Determination of selenium concentration and glutathione concentrations in preeclampsia women in Balad city- Salah al-deen governorate.

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Abstract

Background: Selenium concentration was measured in women under oxidative stress and was found lower than normal healthy women. Also, there was significant reduction in serum Se in type 2 diabetic patients. Whole blood and plasma selenium and red cell glutathione concentrations were significantly lower in the patients with chronic liver disease as compared with the normal healthy controls. The **aim** of the study is Determination of selenium concentration and glutathione concentrations in preeclampsia women in Balad city- Salah al-deen governorate. **Subjects and methods:** A cross sectional study was done in Balad hospital – Salah al-deen governorate. A 90 pregnant women were participated in the present study, (60 women with pregnancy induced hypertension and 30 normotensive pregnant women). In the present study, there is significant elevation in the concentration of MDA in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). However, there is significant reduction in the concentration of glutathione (GSH) in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). Also, there is significant reduction in the concentration of serum selenium in the serum of hypertensive pregnant women, as compare with normotensive pregnant women, ($p \leq 0.01$). The present study **concludes** that there was a highly significant trend for decreasing plasma selenium concentrations in hypertensive pregnant women as compare to normal pregnant and pre-eclamptic women.

Key words: Pregnant women, hypertension, MDA, GSH, selenium.

الخلاصة

الخلفية: تم قياس تركيز السيلينيوم في النساء تحت الضغط التأكسدي ووجد أنه أقل من النساء السليمات. أيضا ، كان هناك انخفاض كبير في مصل الدم في مرضى السكري من النوع الثاني.

كان تركيز الدم والسيلينيوم في الدم الكامل وتركيزات الجلوتاثيون في الخلايا الحمراء أقل بشكل ملحوظ في المرضى الذين يعانون من مرض مزمن في الكبد مقارنة مع الضوابط الصحية الطبيعية. الهدف من هذه الدراسة هو تحديد تركيز السيلينيوم وتركيزات الجلوتاثيون لدى نساء التي لديهن مقدمات في ارتفاع ضغط الدم.

المواد والطرق: تم إجراء دراسة مقطعية في مستشفى البلد - محافظة صلاح الدين. وشارك 90 امرأة حامل في هذه الدراسة ، (60 امرأة مع ارتفاع ضغط الدم الناجم عن الحمل و 30 من النساء الحوامل طبيعيات)

في هذه الدراسة ، هناك ارتفاع كبير في تركيز المالوندای الدهايد في مصل الحوامل المصابات بارتفاع ضغط الدم MDA في مصل النساء الحوامل المصابين بارتفاع ضغط الدم مقارنة مع النساء الحوامل ومع ذلك ، هناك انخفاض معنوي في تركيز الجلوتاثيون مع النساء الحوامل المصابات بارتفاع ضغط الدم مقارنه مع الحوامل الطبيعيات. ، ($p \leq 0.01$) أيضا ، هناك انخفاض معنوي في تركيز السيلينيوم في مصل النساء الحوامل المصابات بارتفاع ضغط الدم ، بالمقارنة مع النساء الحوامل الطبيعيات. ، ($p \leq 0.01$).

تلخص الدراسة الحالية: إلى أنه كان هناك اتجاه مهم للغاية بان هنالك انخفاض تركيز السيلينيوم في البلازما في الحوامل المصابات في ارتفاع ضغط الدم مقارنه مع من الحوامل الطبيعيات.

الكلمات المفتاحية: النساء الحوامل، ارتفاع ضغط الدم، المالون داي الدهايد، كلوتاثيون و السلينوم.

Introduction

The role of Se in health has been widely studied in the past two decades; however, there are still gaps in our understanding of the biology of this element, especially concerning the possible roles of Se in human metabolism, the bioavailability and relative effectiveness of different sources and chemical forms of Se (1, 2), and the value of supra-nutritional supplementation (i.e., greater than recommended daily intake) for chemoprevention of disease (3,4).

Selenium concentration was measured in women with oxidative stress and was found lower than normal healthy women, (4). Also, there was significant reduction in serum Se in type 2 diabetic patients, (5).

Whole blood and plasma selenium and red cell glutathione concentrations were significantly lower in the patients with chronic liver disease as compared with the normal healthy controls, (6).

Se content in blood varies widely, depending on various factors such as the Se content of soil (which influences the Se content of foods), dietary intake, age, and furthermore the errors inherent in the various methods of analysis. In the blood of normal adults, people in New Zealand showed the lowest values with 54±1 ng/ml (n =113) in whole blood, 66 ± 3 ng/ml (n =109) in erythrocytes, and 43±2 ng/ml (n =109) in plasma, (7). Selenium (Se) content in blood varies widely, depending on various factors such as the Se content of soil (which influences the Se content of foods), dietary intake, age, and furthermore the errors inherent in the various methods of analysis. In human its deficiency of selenium level falls during oxidative stress, (8).

The **aim** of the study is to determine selenium concentration in preeclampsia pregnant women in Balad city.

Patients and methods

A cross sectional study was done in Balad hospital – Salah al-deen governorate. 90 pregnant women were participated in the present study; 60 women with pregnancy induced hypertension and 30 normotensive pregnant women.

Cases were defined on admission with a clinical diagnosis of preeclampsia, defined as a systolic blood pressure of ≥ 140 mm Hg and diastolic pressure (Korokoff V) of ≥ 90 mm Hg on 2 occasions after 20 weeks gestation in a previously normotensive women and proteinuria > 300 mg/L, 500 mg/day or 2+ on dipstick analysis of midstream urine (MSU) if 24-hour collection result was not available. Medical and obstetric histories, including delivery data, were obtained for each woman.

Five ml of blood was taken from every pregnant woman. *Biochemical measurements:* The plasma concentration of TBARS (a global measure of lipid peroxidation) was measured by the method of Urchiyama and Milhara. Samples were assayed in duplicate; the within- and between-assay coefficients of variation were 4% and 5% respectively. Serum

malondialdehyde was determined as conjugate with TBA, serum proteins were precipitated by TCA and then removed by centrifugation. The MDA –TBA complex was measured at 534 nm, (9). While, serum glutathione (GSH) was measured by reacting with 5'5-dithiobis (2-nitrobenzoic acid), which reacts with sulfhydryl groups, to develop a stable color. The absorbance was measured at 412nm, (9). Selenium was measured by atomic absorption.

All data were presented as a mean and standard deviation. P value less than 0.05($p \leq 0.05$), was accepted as a significant value.

Results

Table 1 shows the characteristic features of preeclampsia patients and normal healthy women. There were significant elevations in body weight and body mass index, (BMI), of hypertensive patients as compare with normotensive pregnant women, ($p \leq 0.01$).

Table 1 show the mean and SD of blood pressure, (BP), there is significant elevation in systolic blood pressure of patients, (148.4 ± 6.7 mmHg), as compare with control healthy pregnant women, (115.4 ± 8.4 mmHg), ($p \leq 0.01$). Moreover, there is significant elevation in diastolic blood pressure of patients, (97.1 ± 7.5 mmHg), as compare with control healthy pregnant women, (74.5 ± 6.4 mmHg), ($p \leq 0.01$)

Table 2 show the mean and standard deviation of serum MDA, GSH and selenium in hypertensive and normotensive pregnant women. There is significant elevation in the concentration of MDA in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). However, there is significant reduction in the concentration of glutathione (GSH) in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$).

Also, there is significant reduction in the concentration of serum selenium in the serum of hypertensive pregnant women, (161.3 ± 78 ug/l) as compare with normotensive pregnant women, (215.6 ± 98), ($p \leq 0.01$).

Discussion

In the present study, there were significant elevations in body weight and body mass index, (BMI), of hypertensive patients as compare with normotensive pregnant women, ($p \leq 0.01$). Moreover, there is significant elevation in diastolic blood pressure of patients, (97.1 ± 7.5 mmHg), as compare with control healthy pregnant women, (74.5 ± 6.4 mmHg), ($p \leq 0.01$). So, the study compare between hypertensive and normotensive pregnant women regarding MDA, GSH and serum selenium.

In the present study, there is significant elevation in the concentration of MDA in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$). However, there is significant reduction in the concentration of glutathione (GSH) in the serum of hypertensive pregnant women as compare with normotensive pregnant women, ($p \leq 0.01$).The elevation in serum MDA in hypertensive pregnant women is due to increase the generation of reactive oxygen species (ROS) due to excessive oxidative damage generated in hypertensive pregnant women, (10, 11).

At present the source of the lipid peroxides in preeclampsia is unknown, but it has been suggested that poorly perfused placental tissue may evoke a free radical cascade and increase in generalized lipid peroxidation, (12). By entering the maternal circulation, these lipid peroxides could affect the maternal endothelial cellular membranes by the increased production of ROS, thus contributing to the maternal vascular dysfunction, (13). In similar study, it was found that there was a significant reduction GSh and elevation in MDA, (10).

In the present study, there is significant reduction in the concentration of serum selenium in the serum of hypertensive pregnant women, (161.3 ± 78 ug/l) as compare with normotensive pregnant women, (215.6 ± 98), ($p \leq 0.01$). Selenium is a unique element in that; it takes the place of sulfur in cysteine to form 21st amino acid selenocystine that is directly prosthatic groups or co-factors, (15).

The selenium concentrations are further reduced in normal pregnancies, illustrating a possible increased requirement

for selenium during pregnancy. However, this could also be due to inadequate absorption from the gastrointestinal tract, or inadequate renal reabsorption in the face of the increased glomerular filtration rate of pregnancy, (16).

Moreover this study also observed a further significant reduction in maternal selenium concentrations in the pregnant women with preeclampsia as compared to both the normal pregnant women, (17). The lower selenium concentrations seen in preeclampsia might adversely affect the functional activities of the selenoproteins, GPx, thus compromising the protection against oxidative stress. Also, a recent report linked increased selenium intake over two years with significantly decreased excretion of the major thromboxane metabolite, (18). An early imbalance between thromboxane and prostacyclin synthesis has been implicated in the pathogenesis of preeclampsia over the last 20 years (19, 20).

The selenium concentrations in the non-pregnant women were lower than the recommended levels, as observed in other studies, suggesting that the selenium concentrations may not actually be high enough for optimum GPx activities even in the non pregnant population, (4). The reduction in serum GSH may due to increase turnover of antioxidants for preventing oxidative damage in hypertensive pregnant women, (12). However, the present study not agrees with previous finding, (14).

Hypertension in the pregnant women could be because of, under pathophysiological conditions, increased levels of ROS contribute to vascular dysfunction which results in hypertension (12).

The level of MDA in placenta of preeclampsia women is higher than its level in normal pregnancies. Significant elevation of MDA during pregnancy. This elevated level of MDA can lead to huge damage in endothelial which result in provocation of diastolic pressure (20-22). Overproduction of Reactive oxygen species (ROS) in hypertensive pregnant women can lead to significant damage in important biomolecules such as oxidization of the lipid of erythrocyte membrane. This oxidized effects of ROS result in elevation of MDA level. (23).

This study showed there is strong relationship between oxidative stress and oxidation or depletion of GSH; this is clear in hypertensive group compared with normal one. This is due to GSH defenses against oxidative damage in hypertensive individuals. Since oxidative stress is significantly high, there was reduction in GSH level. Also, GSH act as a cofactor by cellular glutathione peroxidase (Gpx-1) to reduce H_2O_2 and organic hydroperoxides, (23,24).

The present study **concluded** that there was a highly significant trend for decreasing plasma selenium concentrations in hypertensive pregnant as compare to normal pregnant.

If selenium deficiency is confirmed in women suffering from preeclampsia, and continues to be linked with GPx inadequacy, consideration could be given to a randomized controlled trial of selenium supplementation in pregnancy or advice pregnant women to take fruit and vegetables rich in selenium and other trace elements, (21, 22).

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Table 1 the mean and standard deviation of age, body weight, height, body mass index (BMI), and blood pressure.

Parameters	**Hypertensive Patients**	**Normotensive women**	**P value**
Age (years)	27.6 ± 5.8	25.6 ± 4.5	NS
Body weight (kg)	84.43± 7.3	71.4 ± 7.84	0.01
Height (Cm)	154.7 ± 3.2	158.7 ± 3.4	NS
BMI (kg/m^2)	28.12 ± 3.6	22.6 ± 2.4	0.01
Systolic BP (mmHg)	148.4 ± 6.7	115.4 ± 8.4	0.01
Diastolic BP (mmHg)	97.1 ± 7.5	74.5 ± 6.4	0.01

Table 2 the mean and standard deviation of Malondialdehyde (MDA), glutathione, (GSH) and selenium in the serum of hypertensive and normotensive pregnant women.

Parameters	**Patients**	**Normotensive**	**P value**
MDA (micromole/L)	83.9 ± 10	34.2 ± 3.5	0.01
GSH (micromole/L)	399 ± 48	945 ± 112	0.01
Selenium (ug/l)	161.3 ± 78	215.6 ± 98	0.01