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ZINC, COPPER AND MAGNESIUM STATUS OF THE HAIR AND SERUM DURING PREGNANCY

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Ö Z E T

Bu çalışmada, 40 gebe ve 34 gebe olmayan olgunun saç ve serumlarında çinko, bakır ve mağnezyum konsantrasyonları tayin edildi.

Gebelik esnasında serum çinko ve mağnezyum konsantrasyonlarının artmış, bakır konsantrasyonunun azalmış olduğu tesbit edildi. Ortalama çinko kansantrasyonu gebelerin saçlarında, kontrol grubunkinden daha küçük bulundu, saç mağnezyum ve bakır konsantrasyonlarında gruplar arasında fark bulunmadı.

ABSTRACT

In this study; zinc, copper and magnesium concentrations of the hair and serum from 40 pregnants and 34 nonpregnants were studied and it was determined that serum zinc and magnesium concentrations of the pregnants decreased as serum copper concentration increased during the pregnancy. However, the mean zinc level of hair from pregnants was found to be lower than that of nonpregnants, but no meaningful differences were observed between the groups as to magnesium and copper levels.

INTRODUCTION

It has long been known that some elements have very important functions for the normal embryonic and fetal development, in particular, it has been estab-

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lished that iron metabolism as well as zinc, copper and magnesium has changed during the pregnancy. Therefore, it appears to be important to determine whether such deprivation of elements occurs and if there is, these elements should be supplied. By this purpose in particular iron metabolism has been investigated intensively since this element concerns the of both mother and instead, we aimed to establish the zinc, copper and magnesium status since satisfactory results for these elements have not been obtained, during the pregnancy.

Furthermore, in works studied with pregnant rats, zinc deficiency was found responsible for a wide variety of major and minor congenital malformations in surviving offsprings (1,2) and it was also found that the fetus became more sensitive to teratogen effects (3). In addition, recently, it has become apparent that people suffer adverse effects from nutritional deficiencies of some other elements including copper (4,5,6), chromium (7,8), manganese (9) etc. The deleterious effects of such element deficiencies on pregnancy and fetal development point out the importance of these minerals for fetus and mother's health.

MATERIALS AND METHODS

Forty pregnant women who were at the last trimester of their pregnancies and had received no element supplement during that period, were included in this study. They were all cohsen from among the women who have had no serious obstetric or medical problems. The subjects, whose ages ranging from 20 to 34 (25.2 $\pm$ 3.4 as mean) were of different income background, thus their nutritional status during pregnancy were different. As control group, 34 non-pregnant women, whose ages ranging from 22 to 37 (28.2 $\pm$ as mean) were included and none had medical problem, either and they were also of different income background.

Blood samples were taken by disposable plastic syringes after over night fasting, then they were centrifuged and sera obtained in this step were seperated, collected in plastic tubes and stored at -20 °C until analysis. Hair samples were cut close to the scalp in suboccipital area using stainless steel scissors and then washed sequentially with deionised water, hexane, 95 % ethanol and again deionised water. Last samples were dried at 75 °C, left in a dessicator to room temperature and of these samples, 100 mg was weighed, dissolved by wet ashing in the solution which consist of 0.5 ml of perchloric acid and 3 ml of nitric acid, until perchloric acid fume appeared. After cooling at the room temperature hemogenates were boiled by adding 3 ml of deionised water and diluted to a certain wolume with deionised water.

Element determinations were performe using atomic absorption spectrophotometer (Varian Techron Model 1200 AAS).

RESULTS

The mean element levels of serum and hair are given in the table 1 and table 2 for both gropus, respectively.

Table 1. Serum zinc, magnesium and copper levels for pregnants and non-pregnants

	Zinc µg/ml	Magnesium µg/ml	Copper µg/ml
Non-pregnants n: 34	1.03±0.14	19.58±3.12	1.12±0.18
Pregnants n: 40	0.91±0.12	17.47±2.12	2.06±0.20
p	<0.01	<0.01	<0.01

Table 2. Hair zinc, magnesium and copper levels for pregnants and non-pregnants

	Zinc ppm	Magnesium ppm	Copper ppm
Non-pregnants n: 34	182 ± 32	112 ± 24	58 ± 12
Pregnants n: 40	168 ± 36	109 ± 32	57 ± 11
p	<0.01	>0.05	>0.05

DISCUSSION

As shown in the table 1, serum zinc and magnesium levels of the pregnants have decreased during the pregnancy period but copper levels has elevated, which shows agreement with some other works (10,11). Various explanations have been put forward on these results, for example, some researchers suggest that deficiency of some minerals result from inadequate mineral status (12), while others claiming that this situation can not be limited to the subjects who are economically or nutritionally deprived and there is evidence to suggest that pregnant women who take even optimal nutrition have low serum zinc and magnesium levels (13,14). At the time being, it has been determined that this decline is gradual and begins as early as the middle of the first trimester (15) and greatest rate of decline occurs very early in the gestation, the reason of which has not completely been known, yet. It is however possible that increased blood volume as well as the needs of the placenta or decreased serum albumine or increased blood levels of estrogens are important factors for it (16). These results appear

to be significant since it has been suggested that maternal zinc deficiency may be one of the reasons of the human congenital malformations in the central nervous system (17) and with the fact that rat fetus develops severe congenital malformations by feeding the diet without zinc and as a result, even though only minimal reduction in the maternal body zinc content exists, the development of severe congenital malformations suggests that zinc have very important functions for fetal and embryonic developments in rats as well as human beings (18).

In contrast to zinc and magnesium, copper level in serum was found to increase during pregnancy, which is consistent with several reports (11,12,19,20). Such a correlation was not observed in hair samples. The cause of this elevation in serum copper level may be the increase in the plasma progesteron or estrogen levels or some other reasons unknown yet (21,22). Now , what is clear for us is that in the serum of pregnant woman, and probably in the other intracellular and extracellular compartments of her body, there are deprivations of zinc and magnesium but an elevation of copper.

While hair zinc level of pregnant group was lower than that of non-pregnant group ($p<0.01$), no notable difference was found in hair magnesium and copper levels between two groups ($p>0.05$).

As a result of this study, we can say that especially zinc need of the pregnants, possibly together with some other minerals increase due to some metabolic and physiological changes during pregnancy, indicating a need of supplementation for these elements during pregnancy.

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