn), selenium (Se), iron (Fe) in women with type 2 diabetes mellitus and their possible association with lipid profile, age, and BMI. The comparative study included (25) diabetic women and (20) non diabetic women as control. Subject trace elements were determined using atomic absorption spectrometry, total cholesterol,(TG), triglyceride (TG), low density lipoprotein (LDL),high density lipoprotein cholesterol (HDL) and very low density lipoprotein(VLDL) concentrations were determined using enzymatic method. Data were evaluated as mean and standard error. Results indicated that there is a significant higher level of serum iron in diabetic patients compared with the control group, while selenium, copper and Zinc showed no significant difference between the two groups. A significant negative correlations were found between serum selenium and each of TG (r = - 0.44), VLDL (r= -0.55) and LDL (r = -0.42), also a negative correlation was found between serum iron and HDL(r = -0.61) while a significant positive correlation was found between Se and HDL- c(r = 0.40) and between serum iron and TG(r = 0.40).

KEYWORDS: Trace elements, diabetes mellitus, lipid profile.

INTRODUCTION

Dietary composition has a big role in control of diabetes mellitus, now a day's composition of our diet has changed considerably which causes greatly to increase incidence of many different disease such as diabetes mellitus (1).Trace elements from part of daily diet, which are well known to play vitally important roles in the maintenance of health (2). Although there have been numerous studies yielded inconsistent results (3, 4, 5, 6, and 7). Literature survey shows that some trace elements as Cr, Mg, Va, Zn, Mn, Mo, and Se play important role in insulin action (8) including activation of insulin receptor (9), serving as cofactor or components for enzyme systems involved in glucose metabolism (10), increasing insulin sensitivity and acting as antionxidant preventing tissue per oxidation (11,12,13,14). According to the above mentioned, it is important to determine the essential element concentrations in biological samples of diabetes mellitus patients and to investigate its relationship with lipid profile. Present study was under taken to estimate the serum levels of Zn, Cu, Fe, and Se in women with diabetic patients and their association with lipid profile, age and BMI.

MATERIAL AND METHODS

Study population: the study population is known diabetic patients attending Al-Mustansirya University, national diabetes center, Baghdad and non-diabetic individuals. The non-diabetic individuals were selected following medical examination and laboratory test that determined fasting blood glucose level.

Exclusion criteria

These included pregnant women, lactating mothers, smoking and alcoholic individuals, anyone on medication that could affect exposure to measured metals-women with other chronic illness also excluded.

Subject population

The present study included (45) women categorized into two groups, the first group includes 20 normal subjects considered as apparently healthy by clinical examination and with no history of diabetes. Their age ranged between (40-67) years, the second group included 25 patients with type 2 diabetes, their age ranged between (37-68) years.

Blood sample collection

After an overnight fasting (from 8 p.m. to 8 a.m.) blood was drown from the capital vein of each participant using sterile disposable plastic syringe. The sample left to clot and the serum was separated by centrifugation.

Trace metals determination

Level of the selected metals was estimated by atomic absorption spectrophotometer. The principle is based on dissociation of the element from its chemical bond, then placed in unexcited state (neutral atom), which can absorb radiation corresponding to its own line spectrum. The amount of radiant energy absorbed is proportional to its concentration. The serum diluted to (10) ml with hydrochloric acid in (10) ml centrifuge tube. The diluted sample displayed directly to the flame.

Lipid profile determination

The principle determination of total serum cholesterol (TC), triglyceride (TG) and high density lipoprotein (HDL) was based on the enzymatic hydrolysis using a ready-made laboratory kits for this purpose, whereas serum low density lipoprotein (LDL) and very low density

lipoprotein (VLDL) were calculated mathematically from the total cholesterol, triglycerides and HDL-cholesterol concentration (15).

Statistical Analysis

Data were analyzed by using SAS program and results were expressed in means and standard error and means were compared by two – tailed unpaired t-test.

Pearson's correlation coefficient (r) was calculated to determine associations between studied parameters. P (probability) < 0.05 was considered significant.

RESULTS

Diabetic patients had mean age (53.96 ±1.55), while the mean age of non-diabetic control was (55.80 ± 1.53), (Table-1). The difference between the means was not significant. Results revealed that the mean concentration of iron in serum of diabetic group was significantly (P<0.05) higher than content samples, whereas the difference between the mean concentration of zinc, copper, and selenium in diabetic and control group were not significant.

TABLE 1: Descriptive physical characteristics of control subjects and diabetic patients

characteristics	Control N=20	Patients N=25	P value
Age (years)	55.80±1.53	53.96±1.55	0.44
Height (cm)	169.25±2.05	164.48±1.84	0.40
Weight (Kg)	78.90±2.08	94.20±2.34	0.02
BMI (Kg/m^2)	27.47±1.35	34.84±3.80	0.01

As shown in (Table-2) the mean concentration of Fe in diabetic group was significantly higher than control group (P < 0.05), while the differences between the mean concentrations of zinc (Zn), copper (Cu) and selenium (Se) in control group and diabetic group were not significant.

TABLE 2: Descriptive chemical characteristics of control subjects and diabetic patients

Biochemical characteristics	Control N=20 Mean±SE	Patients N=25 Mean±SE	P value
TC	162.15±11.09	175.76±9.51	0.31
HDL-C	43.78±1.70	36.04±0.99	0.52
LDL-C	92.83±11.06	99.30±11.83	0.44
VLDL	35.15±4.26	37.60±3.94	0.72
TG	175.45±21.43	205.12±21.46	0.21
Se	56.00±1.02	53.92±1.11	0.18
Fe	0.67±0.05	0.80±0.02	0.01
Zn	0.64±0.01	0.61±0.02	0.23
Cu	0.87±0.05	0.83±0.02	0.42

All correlations between trace elements and lipid profile in control group were not significant (Table-3), whereas in diabetic group results obtained a significant correlation between serum iron and TG (r=0.40) and significant negative correlations between selenium (Se) and each ofTG (r=-0.43), VLDL (r=-0.55) and HDL (r= -0.40) (Table-4).

TABLE 3: The correlations of serum concentrations of trace elements with lipid profile parameters in control subject.

Trace elem. / Lipid profile	Se	Fe	Cu	Zn
TC	r=-0.07	r=0.22	r= 0.25	r=0.24
	p=0.73	p=0.33	p= 0.28	p=0.30
TG	r=0.17	r= -0.22	r= -0.06	r=0.29
	p=0.47	p=0.33	p=0.79	p=0.20
LDL-C	r= 0.03	r=0.33	r=0.30	r=0.38
	p=0.89	p=0.17	P=0.22	P=0.11
VLDL	r=0.16	r=-0.22	r=-0.06	r=0.29
	P=0.48	P=0.33	P=0.79	P=0.20
HDL-C	r=-0.26	r=0.39	r=0.13	r=0.01
	P=0.27	P=0.09	P=0.58	P=0.95

Table 4: The correlations of serum concentrations of trace elements with lipid profile parameters in diabetic patients

Trace elem. / Lipid profile	Se	Fe	Cu	Zn
TC	r=-0.13	r = 0.40	r = -0.09	r = -0.14
	p=0.73	p = 0.04	p = 0.64	p = 0.47
TG	r = -0.44	r = -0.23	r = -0.19	r =0.005
	p = 0.02	p = 0.25	p = 0.35	p = 0.95
LDL-C	r= -0.42	r=0.38	r=-0.08	r=-0.14
	p=0.04	p=0.06	P=0.70	P=0.51
VLDL	r=-0.55	r=-0.23	r=-0.24	r=0.005
	P=0.006	P=0.27	P=0.25	P=0.97
HDL-C	r=0.40	r=-0.61	r=0.35	r=0.16
	P=0.04	P=0.001	P=0.09	P=0.45

DISCUSSION

Diabetes has become an international health care crisis that required new approaches to prevention and treatment. Diabetes management should begin with exercise and diet (16) and dietary modification the simplest and cheapest form of diabetes treatment is the primary therapy in type 2 diabetes (17). Diabetes has been shown to be associated with abnormalities in the metabolism of Cu, Zn, Fe, Se. and the impairment of these metals had been reported as aggravating factors in the progression of disease.

Zinc

Zinc and insulin concentration in the pancreas change in the same direction in a variety of situations in humans (18), its useful in synthesis, storage, and secretion of insulin (19) the present results showed that the level of zinc decrease in the serum of diabetic patients (Table-2). The loss of these minerals might be attributed to impaired absorption or to the excess excretion of these metals in urine in these patients, which may include a deficiency of these metals in serum of diabetic patients and that is consistent with the works of (20).

Copper

Clinical studies of type 2 diabetes have shown alterations in copper metabolism in this disease (21). Our result showed a decrease in serum copper level in diabetic individuals which is consistent with the findings of Smith et al., Ito et al., and Babalola et al., (21, 22, 23).(22). It is not yet known, whether that abnormalities in copper metabolism noted in these subjects are a consequence of the disease or they play a role in the progression of the disease.

Selenium

Concentration of selenium in serum depends largely on selenium intake and varies widely geographically (24). Selenium statues in diabetic lower than in healthy groups, our results have been consistent with results obtained by some other studies(25,26). Low serum selenium concentration levels in diabetic populations may be due to low intake, malnutrition, high selenium urine excretion, increase requirements or metabolic changes.

Iron

Excess iron has been implicated in the pathogenesis of diabetes and its complication (27). Free iron serves as a catalyst for lipid and protein oxidation and the formation of reactive oxygen species. In addition, iron induces are correlated with obesity and insulin sensitivity.

The present study observed a significant elevation in the level of the total serum iron in patients' subject compared with controls.

In regards with the relation between trace elements and some lipid profile the results obtained thatthe control group exhibited no significant correlations between them. These results are similar to the results of a recent study conducted on the same subject in Iraq(28). In the diabetic patients, it was found a negative correlations between selenium and each of TG (r= -0.44) and VLDL (r= -0.55) and LDL (r=-0.40). Negative correlations between selenium and lipid profile is previously confirmed by several studies (29, 30, 31).

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