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Original Research Article

Assessment of zinc, Lipid profile and HB A1c in Sudanese with Type II Diabetes Mellitus in Khartoum State

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Abstract: Type 2 diabetes mellitus is associated with increased metabolic processes and oxidative stress. The trace elements are important co-factors in these events. Thus this study was conducted to compare serum levels of lipid profile, Zinc and HbA1c between type 2 diabetic patients and normal controls. The study was designed to find out the relation between lipid profile levels to severity and complication of diabetes mellitus. Degree of lipid profile with antioxidants and blood glucose in Sudanese with type 2 diabetes mellitus. Total 400 human subjects, out of which100 healthy individuals of age group (years) were taken as control and 300 diabetic subjects of age group (years) were taken as cases. There was significant increase in the lipid profile except HDL cholesterol, which is decreased, also significant decrease in trace elements chromium and Zinc. Impaired metabolism of these minerals may have a contributory role in the progression of DM and later development of complications.
Keywords: Zinc, lipid profile, Type II Diabetes Mellitus

INTRODUCTION

Type 2 diabetes mellitus (DM) is a well-known risk factor for the development of cardiovascular disease, cerebrovascular disease and peripheral vascular diseases. Dyslipidemia is a risk factor for coronary artery disease, a leading cause of mortality in patients with diabetes mellitus. Dyslipidemia remains largely undiagnosed and under treated in high risk populations, such as patient with type- 2 diabetes [1].

Hormonal, biochemical and nutritional disorders present in type 2 diabetic individuals have been subject to researches with the aim of clarifying the mechanisms involved in the pathogenesis of this disease. Regarding both biochemical and nutritional disorders, studies show changes in the mineral metabolism and the activity of antioxidant enzymes such as zinc and superoxide dismutase [2, 3]. Zinc is an essential micronutrient which has an important role in the functioning of hundreds of enzymes [4], zinc in insulin metabolism acts as an efficient antioxidant [5]. The implication and regulation of Zn transporters in chronic diseases has been reviewed [6]. Concerning metabolic diseases (insulin resistance, metabolic syndrome, diabetes), Zn is considered important mainly because it plays a major role in the stabilization of insulin hexamers and the pancreatic storage of the hormone [7] and it is an efficient antioxidant [8], while oxidative stress is considered to be a main component in initiation and progression of insulin resistance and diabetes [9].

Thus, the aim of our study was to find out the association of these minerals with lipid profile, zinc and glycemic control in the patients of type 2 diabetes mellitus.

MATERIALS AND METHODS

The study was a descriptive, case control hospital based study. 100 healthy subject were control group with mean FBS 5.3= m mol/L, they were 59 males and 41 females. The age ranged from 27 to 66 years old. The mean age average was 46.67 years. Type 2 diabetic patients were 300, the ages ranged from 27 to 78 years old. The mean age average was 46.62 years. All samples were in a state of fasting for 12 hours before drawing blood were obtained on these samples in Advanced Diagnostic Center during the period between March 2014 until January 2017.

Zinc serum level was measured using atomic absorption spectrophotometer 210-VGP Electron of the atom promoted to higher orbital's (excited state) for a short period of time by absorbing a defined quantity of energy. The amount of energy was specific to a particular electron transition in a particular element

(zinc). The radiation measured by using detector and the absorbance was converted to analytic concentration. Brief according to the manufacture's protocol, serum zinc was diluted 1:5 with deionized, then diluted serum aspirated and absorbance was measured at wave length 213.9 nm.

The analysis of serum samples for measuring zinc was done by calibrated atomic absorption spectrometer instrument with known stock standard solutions prepared in ratio 1:3:6 mg/l to perform the linear curves within the linear ranges (2.5mg/l) for the mentioned element respectively, beside the reference sample materials (certified samples for the same elements) according to certain condition listed . Statistical Package for Social Science SPSS (version 19) computer software was used for data analysis. The means and standard deviations of variable calculated and T-test (paired samples) was used for comparison (significant level was set at $P \leq 0.05$).

RESULTS

Table (1) shows the comparison between the test group and control group. There a significant difference in all parameter(FBS, HA1c, Total cholesterol, HDL, LDL, Triglyceride and Zinc) and height between the two groups Age mean±SD was 46.67±8.93 for the control group versus 46.62±8.82 for the test group (P = 0.89). Height mean±SD was 170.07±5.68 cm for the control group and was 170.44±9.29 for the test group (P = 0.73).

The present study was shows significant increase in the means of the plasma levels of fasting plasma glucose, total cholesterol, LDL, triglyceride, and HbA_{1c} of the test group when compared with healthy control group subjects (P= 0.001, P= 0.013, P= 0.001, P= 0.001, P= 0.012) whereas the means of the plasma levels of zinc and HDL showed significant reduction of the test group when compared with healthy control group subjects (P= 0.011, P= 0.003). Also was shows significant strong negative correlation between fasting blood sugar and zinc of the test group (r= -0.592, P value = 0.001), also was shows significant strong negative correlation between HbA1c and zinc of the test group (r= - 0. 710, P value = 0.000), also was shows significant strong negative correlation between total cholesterol and zinc of the test group (r= -0.327, P value = 0.012). Shows significant strong negative correlation between triglyceride and zinc of the test group (r= -0.803, P value = 0.001).

Table-1: Comparison of the means of Blood Parameters between diabetics and none diabetics:

Variables	None-diabetics (n=100)	Diabetics (n=300)	P value
FBS (Max-Min)	95.5±8.5 (79.0-110.0)	195.4±36.0 (127.0-299.0)	0.001*
HbA_1c% (Max-Min)	4.9±0.3 (4.4-5.4)	8.4±1.3 (6.1-12.1)	0.012*
Total Cholesterol (Max-Min)	144.2±20.9 (100.0-198.0)	243.1±21.0 (197.0-280.0)	0.01**3***
HDL (Max-Min)	53.4±9.3 (37.0-70.0)	28.2±4.2 (20.0-35.0)	0.03*
LDL (Max-Min)	67.9±26.1 (17.0-130.6)	168.2±18.9 (122.0-215.6)	0.0**01***
Triglycerides (Max-Min)	113.5±20.0 (149.0-81.0)	233.3±55.7 (349.0-145.0)	0.0**0**1*
Zinc (mcg/dl) (Max-Min)	0.830±0.112 (1.191-0.455)	0.293±0.085 (0.454-0.113)	0.0**11***

The table shows the mean ± SD, and the probability (p).
T-test was used for comparison.
P-value ≤ 0.05 is considered significant.

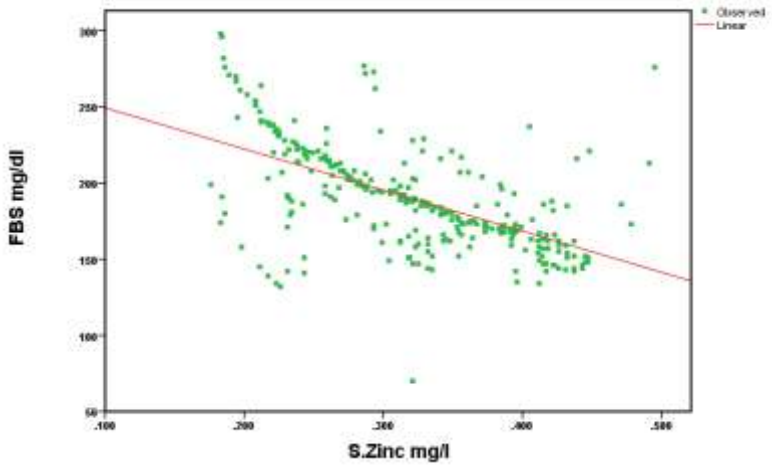

Fig-1: Scatter plot shows the relationship between serum zinc and serum FBS (r= -0.592, P value = 0.001).

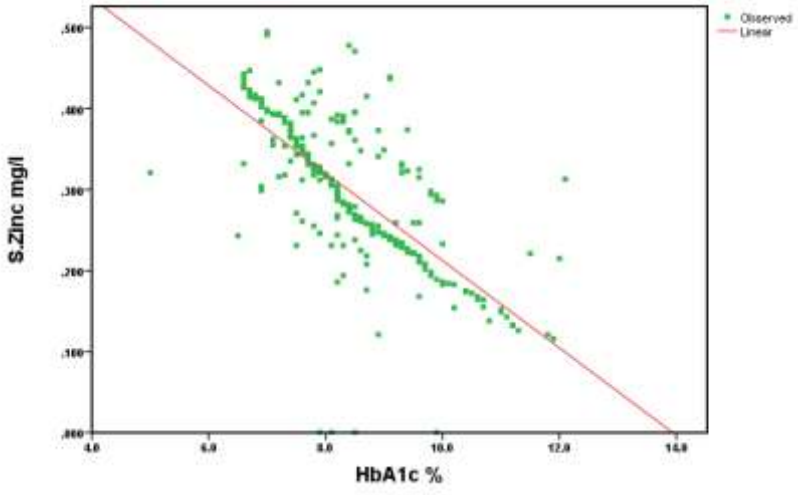

Fig-2: Scatter plot shows the relationship between HbA1c% and serum zinc (r= - 0. 710, P value = 0.000)

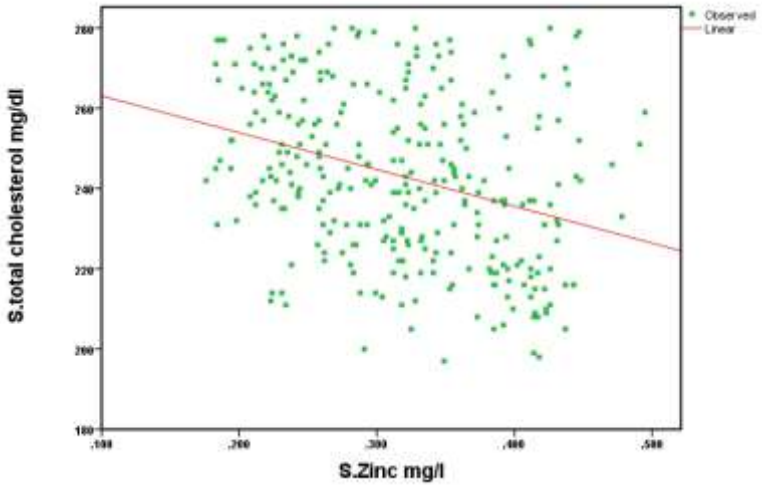

Fig-3: Scatter plot shows the relationship between serum zinc and serum total cholesterol (r= -0.327, P value = 0.012)

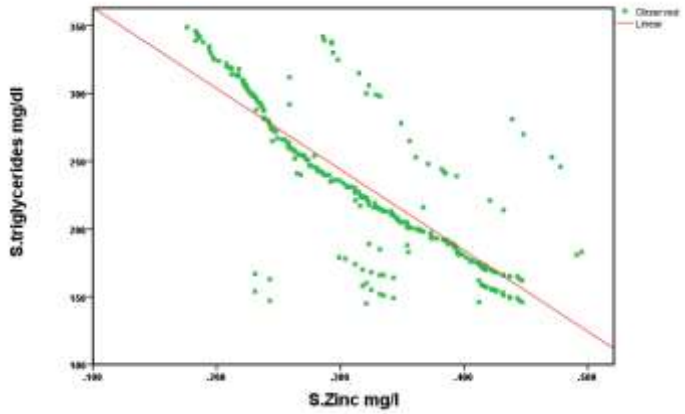

Fig-4: Scatter plot shows the relationship between serum zinc and serum triglycerides (r= - 0.803, P value = 0.001)

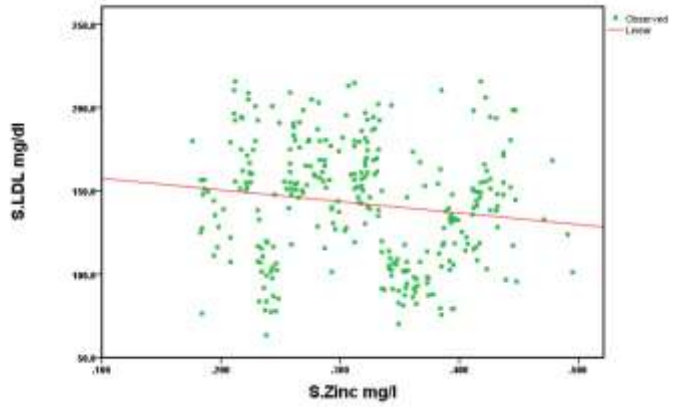

Fig-5: Scatter plot shows the relationship between serum zinc and serum HDL cholesterol (r= -0.145, P value = 0.012).

DISCUSSION

Our study showed a significant elevation of the means of the serum levels of total cholesterol of the test group when compared with the control group, these findings agree with the result of P, Annapurna *et al*. [10], who found significant raised in the means of the plasma levels of total, Our study the diabetic patients have a significant reduction in the means of their serum levels of HDL cholesterol when compared to the control group, this result agrees with that reported by Rosmee and K. Shyamal [11], who found the mean of the serum levels of HDLc was significantly lower in diabetic obese patients than in the control subjects. A study done by Wexler *et al*. [12] obtained a result that was not in concordance with our result in which the lipid profile were higher in diabetic patients , Our study we found the diabetic patients have a significant elevation in the means of the serum levels of LDL cholesterol when compared to the control group, this result agrees with that reported by M, G Bhutto [13] in a study done in India, who found the mean of the serum levels of LDLc was significantly elevation in diabetic patients than in the control subjects, The current study shows a significant elevation of the mean of the serum levels of triglycerides among the diabetic patients when compared to the control group, this agrees with a study done by Sarkar Chandra Bidan [14], who found the mean of the serum levels of triglycerides of the test group was significantly raised when compared with the control group, In our study the diabetic patients have a significant reduction in the means of the serum levels of zinc when compared to the control group , this result agrees with that reported by Carvalho, D.B.G *et al*. [15], in a study done in Brazil, who found the mean of the serum levels of zinc was significantly lower in diabetic patients than in the control subjects, and also found a significant inverse relationship in the correlation analysis between fasting blood suger and HbA1c levels and serum chromium concentrations. In our study shows a significant lower correlation between the serum levels of zinc and fasting blood sugar, this agrees with a study done by Olaniyan, O.O *et al*. [16], in a study done in Nigeria, who found a significant lower correlation between the fasting and the serum levels of the zinc, our study shows a significant Negative correlation between the serum levels of total cholesterol and the serum zinc, these findings agrees with that reported by El-zebda. G [17], in a study done in Libya, who found a significant Negative correlation between the serum zinc and the serum levels of the total cholesterol, these result was disagreed by E, Osman *et al*. [18] who does not found any correlations between

zinc and lipid profile in diabetics. In our study shows negative correlation between the serum levels of LDL cholesterol, triglyceride and the serum zinc, this agrees with that reported by Yeasmin *et al*. [19],who found negative correlation between the serum LDL cholesterol, triglyceride and the serum zinc.

CONCLUSION

The present study shows that significant lipoprotein abnormalities in type 2 diabetic patients when compared with healthy subjects. The lower level of serum zinc clearly shows that diabetic patients were exposed to an increased oxidative stress via lipid.

REFERENCES

1. Anastasios Kalofoutis, M. D., Kalofoutis, C., Piperi, C., Kalofoutis, A., Harris, F., & Phoenix, D. (2007). Type II diabetes mellitus and cardiovascular risk factors: Current therapeutic approaches.
2. Saharia, G. K., & Goswami, R. K. (2013). Evaluation of serum zinc status and glycated hemoglobin of type 2 diabetes mellitus patients in a tertiary care hospital of assam. Journal of laboratory physicians, 5(1), 30.
3. Basaki, M., Saeb, M., Nazifi, S., & Shamsaei, H. A. (2012). Zinc, copper, iron, and chromium concentrations in young patients with type 2 diabetes mellitus. Biological Trace Element Research, 148(2), 161-164.
4. Haase, H., Overbeck, S., & Rink, L. (2008). Zinc supplementation for the treatment or prevention of disease: current status and future perspectives. Experimental gerontology, 43(5), 394-408.
5. Saper, R. B., & Rash, R. (2009). Zinc: an essential micronutrient. American family physician, 79(9), 768.
6. Rungby, J. (2010). Zinc, zinc transporters and diabetes. Diabetologia, 53(8), 1549-1551.
7. Wijesekara, N., Chimienti, F., & Wheeler, M. B. (2009). Zinc, a regulator of islet function and glucose homeostasis. Diabetes, Obesity and Metabolism, 11(s4), 202-214.
8. Prasad, A. S. (2008). Clinical, immunological, anti-inflammatory and antioxidant roles of zinc. Experimental gerontology, 43(5), 370-377.
9. Wiernsperger, N. F. (2003). Oxidative stress as a therapeutic target in diabetes: revisiting the controversy. Diabetes & metabolism, 29(6), 579-585.
10. Taklikar, R. H. (2015). KEYWORDS: Lipid profile, Diabetes, Atherosclerosis. Assessment Of Serum Lipids In Type Ii Diabetes Male And Female Patients, (93412).
11. Sharma, R., Sharma, P., Kumar, P., & Tripathi, G. K. (2015). A Correlation between Glycosylated Haemoglobin & Lipid Profile in Type-2 Diabetes Mellitus with & without Complications. International Journal of Contemporary Medicine, 3(2), 115-120.
12. Wexler, D. J., Grant, R. W., Meigs, J. B., Nathan, D. M., & Cagliero, E. (2005). Sex disparities in treatment of cardiac risk factors in patients with type 2 diabetes. Diabetes care, 28(3), 514-520.
13. Bhutto, M. G., Lokesh, M. R., Shah, S. K. D., Afroze, M. K. H., Ghouse, P., & Abhilash, D. (2017). Association between lipid profile and silent coronary artery disease in south Indian patients with type 2 diabetes mellitus. International Journal of Advances in Medicine.
14. Sarkar, B. C., Saha, H. R., Azad, A. K., Sana, N. K., & Choudhury, S. (2012). Serum Lipid Profile status of Type 2 Diabetic Patients in the cross section population in Dhaka City of Bangladesh. Bangladesh Journal of Medical Science, 11(2), 121.
15. Barra, K., Barbosa, F., Brunoro, N. M., Alfenas, G., De, S. O., Minin, R., & Bressan, J. (2008). Estresse oxidativo: avaliação de marcadores Oxidative stress: assessment of biomarkers. CEP, 36570, 000.
16. Olaniyan, O. O., Awonuga, M. A. M., Ajetunmobi, A. F., Adeleke, I. A., Fagbolade, O. J., Olabiyi, K. O., ... & Osadolor, H. B. (2012). Serum copper and zinc levels in Nigerian type 2 diabetic patients. African Journal of Diabetes Medicine Vol, 20(2).
17. El-Zebda, G., Abed, A. A., & El-Ashgar, N. M. (2006). Significance of serum levels of copper and zinc in Type II diabetic, hypertensive, and diabetic hypertensive patients in Gaza City. The Islamic University-Gaza.
18. Evliyaoğlu, O., Kebapçılar, L., Uzuncan, N., Kılıçaslan, N., Karaca, B., Kocaçelebi, R., & Yensel, N. (2004). Correlations of Serum Cu, Zn, Mg and HbA 1c in Type 2 and Type 2 Diabetes Mellitus. Turkish Journal of Endocrinology and Metabolism, 2, 75-79.
19. Yeasmin, R., Muttalib, M. A., Sultana, N., Bhuiyan, N. H., & Alam, R. (2016). Status of some Trace Elements in Type-2 Diabetic Patients and its Relationship with Lipid Profile. Journal of Bangladesh Academy of Sciences, 40(1), 79-85.