Does Zinc Deficiency Have a Role in Pregnancy-Induced Hypertension?

GEBELİĞİN İNDÜKLEDİĞİ HİPERTANSİYONDA ÇİNKO EKSİKLİĞİNİN ROLÜ VAR MİDİR?

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Summary

Objective: 'To compare plasma zinc and erythrocyte zinc cou- • cnlrulions nnd h-iikoctle alkaline phosphatase activity scores own die •nurse ol pregnancy m normal women and in women who develop fircclampsia.

Muleriul and Methods: i'enous serum samples were analyzed lor plasma ami erythrocyte zinc concentrations and leucocyte alkaline ph. isphut use act i via tl.. I PA) scores a biomedieal chennsmy nnaivzci: In oar stiniv we compared plasma end cnihmeMc zinc concentrations and leucocyte alkalnn phosphatase activity (LA/A) scores in iprceklampsia anıl uırrınoicusive pucguiiiits. Student t lest was used pre statistical comparison.

Results: Plasma zinc levels ol the control group varied between 60 and 'A mg/dl with an average ol 73.6zd3.6 mg (II when -as those le\(.'ls were found be I ween 36 and YV mgydl wnh an a\eruge of al.113.4 mg ill in patient group. When these values in patient group were significantly lower ıhan those in control group ljrA).05). The difference between nvo groups in terms ok l.APA scores was statistically significant t/r- 0.005i.

i 'anelusion: Our uesniis provide evidence ol decreases in plasma zinc ami leucoi vn alkaline fihosphalase activity tl.. I-I'A) scores with increasing during preeclamptic women. Future stndh s ol zinc and l.APA balance in women at risk lor developing enui/iliealioii of pregnuncv are indicated.

Key Words: /.inc. Preeclampsia

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Özet

Amaç: Seram çinko, eritrosit çinko kouscılrasyouu ve h'ikosıı (likiden fosfata: seviyelerini normal gebeler ile precldıiuplik gebelerde karşılaştırmak.

Materyal ve Metoıl: Alınan kan örnekleri /t/asımı çinko, eritrosit çinko konsantrasyonu ve lökosıı alkaleıı fosfat açısın da ıı biyokimya laboratuvarıuda değerlendirildi. Hasta ve kontrol grubundan ehle edilen Zıt değerleri karşılaştırıldı. Kontrolgrubunun plazma An değerleri (>0-96 ıng.dl arasmda değişiyordu ve ortalama a'eğeri 73.6±13.t> ıug/dl olarak bu/undu. Hasta grubunun verileri isa 59-55 ınl/dl anasında bulundu ortalama değeri 6l.l±f3.4 ıug/dl. Hasla kontrol grubunun verileri islulislikl olarak karşılaştırıldığında, hasla gru/ıta '/.ıı değerlerinin kouirol grubuna kıyasla anlamlı ölçüde düşük bulundu (p 0.U5I. Buna karşılık lökosıı alkaleıı tosianıs skorlarının hasta grubunda, kontrol grubunu kıyasla anlamlı devrede düşük olduğunu saptadık İp- 0.005ı. İstatistik! karşılaştırma için studenı l leşti kullanıldı.

Sonuç: Bizim çalışmamızda plazma çinko ve lökosıı alkaleıı fosfat akıvile skorlarının prccklaıuplik kadınlarda azaldığı biçimlenmiştir. Plazma ıfnılıo ve lökosıı alkaleıı fosfat aklıvlic skorlarının komplikosvon gelişen gebelerde gelecek çalışmalarla araştırılması gerekmekledir

Anahtar Kelimeler: Çinko, Preeklampsi

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Pregnancy-induced hypertension (PHI) is an important obstetric problem which carnes potential risk for both mother and fetus. Its seventy ranges from a minimal elevation m blood pressure to multiple organ dysfunction. Its incidence is 5-7% in the world, but may vary according to geography and economic status (1).

Its etiology has not been thoroughly understood, but there are many theories trying to explain its cause. Especially in recent years, there is an lit-

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creasing interest en whether trace elements, such as copper, /inc. cobalt may have a possible role in pathophysiology of Pill.

Zinc exists in all plant and animal tissues as a trace element and is a component of more than one hundred metallo-enzymes such as carbonic anhydrase, alkaline phosphatase, ribonucleic acid and deoxyribonucleic acid polymerase, alcohol dehydrogenase and retmon reductase (2).

Zinc plays role m normal development, wound healing, immunity, normal endocrine function and reproduction by way of protein synthesis.

In zinc deficiency ribonucleic acid and deoxyribonucleic acid synthesis are decreased and it result in decrease in protein synthesis and an increase in protein eatabolism (3). Zinc deficiency can have profound teratogenic effect if the deficiency occurs during embryogenesis (4),

In some studies associations were found between low zinc levels in plasma or tissue and complications of pregnancy and delivery such as pregnancy-induced hypertension, intrauterine growth retardation, congenital malformations, prematurity, prolonged labor and intrapartum hemorrhage (5).

In our study we compared plasma and erythrocyte zinc concentrations and leukocyte alkaline phosphatase activity (LAPA) scores in hypertensive and normotensive pregnants and investigated if significant zinc deficiency existed in hypertensive pregnants.

Material and Method

The study population consisted of 40 pregnant women between 21 and 40 weeks* gestation; twenty were normotensive and twenty had preeclampsia-eclampsia.

All patients with preeclampsia had persistent elevations m blood pressure of 140/90 mm Hg and significant proteinuria (-300 mg/24 hour urine sample). Normotensive pregnant women served as the control group, and were excluded from the study population if they had any obstetric or medical complication of pregnancy.

Gestational age was established by date of last menstrual period and confirmed by ultrasonography or only based on ultrasonography if date of last menstrual period was unreliable.

All routine laboratory tests for preeclampsia-eclampsia, such as liver function, uric acid level, coagulation studies, complete blood count and urine analysis, were performed at initial visit and repeated when required.

For zinc analysis 5 ml. of blood was obtained from each subject by antecubital vein puncture in the morning between 8°" and 8[i<], after an overnight fast. Additionally, peripheral blood for smear was obtained by fingertip puncture at the same lime.

Blood samples obtained by vein puncture were poured into poly praline tubes containing 20% ammomum-potassium-oxalate in 0,5 ml of demineralized water without touching the tips of the injectors to the tubes. The tubes were immediately closed with paraffin. They were ccntrifugated in 3000 cycles / minute for five minutes and plasma fractions were removed and preserved in the tubes with same properties in ice-box until analysis. 'The zinc levels in plasma fractions were measured by atomic absorption spectrophotometry (model 2380. Perkm-Elmer, Norwolk. Conn.)

Erythrocyte sediments were washed with isotonic saline solution and upper portions of these sediments were taken into buffy-coated Pasteur pipette. And 20 ml. of 10% trichlor acetic acid was added into 1 ml. of erythrocyte sediment of each sample and they were ccntrifugated in 2500 eyclcs/min. For 20 minutes and in obtained supernatant fluids zinc levels were measured by atomic absorption spectrophotometry.

Leukocyte alkaline phosphatcse. Prepared slides from preserved in room temperature (18-26" C) for at least one hour before dying procedure. Dyed slides were evaluated with immersion microscope and areas in which erythrocytes were completely dispersed were selected for evaluation. Alkaline phosphatase activity, which was reflected as blue-red granules in neutrophil cytoplasm's, was graded from 0 to 4 according to the density of coloration. For each subject one hundred neutrophills were counted by the multiplication of the cell number with grade number and by adding all these numbers for each patient.

Leukocylc alkaline phosphates kit included Naphlol AS-B1 Alkaline solution, FRV-Alkalinc solution, FBB-Alkaline solution, Sodium-Nitrite solution, citrate solution. Hematoxylin solution and Neutral Red solution.

Statistical comparison of the data obtained from two groups were made with student t lest. P-:().05 was considered statistically significant.

Results

There were no slatistieaily significant differences between preeclamptic-eclamptic patient group and control group with regard to mean maternal age, parity, gestational age during the study period, or nutritional and socioeconomic status.

Plasma zinc levels of the control group varied between 60 and 96 ftg/dl with an average of 73,6-13,6 Ltg/dl whereas those levels were found between 36 and 88 nig/dl. with an average of 61,F-zl3.4 ug/dl. in patient group. When these values in patient group were significantly lower than those in control group (p- 0,05)

Zinc levels in erythrocytes varied between 10,95 and 23,25 ug/mk with an average of 159,3-29,7 Ug/dl in control group where as they were found between 36 and 174 ug/dl with on average of 1 3 1.2.-.25.5 ug/dl in patient group The difference between two groups in terms of LAPA scores were statistically significant (p<(),()05).

Plasma zinc levels and LAPA scores show parallelism and indicate a decrease in circulating zinc levels in patient group.

Comment

In our study we found that preeclamptic-eclamptic patients had lower plasma zinc levels and lower leukocyte alkalcn phosphatase scores, which was considered to reflect zinc deficiency, than control group. Our findings are consistent with many studies in literature suggesting on association between zinc deficiency and complications of pregnancy and delivery including P1F1, preterm labor, low birth weight, postpartum hemorrhage (5).

The most commonly used assay for assessing zinc status is the measurement of plasma or scrum zinc, but circulating zinc levels may decline throughout gestation and during the states of infection or stress. Other tissue zinc measurements such as hair zinc or lcucocytic zinc concentrations have not proven to be reliable indicators of zinc status (6).

An adult human body contains nearly 2 grams of zinc and the highest concentrations arc in coroids of eyes and spermatozoa. Zinc absorption occurs in duodenum and proximal jejenum by way of active transport, and approximately 25% of dietary zinc is absorbed. Animal products such as meat, liver, egg and zinc in the same multiminerai supplement impairs zinc absorption. Alcohol increases urinary zinc excretion Women who smoke may have an increased risk of zinc deficiency. It is important to ensure that pregnant dietary intake of zinc is sufficient for the production of compounds essential for body-function (6).

In previous studies it has been demonstrated that plasma zinc levels gradually decreased during the course of non-complicated pregnancies as the pregnancy advanced. The decrease in circulating zinc concentrations begins in early pregnancy and gradually continues until term (7).

However, during gestational period zinc transfer between mother and fetus is provided sufficiently with adaptive mechanisms and increased demand is met without an increase in dietarv zinc (8).

There are some complications associated with in terms of plasma zinc concentrations, especially in P1H cases (9,10).

Supplementation of a group of pregnant teenagers with 30 mg. of zinc per day significantly decreased the incidence of preterm delivery and the requirement for respiratory assistance of newborn.

In a longitudinal study by Hambidge ct al it has been demonstrated that gradual decrease in plasma zinc concentrations during the course of pregnancy was not affected by zinc supplementation.

In another study comparing zinc, magnesium, copper and calcium concentrations in umbilical cords of 106 preeclamptic patients with those of 196 normotensive, healthy pregnant women it has been demonstrated that there existed no difference (12).

In a comparative study of 8 preeclamptic and 10 normal pregnants, placental calcium, cobalt, copper, magnesium, /me, ci linni and potassium concentrations were evaluated and there was found a significant difference between two groups in terms of copper and zinc concentrations and a borderline difference in terms of cobalt (10). Authors have suggested that an increase in placental copper concentrations with low placental zinc levels may exaggerate the symptoms of precclamlie.

In another study plasma, erythrocytic and placental zinc concentrations an alkalen phosphatase activity were evaluated in both hypertensive and normotensive pregnants. There was no difference between pregnant women with chronic hypertension and control group in terms of zinc parameters, but plasma and placental zinc concentrations in PI H cases were 19% and 12% less then in control group, respectively (13).

Alterations in prostaglandin of PIH and other obstetric complications, are associated with zinc deficiency. Simmer et al demonstrated the effect of zinc deficiency on prostaglandin synthesis in human leukocytes (14). In animal models zinc deficiency has caused an increase in production of 6. Keto- I (/. F,. PCili, and P(1F,(/ in uterine tissue and a decrease in their synthesis in placenta and a decrease of 85% in uterine blood llow. The net result was an increase in utérin contractility (15).

In our study we didn't observe imv difference between two groups in terms of nutritional status. Zinc deficiency in preeclamptic-eclamptic patients is related to abnormal zinc redistribution rather than nutritional factors.

There are two questions here to be answered: 1). Is the cause of zinc deficiency in PIH cases a result of normal pregnancies'.' And is it the responsible factor for the initiation of clinical symptoms or does the zinc deficiency follow multisystcmie changes depending other factors'?

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