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ORIGINAL ARTICLE

Evaluation of Serum Zinc Levels in Pregnant Women with Gestational Diabetes Compared with Non-diabetic Pregnant Women

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KEYWORDS

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ABSTRACT: Zinc is one of the main and essential elements in pregnancy that its deficiency in this period causes disorders of the maternal and fetal immune system and disorders of the metabolic systems in pregnant women, and its deficiency is often observed in pregnant women. In this study, the effect on pregnant women with gestational diabetes (GDM) compared to pregnant women without gestational diabetes (NGT) will be discussed. Methods: In this study, fresh blood samples were taken from 50 pregnant women with gestational diabetes and 50 pregnant women without gestational diabetes. Blood samples were taken from both groups in the third trimester of pregnancy and then the obtained values were analyzed by Flame Atomic Absorption Spectrophotometry for Plasma zinc level (FAAS). Zinc levels in pregnant women with gestational diabetes were higher in comparison with pregnant women with non-gestational diabetes (93.4±77.57µmol/dl vs 66.35±53.74 µmol/dl). Conclusion: This study showed No significant differences between GDM and NGTwomen in the serum zinc levels.

INTRODUCTION

Zinc is one of the elements that has more than 200 metalloenzymes and plays important and effective roles in protein and carbohydrate metabolism pathways, bone growth and fusion, nucleic acid synthesis and antioxidant functions in the immune system[1, 2]. Studies have also shown that zinc can play a similar role to insulin in glucose transport and lipogenesis. This element is very important during pregnancy for fetal growth and maintenance of pregnancy, and its level is important in women with glucose metabolic disorders and gestational diabetes[3 - 5]. Gestational diabetes means glucose intolerance during pregnancy, the mechanism of which is related to cell dysfunction and insulin resistance, which begins in mid-pregnancy and may lead to type 2 diabetes(T2DM) [6-8]. Numerous studies have identified the role of inflammatory markers in the development of insulin resistance in gestational diabetes, and these data are inconsistent. Changes in trace elements in the serum of pregnant women

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are also associated with glucose tolerance and gestational diabetes.Zinc deficiency is also effective in spontaneous abortions and congenital anomalies or low birth weight babies [9, 10]. The anti-inflammatory effects of zinc appear to be due to a decrease in the functional response of B and T lymphocyte proliferation This disorder results from a lack of insulin secretion, which indicates the importance of the role of serum zinc levels due to its effect on insulin function [11-14]. Zinc deficiency is seen in most pregnant women, and pregnant women with gestational diabetes are at higher risk for preeclampsia during pregnancy, which affects the development of the fetus and the health of the pregnant mother, as well as childbirth, and in some cases the risk of type 2 diabetes. In the later stages of women's lives, Studies have shown a physicochemical relationship between insulin and serum zinc levels [15-17]. Serum zinc deficiency may be the result of hyperzincuria or decreased gastrointestinal absorption of zinc. Serum zinc concentration can be used as an indicator to assess zinc status, which is more difficult to assess during pregnancy as plasma zinc concentrations decrease with increasing plasma volume [18, 19]. Zinc is usually found in plasma and red blood cells, so measuring of zinc important in diagnosing zinc deficiency in early pregnancy. Studies have also shown that plasma zinc concentrations are a more sensitive indicator of red blood cells. In this study, we investigated the effects of zinc in women with gestational diabetes compared with non-diabetic pregnant women.

MATERIAL AND METHODS

Study design

In this study, 50 pregnant women with gestational diabetes who were in the third trimester of pregnancy and had an average age of (68.98±15.8) were included in the study. The control group consisted of 50 non-diabetic pregnant women with a mean age of (67.76±15.54). Written consent was obtained from all subjects, which was approved by the Medical Ethics Committee of Zahedan University of Medical Sciences, Sistan and Baluchestan Province, and clinical and pathophysiological parameters were evaluated in all study volunteers. Exclusion criteria included acute gestational infection, insulin sensitivity, anemia, fetal abnormalities, smoking, alcohol consumption, and the use of drugs that affect carbohydrate metabolism. Blood samples were taken from all control and control women 60 minutes and 120 minutes after glucose consumption to measure serum levels.

Determination of serum zinc levels in plasma

Blood samples for evaluation of serum zinc level by test tubes were collected (7.5 ml, LHMetall Analytic, anticoagulant lithium heparin). Then the plasma was separated by centrifuge (20 min, 3000 rpm) up to 1 hour after blood collection.The samples were refrigerated (2-4°C) for 24 hours. The measurement of serum zinc level was done using flame atomic absorption spectrophotometry (Perkin Elmer Analyst 300, USA). All measurements were performed after calibration of the method with a standard calibration solution with zinc concentration. (zinc stock standard Titrisol, 1000 mg Zn as $ZnCl_2$ in 0.06% HCl, Merck KGaA, Germany).

Statistical analysis

the Mann-Whitney test were used to compare selected groups. All continuous variables are presented as mean values +/− SD (standard deviation). A $p<0.05$ value was defined as significant. Student t-test was used to find out the significant differences between zinc levels for the tested groups of patients and controls. Data were analyzed using Statistical software SPSS.

RESULTS

Statistical analysis of metabolic and clinical study subjects are shown in Table 1, 2.

Table 1. Clinical and metabolic characteristics of the subjects.

Characteristics	Pregnant with GDM (n=50)	Pregnant with NGT (n=50)	P-value (T-test)
Age (years)	68.98±15.8	67.76±15.54	0.72
BMI (kg m^{-4})	47.68±4.33	47.34±4.05	0.46

Table 2. Serum zinc level between pregnant women with GDM and NGT.

Parameters	Zn in case (Mean± SD)	Zn in control (Mean± SD)	P-value (T-test)
Serum zinc level (μg dl^{-1})	93.4±77.57	66.35±53.74	0.26

DISCUSSION

Gestational diabetes is a metabolic disorder during pregnancy that is associated with complications such as abortion and perinatal complications[20,21]. Research has shown that high blood sugar during pregnancy has an effect on serum zinc levels, which may indicate the antioxidant properties of zinc. There have been many studies on the role of serum zinc levels and gestational diabetes, which have been inconsistent with the results of research. In one research showed that serum zinc levels in women with gestational diabetes were lower than non-diabetic pregnant women [22-24]. The results of another studies Were in the same direction, which showed that the serum level of zinc in diabetic pregnant women is lower than non-diabetic women [25]. Another study showed that serum level in diabetic subjects were lower than non-diabetic pregnant women [26]. The results of our study showed that serum zinc levels in diabetic pregnant women were higher than in non-diabetic pregnant women, but this increase was not significant as our results were similar to the results of another research [27]. The results of one research Showed that the use of zinc supplementation significantly reduces fasting glucose levels in pregnant women with gestational diabetes [28]. The results of another research Showed that serum zinc levels decreased as pregnancy progressed [29, 30]. Also, the results of one research showed that in the first trimester of pregnancy, plasma zinc concentration in diabetic pregnant women is lower than non-diabetic pregnant women [31, 32]. This decrease in serum zinc levels may be due to increased plasma volume seen in pregnant women but not exactly . Among the causes of decreased serum zinc levels is increased urinary excretion of this mineral and also estrogen levels and high amounts of corticosteroids lead to decreased serum zinc levels [33-35]. Therefore, the use of appropriate standards for assessing serum status can be an important indicator in assessing the pregnancy status of pregnant women.

CONCLUSIONS

In this study, we found that pregnant women with gestational diabetes serum zinc levels were higher than women without diabetes, although this difference was not statistically significant and it seems time to clarify the relationship between serum zinc levels and insulin resistance more research And be done more completely**.**

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

ETHICAL CONSIDRATION

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Abbreviations

BMI: Body mass index; GDM: Gestational diabetes mellitus; NGT: Normal glucose tolerance; SD: Standard deviation; T2DM: Type 2 diabetes mellitus

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