

Trace Elements Levels (Zn, Cr, Mg) in Type 2 Diabetic Patients

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Abstract

Introduction: In Diabetes, (both type 1 and type 2) an alteration in the metabolism of the minerals Zinc (Zn); Chromium (Cr) and Magnesium (Mg) have been demonstrated. Little is known about the role of these minerals in type 2 diabetes mellitus.

Objective: To examine the hypothesis that there is an alteration in serum level of some trace elements, Zinc (Zn) Chromium (Cr) and Magnesium (Mg) in type 2 D.M.

Patients and Method: The study was conducted on 35 type 2 diabetic subjects and 32 age matched control subjects, age range (42-57) years after obtaining their consent for active participation during the entire study period from November 2007 to June 2008, in National Diabetes Center / Al Mustansiriya University.

Results: The (Mean±SD) of plasma glucose in patients and controls were (162.16± 25) mg/dl and (78.18±9.5)mg/dl respectively, (p<0.01). The (Mean±SD) of Zn for patients and controls were (125.0±19) µg/dl and (152.5±23.5) µg/dl respectively (p<0.05). For Cr were (0.04±0.03) µ /dl and (0.08±0.03) µg/dl respectively (p<0.001). For Mg were (1.8±0.31)mg/dl and (2.4±0.32)mg/dl respectively (p<0.001).

Conclusions: There is an alteration in concentration of serum Zn, Cr and Mg in type 2 diabetics.

Key words: Type 2 diabetics, Trace elements.

Introduction

Diabetes mellitus results in disturbances of chemical elements concentrations' in the body, many trace elements are affected by this disease such as Cr, Zn and Mg^[1,2]. Direct association of trace elements with health and disease is already established, Chromium has role in glycemic control in diabetic patients^[3] because of its role in potentiating the action of insulin in decreasing postprandial glucose^[4]. Chromium is considered to be essential for normal carbohydrate metabolism in humans^[5]. Cr deficiency leads to impaired glucose tolerance^[6,7]. Cr as a part of the organic complex known as glucose tolerance factor (GTF), works together with insulin to clear the blood from glucose^[4].

Zinc, an essential trace element has a role in glycemic control in individuals with diabetes mellitus^[3]. Many complications of diabetes may be related to increased intracellular oxidations of free radicals associated with decreases in intracellular Zn and Zn dependent antioxidant enzymes^[8]. Zn deficiency in humans may result from inadequate dietary Zn intake especially during pregnancy, lactation, periods of rapid growth and also because of some disease like diabetes^[9,10]. Magnesium is an essential trace element that involved insulin secretion, binding and activity and is a critical cofactor of many enzymes in carbohydrate metabolism^[11,12].

Objectives:

Evaluated the levels of Zn, Cr and Mg in serum of type 2 diabetic patient .

Patients and Methods:

Thirty five type 2 diabetic subjects and 32 ages matched healthy subjects (control group) age range of (42-57) years. Detailed history was recorded and clinical examination was performed. Patients who are currently taking nutritional supplementations, magnesium containing laxatives, alcohol and diuretics were excluded from the study after an overnight fasting blood samples were taken for all patients and controls. Fasting plasma glucose were determined by enzymatic colorimetric assay using kits supplied by (Spinreact S, A .Spain), and estimation of Zn, Cr and Mg, done by use of atomic absorption spectrophotometer (AA-6200, Shimad Zn, chinal), Baghdad University/ College of Science.

Statistical Analysis:

The data was analyzed with the help of independent (t) test and Pearson's correlation (r).

Results:

In type 2 diabetic patients plasma glucose were significantly elevated (p<0.01) as compare to healthy age matched controls.

Diabetic subjects had significantly lower serum concentration of Zn, Cr, and Mg as compared with the control group, and plasma glucose levels were significantly negatively correlated with the serum concentrations of Zn, Cr and Mg, Tables (1),

Table 1: The (mean± SD) value of fasting plasma glucose in diabetic patients and control subjects.

P value	Fasting plasma glucose	
	Control subjects n=32	Diabetes patients n=35
< 0.01	78.18 ± 9.5	162.16± 25

Table 2: The (mean± SD) value of serum concentration for Zn, Cr and Mg in patients and control subjects.

Serum concentration	Control subjects n=32	Diabetic patients n=35	P value
Zn (µ g/ dl)	152.0 ± 23.5	125.0 ± 19	<0.05
Cr (µg/ dl)	0.08 ± 0.03	0.04 ± 0.03	<0.01
Mg(mg/ dl)	2.4 ± 0.32	1.8 ± 0.31	<0.01

Discussion:

In diabetes mellitus the disturbed concentration of Zn, Cr and Mg in the body are often found [13]. Some trace elements acts as antioxidants and prevent membrane peroxidation while others act directly on glucose metabolism [14]. In the present study, diabetic subjects showed an elevated fasting plasma glucose level as compared to healthy controls, which is the hallmark of diabetes and in this study were found to have lower levels of Zn in serum as compared with healthy controls, this finding confirms results presented in the study of Rai V, 1997[15]. There is a significant decrease in serum Cr concentrations in diabetics when compared to controls, which agreed with the results by [Ding WJ, 1998][16].

The mean serum Mg in diabetics was significantly lower than controls and this agreed with the study of [Fujii S, 1994][17] and [siogren A, flossn A,1998][18].

Present study demonstrated negative correlations of plasma glucose with serum Zn, Cr and Mg levels in diabetics compared to controls as seen in table (2), more over the altered, Zn, Cr and Mg levels were related to degree of glycemc control.

The inverse correlations between plasma glucose and the trace elements (Zn, Cr and Mg), suggest that Zn, Cr and Mg may found to deteriorate due to abnormal metabolic process in diabetes.

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