

Research Article**Assessment of Serum Cadmium and Manganese Levels in Sudanese Pregnant Women with Preeclampsia****Hadeel A. Ajeeb¹, Gad Allah Modawe², Abd Elkarim A. Abdrbo^{1*}**¹AlNeelain University, Faculty of Medical Laboratories Science, Department of Clinical chemistry, Khartoum, Sudan²Omdurman Islamic University, Faculty of Medicine, Department of Biochemistry, Omdurman, Sudan.***Corresponding author**

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Abstract: Preeclampsia is one of the causes that lead to significant mortality among pregnant women and fetus. However it is etiology is unknown. The objective of this study was to assess the level of serum cadmium and manganese and their relation in development of preeclampsia. A case control hospital based study was conducted in Khartoum-Sudan, blood samples were collected from 50 preeclampsia and 50 normal pregnant women. Serum cadmium and manganese were determined using atomic absorption spectrophotometers. The study was conducted during the period of January to April 2015. The mean \pm SD of serum cadmium and manganese respectively were (0.13 \pm 0.05, 0.14 \pm 0.04) for preeclampsia, while the mean \pm SD of serum cadmium and manganese in normal pregnant women were (0.08 \pm 0.02, 0.42 \pm 0.1.0) respectively. Cadmium was significantly higher (p=0.00), were as manganese was significantly lower (p=0.00) in preeclampsia than in normal pregnant women. Preeclamptic patients have higher serum cadmium and lower manganese level when compared with normal pregnant women. It appears that increase serum cadmium and decrease in serum manganese may be related to the development of preeclampsia.

Keywords: Preeclampsia, Pregnant women, Serum cadmium, Serum manganese, Sudanese.

INTRODUCTION

Cadmium is toxic metal. It is commonly found in industrial dirty places, environment, soil, air and food. Acute exposure of cadmium causes fever, respiratory damage, kidney problems, liver damage and other complications [1]. It acts as a catalyst in the formation of reactive oxygen species. It increases lipid peroxidation. Additionally it causes depletion of antioxidants, glutathione and protein-bound sulfhydryl group and also promotes the production of inflammatory cytokines [2].

Manganese is a trace element found in the liver, bones, and kidneys [3]. It is a cofactor for a number of important enzymes and as a part of a powerful antioxidant called manganese superoxide dismutase; it protects cells from oxidative injury [4]. Manganese is required for the proper functioning of enzymes like superoxide dismutase, which is required for scavenging free radicals [5].

Preeclampsia is a complication of pregnancy and is next to the hemorrhage and embolism among pregnancy related cause of death [6]. It is affect 2-8 % of pregnant woman [7], when complicated with convulsion is called eclampsia. It occurs during 2nd and 3rd trimester of pregnancy, more common in nulliparous

women. It is characterized by hypertension and proteinuria after 20 weeks of gestation [8].

Essential trace elements are found to be involved in various biochemical pathways [9]. They play a specific and role in the catalysis of the chemical reactions and in structural function in large molecules such as enzymes and hormones [7].

The objective of this study was to assess the effect serum cadmium and manganese in the development of preeclampsia.

MATERIALS AND METHODS**Study population**

We compared 50 pregnant women diagnosed with preeclampsia the age range between (20-40 years) with 50 normal pregnant women the age range between (20-40 years) the study carried out in Omdurman Maternity Hospital, Khartoum state-Sudan.

Blood sample

5.0 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 cadmium and manganese by using atomic absorption spectrophotometer.

Statistical analysis

Statistical analysis was performed by using the SPSS (SPSS for windows version 19) result was presented as mean \pm standard deviation (SD).

RESULTS

Total of 100 pregnant women were included in this study. 50 of those pregnant women suffer from preeclampsia and 50 normal pregnant women as control group. Significant increase in serum cadmium ($p=0.00$) and decrease in serum manganese ($p=0.00$) in preeclamptic women compared with control group as showing in the table.

Table 1: Comparison of the clinical characteristics between control and case

Parameter	Preeclampsia (N=50)	Control (N=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 cadmium (mmol/l)	0.13 \pm 0.05	0.08 \pm 0.02	0.00
Serum manganese(mmol/l)	0.14 \pm 0.04	0.42 \pm 0.13	0.00

Values are expressed as mean \pm SD

DISCUSSION

Preeclampsia is a multisystem and multifactorial disease affecting both mother and fetus by vascular dysfunction and by intrauterine growth restriction [11]. During pregnancy, manganese is required for the proper functioning of enzymes such as superoxide dismutase that is important for the scavenging of free radicals. Less magnesium level during pregnancy may result in impairment of antioxidant potential of cells by reducing the superoxide dismutase activity, as well as increased lipid peroxidation that leads to increase in blood pressure [10]. Serum levels of manganese were found to decrease in preeclamptic group ($p < 0.00$) compared to control. Previous studies have reported that low manganese levels may cause accumulation of superoxides that could consequently cause preeclampsia and associated complications [12, 13]. Thus, significant depletion of serum level of manganese ($p < 0.00$) as reported in the current study may trigger the pathogenesis of preeclampsia. Our results are in concordance with earlier findings.

A distinct involvement of low manganese concentration in the pathogenesis of preeclampsia is in the impairment of endothelial function. Arginine, precursor of the key determinant of endothelial function, contains manganese as an active component [13]. Thus, reduction in serum manganese concentration in the blood of preeclamptic pregnant women as reported in the current study may be more of a cause than a resultant effect [4]. The heavy metal, Cd, is known to be toxic, carcinogenic and related to the development of atherosclerosis through various mechanisms [14, 15]. The present study found that the level of serum Cd significantly increased in preeclamptic women.

In the present study, significant decrease in concentration of manganese was observed in comparison to the control group. Though, the

observations provide a role manganese and cadmium in the development and pathogenesis of preeclampsia, the result must be interpreted with caution as the dietary intake was not investigated.

CONCLUSION

The results on the study suggest that Sudanese preeclamptic pregnant women have lower levels of serum manganese and higher level of cadmium compared to healthy pregnant females. It is hoped that this study will contribute to the information regarding these two elements in pathogenesis of preeclampsia.

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