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Serum Lead and Phosphorus Levels in Sudanese Pregnant Woman with Preeclampsia

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ABSTRACT

Preeclampsia is one of the causes that lead to mortality among pregnant woman and fetus. However its etiology is unknown. The objective of this study was to assess the level of serum lead and its relation with serum phosphorus in the development of preeclampsia. This study was a case control hospital based study. Blood samples were collected from 50 preeclamptics, 50 normal pregnant women. Serum lead was determined using atomic absorption spectrophotometer and serum Phosphorus was determined by using spectrophotometer. The study was conducted during the period of January to April 2015. The mean \pm SD of serum lead and phosphorus respectively were $(0.98 \pm 0.26, 3.98 \pm 0.81)$ for preeclampsia, while the mean \pm SD of serum lead and phosphorus respectively in normal pregnant women were $(0.32 \pm 0.11, 3.6 \pm 0.66)$. Lead was significantly higher ($p=0.00$), whereas Phosphorus was significantly lower ($p=0.03$) in preeclamptics than in normal pregnant women. Also serum lead was positively correlated with systolic and diastolic blood pressures ($p=0.01$) in preeclampsia. Preeclamptics have a higher serum lead and lower serum phosphorus levels when compared with normal pregnant women. It appears that increase in serum lead, which parallels decreases in serum phosphorus, may be related to the development of preeclampsia.

KeyWords: Preeclampsia, pregnant women, Serum lead, serum phosphorus, Sudanese.

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INTRODUCTION

Lead is a well known industrial and environmental toxin¹. Common sources of lead exposure include industrial and mining activities, dust, air, workplaces, food, and cosmetics². Environmental lead is absorbed either through the gastrointestinal tract or through the lungs³. After absorption, lead is distributed in the blood, bone, and soft tissues⁴. It is known to induce broad range of harmful effects on various organs including the reproductive system. It is considered to be one of the most difficult health issues during pregnancy and cause number of adverse outcomes in women like hypertension, infertility, miscarriage, and premature delivery. Long-term exposure during pregnancy to even low concentrations of toxic metals, which have the ability to accumulate, often leads to irreversible damage to fetal developments and maternal morbidities including preeclampsia³. Preeclampsia is one of the most important complications of pregnancy that is associated with increased maternal mortality and morbidity⁵. Preeclampsia occurs during second and third trimester of pregnancy and characterized by development of high blood pressure (hypertension) and proteinuria and affects about 5-8% of all pregnancies ,Although many pathophysiological factors have been implicated in the etiology of preeclampsia, its etiology is still under investigation⁶. Also associated with oxidative stress, Oxidative stress is a condition of oxidant/antioxidant disequilibrium ,One of the important contributors to the state of oxidative stress is exposure to excess toxic metals in the environment and the deficiency of bioelements necessary for antioxidant defense mechanisms⁷. Several reports show that various elements might play an important role in etiology of preeclampsia .Despite all indications that lead might be a factor in this⁴.Blood lead levels increase during pregnancy, from 24 weeks of gestation until delivery, because of increased gastrointestinal absorption and because of an increase in bone turnover in this period⁸ during pregnancy there is increase in bone resorption to accommodate the mineral needs of the fetus, which may lead to transient increases in endogenous serum lead levels⁹, low phosphate mobilizes lead from bone and raises the concentrations in soft tissues⁴. The objective of this was study to assess the effect of serum lead and it is relation with phosphorus in the development of preeclampsia. .

MATERIAL AND METHOD

Study population: we compared 50 pregnant women suffering from preeclampsia the age range between (20-40years) old with 50 normal pregnant women the age range between (20-40 years) old. The study carried out in Omdurman maternity hospital, Omdurman, Khartoum state.

Blood sample collection: 5 ml of venous blood samples were collected from each patient and control subjects in sterile plain containers, after collection the sample were centrifuged and

serum was analyzed to measure the concentration of lead and phosphorus. Serum lead was measured by using atomic absorption spectrophotometer while serum phosphorus was measured by spectrophotometer.

Statistical analysis: Statistical analysis was performed by using the SPSS (SPSS for windows version 19) Results was presented as mean \pm SD. ANOVA test was using to compare mean of different variables . Pearsons correlation was performed to determine the relation of lead with, systolic and diastolic blood pressures in preeclamptic group.

RESULTS AND DISCUSSION

A total of 100 pregnant women were concluded in this study .of those 50 pregnant women suffer from preeclampsia, and 50 normal pregnant women as control group. Significant increase in serum lead (p value= 0.00) and decrease in serum phosphorus (p value=0.03) in preeclamptic women compared with control group as showing in the Table. Also Serum lead is positively correlated with systolic and diastolic blood pressure (p= 0.01).

Table 1: comparison of the clinical characteristics between control and case. P.value

Control

| Parameter | Preeclampsia NO=50 | Control NO=50 | P.value |
|----------------------------|--------------------|------------------|---------|
| Gestational age (weeks) | 32.3 \pm 2.96 | 33.5 \pm 2.27 | 0.33 |
| Systolic pressure (mm/Hg) | 157.2 \pm 24.7 | 117.8 \pm 4.3 | 0.00 |
| Diastolic pressure (mm/Hg) | 100.1 \pm 12.7 | 77.8 \pm 4.6 | 0.00 |
| Serum Lead (mmol/l) | 0.98 \pm 0.26 | 0.32 \pm 0.119 | 0.00 |
| Serum Phosphorus (mg/dl) | 3.98 \pm 0.81 | 3.6 \pm 0.66 | 0.03 |

Values are expressed as mean \pm SD

Preeclampsia is a multi factorial disease that may result on account of generation of oxidative stress in pregnant women. One of the important contributors to the state of oxidative stress is exposure to excess toxic metals in the environment .Lead is one of the most extensively studied reproductive toxicants to living thing¹⁰. The increase in the blood lead observed in the pregnant women most probably results from mobilization of lead from the maternal bone into the blood⁴. In this study serum lead and phosphorus levels was measured and compared between two groups preeclamptic women and normal pregnant woman .we observed a significant increase in serum lead (p value =0.00) level in preeclamptic group compared to control group. Also significant correlation between systolic and diastolic BP with levels of lead in preeclamptic group. Our result is agree with S. M. Motawei et al where they found that the blood lead is positively correlated with both systolic and diastolic blood pressure². Lead was observed to damage the vascular endothelium and endothelial dysfunction is an

important mediator of gestational hypertension.¹¹ Also significant decrease in serum phosphorus in preeclamptic group compared to normal pregnant women (0.03). phosphorus is transferred to the fetus to meet the increasing need of the growing fetus during pregnancy¹. Thereby decreasing the maternal serum levels of Phosphorus, as observed in the present study. Ikaraoha et al have previously reported a progressive decrease in serum inorganic phosphate levels in pregnant women¹² low phosphate mobilizes lead from bone and rises the concentration in soft tissue⁴, and this lead to lead toxicity and therefore to the development of preeclampsia. It is recommended that Future longitudinal studies with larger sample size should be conducted to examine the effect of lead exposure on pregnant women. Sources of lead exposure should be identified and strategies should be established to control lead exposure, particularly in pregnant women.

CONCLUSION

Preeclamptic patients have a higher serum lead and lower serum phosphorus levels when compared with normal pregnant women. It appears that increase in serum lead, which parallel decreases in serum phosphorus, may be related to the development of preeclampsia.

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