International Journal of Innovation Sciences and Research
Vol.4, No, 9, pp.458-460, September- 2015

Available online at
http://www.ijisr.com

RESEARCH ARTICLE

COMPARISON OF LEVEL OF SERUM ZINC AND SERUM MAGNESIUM BETWEEN DIABETICS AND NON DIABETICS PATIENTS

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Accepted 24th August, 2015; Published Online 30th September, 2015

ABSTRACT

Background: Diabetes mellitus is chronic disease characterized by defective insulin production or utilization. In particular, type-2 diabetes mellitus has been shown to be associated with abnormalities in the metabolism of Zinc, Chromium, Magnesium and Manganese.
Aims & Objective: To estimate Serum Zinc and Serum Magnesium level in Diabetics and Non Diabetics patients.
Methodology: Serum Zinc and Serum Magnesium was estimated from 50 diabetics (Study Group) and 50 Non Diabetics (Control Group) patients attending at our Institute. Obtained Results of study Group are compared with Control group to calculate level of significance by calculating p-value.
Conclusion: The Mean concentration of diabetics (Study Group) Serum Zinc and Serum Magnesium is found to be low as compared to Non Diabetics (Control Group).

Key Words: Serum Magnesium, Serum Zinc, Type 2 diabetes mellitus.

INTRODUCTION

Diabetes mellitus is a metabolic disease which is caused by absolute or relative insulin deficiency. About 10% of the Indian population suffers from this disease. Various factors play a role in the aetiopathogenesis and in the glycaemic control among the type 2 diabetic patients. (Mangukiya and Neha, 2014) Diabetes is estimated to affect about 170 million people worldwide and this represents about 2% of the world's population (Wokoma, 2002; Unwin *et al.,* 2001). Speculations on the role of trace elements in human disease were aroused in 1929, when glaser and halpern noticed that yeast extracts potentiate the action of insulin (Glaser and Halpern, 1929). Earlier works of Mertz, *et al.,* in 1959 demonstrating the existence of glucose tolerance factor in yeast with the identification of the active component as trivalent chromium sparked off interest on the status of other trace and macro elements in health and diseases including diabetes (Mertz, 1975).

The proposed mechanism of trace elements enhancing insulin action includes activation of insulin receptor sites, serving as cofactors or components for enzyme systems involved in glucose metabolism (Vincent, 2000; Murray *et al.,* 2000), increasing insulin sensitivity and acting as antioxidants preventing tissue per oxidation (Kruse-Jarres and Rukgauer, 2000). Zinc is required for insulin synthesis and storage and insulin is secreted as zinc crystals, it maintains the structural integrity of insulin (Chausmer, 1998). Magnesium is a cofactor in the glucose transporting mechanisms of the cell membrane and various enzymes in carbohydrate oxidation.

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It is also involved at multiple levels in insulin secretion, binding and enhancing the ability of insulin to activate tyrosine kinase (Suarez, 1993).

MATERIALS AND METHODS

This study was conducted at Geetanjali medical college and hospital, Udaipur, Rajasthan. A total of hundred patients (in patients and outpatients) of our tertiary care institute were included in our study, that consist of 50 patients suffering from Type 2 diabetes mellitus which served as test group and another 50 non diabetic control (age and sex matched from the same population with normal blood sugar). The criteria to diagnose Diabetes mellitus is on the basis of WHO strategy.

Exclusion criteria

The patients suffering from liver disease, kidney disease, and severe congestive heart failure were excluded from the study. Obese or pregnant subjects, subjects with renal complication, hypertension and currently taking nutritional supplements, magnesium containing laxatives, diuretics / alcohol were excluded in both groups.

Collection and processing of blood sample

7ml of fasting venous blood sample was drawn from each subject under aseptic conditions. 2ml of the Sample was dispensed in to fluoride oxalate bottles for plasma glucose estimation. 1ml of the sample was dispensed in to EDTA vial for estimation of glycosylated hemoglobin. The rest of the sample was discharged into a plain vial and allowed to clot. The serum was separated and used for various investigations. Following investigations were carried out in all the patients on semi automated biochemistry analyzer.

Table 1. Age wise distribution of participants

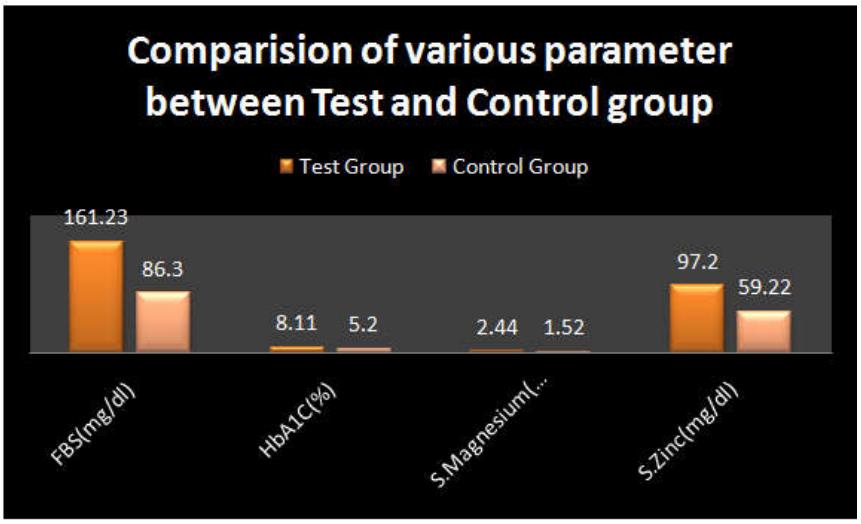
Group	Number(n)	Age(yr)(Mean±SD)
Study	50	45.3±1.3
Control	50	44.4± 1.5

Table 2. The mean concentration of various biochemical parameter in both group

Parameter	Study Group (Mean ± SD)	Control Group (Mean ± SD)
FBS(mg/dl)	161.23±10.2	86.3±11.2
HbA1C(%)	8.11±1.2	5.2±1.1
S.Magnesium(mg/dl)	2.44±0.9	1.52±0.8
S.Zinc(mg/dl)	97.2±9.2	59.22±11.1

Table 3. Comparison of various parameter between study group and control group

Parameter	Number	Group	Result	P-value
FBS(mg/dl)	50	Study	161.23	<0.01
	50	Control	86.3	
HbA1C(%)	50	Study	8.11	<0.01
	50	Control	5.2	
S. Magnesium(mg/dl)	50	Study	2.44	<0.01
	50	Control	1.52	
S. Zinc(mg/dl)	50	Study	97.2	<0.01
	50	Control	59.22	



Graph 1. Comparision of various parameter between Test and Control group

1. Fasting blood glucose: glucose oxidase method.
2. Serum Zinc estimation: Colorimetric kit method
3. Serum Magnesium estimation: Colorimetric kit method
4. Glycosylated Hemoglobin estimation: Immuno turbidimetry method

The result obtained from the above investigations will be analyzed. The results would be expressed as mean SD of each variable. The comparison will be done by student 't' test on the number of variables of each parameter.

p-value less than 0.05 was considered as a difference of significant.

RESULTS

50 patients suffering from diabetes mellitus (Type 2) comprised study group. 50 adults of same age group and normal blood sugar level acted as controls.

In the study group there were 15 males and 35 females, whereas in the control group there were 21 males and 29 females.

DISCUSSION

Numerous studies have demonstrated the essential roles of trace elements as chromium, zinc, magnesium, selenium, vanadium, molybdenum and manganese in insulin action and carbohydrate metabolism (Al-Maroof and Al-Sharbatti, 2006). In our study, it was observed that mean serum zinc level was significantly low in diabetics as compared to control subjects, which correlates with other studies (Anetor *et al.,* 2002; Schmits Chek and Rempis, 2001) in different parts of the world. The possible explanation for decreased level of zinc observed in diabetics can be due to increased excretion and/or decreased gastrointestinal absorption of zinc. Our study also confirms the finding that the patients with type -2 diabetes mellitus have significantly lower levels of magnesium as compared to controls as reported by several workers in the

previous studies (Ashima *et al.,* 2011). In the present study, it was seen that zinc and Magnesium levels were decreased in type 2 diabetic patients. Magnesium depletion is a cause or consequence of type 2 diabetes mellitus remains debatable, but Magnesium depletion has a negative impact on glucose homeostasis and insulin sensitivity in patients with type 2 diabetes mellitus. Zinc also plays a major role in glycemic control of type 2 diabetic patients. If serum magnesium and zinc levels are low, an intervention to increase dietary intake of magnesium and zinc may prove to be beneficiary.

Conclusion

Decreased levels of Magnesium and zinc is the cause or consequence of diabetes mellitus remains yet to be certained, but its strong association with type 2 diabetes mellitus signifies the role played by magnesium and zinc in glucose disposal. The poor glycemic control and the association with type 2 diabetes mellitus strongly suggest that serum magnesium and zinc estimation should be a part of the screening panel in the risk detection for type 2 diabetic patients. Many workers have documented that the magnesium and zinc supplementation, in addition to the other nutritional treatments, play an important role in delay and prevention of the complication of type 2 diabetes mellitus. When the status of zinc and magnesium is poor in patients with type 2 diabetes mellitus, supplementation of these minerals probably is beneficial.

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