

CONCENTRATIONS OF SERUM ZINC IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN THE PROVINCE OF WASIT

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ABSTRACT

Introduction: Worldwide, diabetes mellitus is a metabolic disorder. Type 2 diabetes accounts for 90% of diabetes diagnoses. We examine type 2 diabetic patients' blood zinc levels. Zinc is important in glucose metabolism, which is why we're studying it. **Method:** In Iraq's Wasit governorate, Al-Zahraa teaching hospital's diabetes clinic conducted a cross-sectional research. From October to December 2022, systematic random sampling chose 150 type 2 diabetics aged 18 and older. Individuals with chronic renal illness, haematological disorders, disease duration less than 1 year, pregnant women, and zinc supplementation were excluded. The researcher measured height, weight, and age. Standardized methods and calibrated equipment were used to measure. Results: 75.33% of patients have low serum zinc and 24.67% of them have normal serum zinc. While fig 2 show significant negative correlation between serum zinc and HbA1c. mean when increase in HbA1c level there is decrease in serum zinc level. Low serum zinc is associated with poor glycemic management in 95.6% of individuals. 82.3% of individuals with insufficient serum zinc had excessive triglycerides. Serum zinc does not affect cholesterol or HDL levels (HDL). **Conclusion:** Zinc levels and HbA1c are inversely related. Most low serum zinc patients have high HbA1c and poor glycemic control. Low serum zinc levels raise triglycerides.

KEYWORDS: S. Zinc, Patients, Type II Diabetes Mellitus, Province of Wasit.

INTRODUCTION

Diabetes mellitus, often known as the metabolic disorder, is quite common worldwide. Almost 90% of all cases of diabetes that are diagnosed are of the type 2 kind. In addition to the loss of pancreatic beta cell function, it is a severe and progressive disease that is marked by insulin resistance in peripheral tissues such as skeletal muscle, adipose tissue, and the liver. Impaired insulin function and relative insulin insufficiency cause hyperglycemia. Diabetes damages many organs and may result in serious complications such coronary artery disease, renal disease, and eye conditions, all of which have the potential to greatly raise the risk of morbidity and mortality in diabetic patients.^[1,2] The World Health Organization predicts that from its present level of 171 million in the year 2000 to 366 million in the year 2030, the overall number of individuals living with diabetes would have more than doubled. According to studies, diabetes is becoming more common in Iran, and the country's overall disease prevalence has reached 7%.^[3] A diet high in calories, becoming older, living a sedentary

lifestyle, and being overweight or obese are the main risk factors for type 2 diabetes. Researchers have hypothesised that a number of micronutrients, including zinc, may play a role in the development of diabetes in addition to the known risk factors.^[4,5] Zinc is a crucial trace element that is crucial for maintaining a broad range of biological processes, including cell homeostasis. Several chronic diseases, including diabetes, have been linked to an insufficient zinc signalling system. It is crucial for the synthesis, secretion, and action of insulin in both normal and pathological situations. [Causation and result] Moreover, recent studies.^[6,7] have shown the dynamic role zinc plays as a "cellular second messenger" in the control of insulin signalling and the preservation of glucose homeostasis. Also, there is some evidence to support the notion that zinc serves as an antioxidant. Free radicals are activated when there is a zinc deficit due to a weakened antioxidant defence system, imbalances in the formation of free radicals, and the antioxidant defence system itself. This is because a zinc shortage also makes the body's antioxidant defence mechanism less effective.

High oxidative stress conditions are created, and this situation contributes to the onset of diabetes and the problems associated with the condition.^[8-10] In this study, we examine type 2 diabetic patients' blood zinc levels. This is because zinc, for which we are doing this investigation, is important in the metabolism of glucose.

METHOD

Cross sectional study was carried out in diabetic clinic in Al-Zahraa teaching hospital in Wasit governorate in Iraq. 150 type 2 diabetic patients, who aging 18 years and older were selected by systematic random sampling, within a period of 3 months from October to December 2022. Patients who have chronic kidney disease, hematological disorder, those with disease duration less than 1 year, pregnant women and patients who take Zinc supplementation drug were excluded. Data were collected including age, gender, and anthropometric measurement: including height, weight were taken by the researcher. All measurements were taken by using standardized techniques and calibrated equipment. Weight measured while the patients were standing without shoes and wear light clothes and al Levar - balance type of scale was used, took weight to the nearest fraction of Kg (to the closest 0.5 kg). Height was measured using SECA scale tap without shoes. Then Body Mass Index (BMI) was calculated for each patients as weight (kg) divided by height squared (meter²). BMI level classified according to WHO classification.^[11] Venous blood samples were drowning from each subjects following overnight fasting. Glycemic control status was categorized as good glycemic control when HbA1c less than 7%, and poor glycemic control if HbA1c was more or equal to 7%.^[12] Abnormal fasting blood glucose considered when its level higher than 130mg/dl.^[12] Zinc level of < 55 µg/dl was considered deficiency. Dyslipidemia defined as presence of one or more of the abnormalities in serum lipids.^[13] According to ADA criteria for abnormal blood lipid level.^[14]

- Hypercholesterolemia refers to total cholesterol ≥ 200mg/ dl.
- HDL were considered low when the level is < 40mg/dl in male and <50mg/dl in female.
- Triglyceride was considered high when it was >150mg/dl.

Statistical analysis done by SPSS 22, frequency and percentage used for categorical data, mean, median and SD for continuous data. Chi-square used for assessed association between variables. P-value less or equal to 0.05 is consider significant.

RESULTS

Cross sectional study of 150 patients have diabetic mellitus, mean age of patients 50 ± 11 years old. 34% of patients in 50-59 years' age group, and 31.3% of them in 40-49 years' age group. 54.7% of patients are females while 45.3% of them are males. 42% of patients are obese while 20.7% of them are normal. As show in table 1.

Variables		Frequency	Percentage
Age (years)	<40	18	12.0
	40-49	47	31.3
	50-59	51	34.0
	≥60	34	22.7
Gender	Male	68	45.3
	Female	82	54.7
BMI	Normal	31	20.7
	Overweight	56	37.3
	Obese	63	42.0

As shown in fig 1, 75.33% of patients have low serum zinc and 24.67% of them have normal serum zinc. While fig 2 show significant negative correlation between serum zinc and HbA1c. mean when increase in HbA1c level there is decrease in serum zinc level.

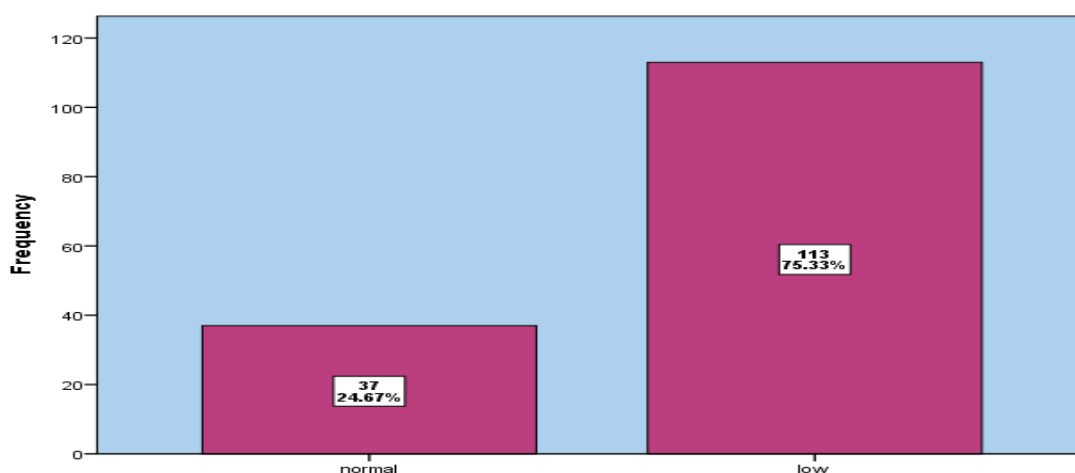


Fig. 1: distribution of patients according to level of serum zinc.

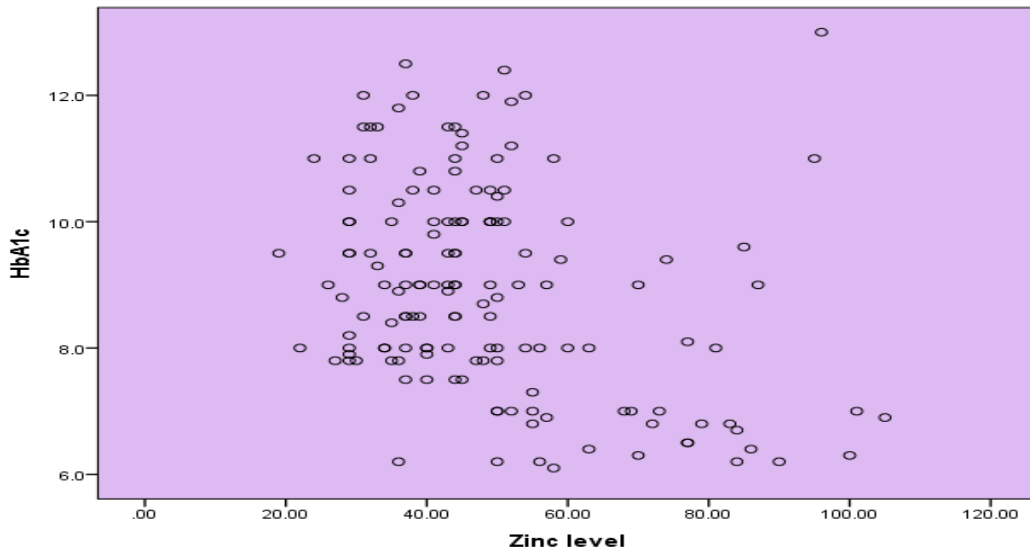


Fig. 2: significant negative correlation between serum zinc and HbA1c, P-value =0.0001

As shown in table 2, there is no significant association between serum zinc level and (age, gender and BMI) of diabetic patients.

Table 2: Association between serum zinc level and (age, gender and BMI) of diabetic patients.

Variables		Zink level		P-value
		Normal	Low	
Age (years)	<40 years	8	10	0.13
		21.6%	8.8%	
	40-49 years	9	38	
		24.3%	33.6%	
	50-59 years	14	37	
		37.8%	32.7%	
	>=60 years	6	28	
		16.2%	24.8%	
	Total	37	113	
		100.0%	100.0%	
Gender	Males	17	51	1.000
		45.9%	45.1%	
	Females	20	62	
		54.1%	54.9%	
	Total	37	113	
		100.0%	100.0%	
BMI	Normal	11	20	0.28
		29.7%	17.7%	
	Overweight	13	43	
		35.1%	38.1%	
	Obese	13	50	
		35.1%	44.2%	
	Total	37	113	
		100.0%	100.0%	

P-value ≤0.05 (significant)

As shown in table 3; there is significant association between serum zinc level and glycemic control, 95.6% of patients with low serum zinc have poor glycemic control.

Also there is significant association between serum zinc level and HbA1c, 92.9% of patients with low serum zinc have high HbA1c.

In addition, there is significant association between serum zinc level and Triglyceride, 82.3% of patients with low serum zinc have high Triglyceride.

While there is no significant association between serum zinc level and Cholesterol and high density lipoprotein (HDL).

Table 3: Association between serum zinc level and glyceemic control, HbA1c, Triglyceride, Cholesterol and high density lipoprotein (HDL).

Variables		Zink level		P-value
		Normal	Low	
	Good	22	5	
		59.5%	4.4%	
Glyceemic	Poor	15	108	0.0001
		40.5%	95.6%	
Control	Total	37	113	
		100.0%	100.0%	
	Normal	10	8	
		27.0%	7.1%	
HbA1c	High	27	105	0.003
		73.0%	92.9%	
	Total	37	113	
		100.0%	100.0%	
	Normal	20	45	
		54.1%	39.8%	
Cholesterol	High	17	68	0.18
		45.9%	60.2%	
	Total	37	113	
		100.0%	100.0%	
	Normal	13	20	
		35.1%	17.7%	
Triglyceride	High	24	93	0.038
		64.9%	82.3%	
	Total	37	113	
		100.0%	100.0%	
	Normal	23	56	
		62.2%	49.6%	
HDL	Low	14	57	0.19
		37.8%	50.4%	
	Total	37	113	
		100.0%	100.0%	

P-value ≤ 0.05 (significant).

DISCUSSION

As was previously observed, zinc deficiency is associated with an increased risk of developing diabetes complications in Type 2 diabetic patients. According to this research, Type 2 diabetes individuals had a prevalence of zinc insufficiency of 75.33%, which is almost identical to the finding of Prior et al.^[15] The polyuria and zinc loss via the urine may be to blame for this. According to Lin et al. and Fung et al.^[16,17] diabetic individuals have reduced zinc levels. Zinc was shown to be an essential component of insulin crystals by Scott, who showed a substantial correlation between zinc and insulin function^[18]. Zinc ions have been shown in several studies to be essential for the action, storage, and synthesis of insulin.^[19] Animal studies have shown that zinc may, like insulin, reduce hyperglycemia and increase lipogenesis.^[20] Although the exact mechanism by which zinc exerts these advantages is unknown, some

research has shown that greater insulin binding to its receptor as well as enhanced phosphorylation and tyrosine kinase activity may favourably affect insulin signal transmission. Contrarily, zinc possesses antioxidant qualities. Zinc is essential for the synthesis of antioxidant enzymes and may protect beta and insulin cells from oxidative stress^[21]. The blood zinc level and glyceemic control are significantly correlated in the present research; 95.6% of patients with low serum zinc had poor glyceemic control. Moreover, there is a strong correlation between blood zinc levels and HbA1c, with 92.9% of patients having high HbA1c levels and low serum zinc. This was in line with the findings of Khan et al, who found an inverse relationship between serum zinc and the glyceemic state of diabetes in their study.^[8] Comparable findings from diabetes study were also reported by Erhabor et al.^[22] and Lin et al.^[15] who discovered that zinc levels in diabetes patients fell by

17% in comparison to controls. This study found a statistically significant negative connection between zinc and HbA1c levels in diabetics. According to Dasarathan et al.^[23] zinc and HbA1c had a bad relationship. The Pearson correlation coefficient of zinc and fasting blood sugar (FBS) indicated a strong negative association in diabetes (-0.553) compared to controls, and fasting blood sugar was considerably higher in diabetics than controls (-0.084). Our research shown that a rise in glycemic status is associated with serum zinc deficiency. Similar findings were made by Eva et al. in their investigation on type-2 diabetes patients, which discovered that zinc supplementation improved glycemic status.^[24] Moreover, there is a strong correlation between blood zinc levels and triglyceride, with high triglycerides occurring in 82.3% of individuals with low serum zinc levels. This is in line with recent findings that showed that in our research, triglyceride and cholesterol levels were considerably higher in diabetes patients than in controls, demonstrating a link between dyslipidemia and type 2 diabetes. A well-known cause of dyslipidemia in people with diabetes is insulin resistance. In our research, triglycerides and cholesterol were negatively correlated with zinc and diabetes. Seet et al.^[25] made similar observations as well. According to the present research, there is no connection between serum zinc levels and blood cholesterol or high-density lipoprotein (HDL). Similar to Daradkeh et al., who similarly claimed that serum zinc levels of cholesterol and high density lipoprotein (HDL) were unrelated.^[26]

CONCLUSION

Serum zinc levels are often low, and there is a strong inverse association between zinc levels and HbA1c. Most people who have low serum zinc also have high HbA1c levels and poor glycemic management. individuals with low serum zinc levels tend to have elevated triglyceride levels.

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