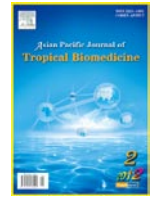




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Alterations in antioxidants enzymes and Malondialdehyde status in preeclampsia

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ABSTRACT

Objective: This study was done to determine and evaluate the level of antioxidant enzymes and malondialdehyde (MDA) in preeclamptic women. **Method:** 100 preeclamptic and 100 healthy pregnant women between the age of 20–32 attending General Hospital Owerri were selected in this study. Fasting venous blood was collected and was used for the estimation of antioxidant enzymes and malondialdehyde. **Result:** The result obtained showed that the level of MDA was significantly increased in preeclamptic pregnant women when compared with the healthy control ($P < 0.05$). On the other hand, the level of catalase, superoxide dismutase and glutathione peroxidase (GPX) was significantly reduced in preeclamptic women when compared with the control ($P < 0.05$). **Conclusions:** This observation showed that the antioxidants are excessively used to attenuate the cellular changes mediated by free radicals. Hence, the level of antioxidants are depleted.

1. Introduction

Preeclampsia is a condition in which hypertension results in pregnancy. It occurs during second and third trimester of pregnancy [1]. It appears that there are substances from the placenta that can cause endothelial dysfunction in the maternal blood vessels of susceptible women. While blood pressure elevation is the most characteristic visible sign of the preeclampsia [2].

It also involves generalized damage to the maternal endothelium, with the release of vasoconstrictive factors [3–6]. Preeclampsia is characterized by having systolic blood pressure of ≥ 140 mmHg and diastolic pressure of ≥ 90 mmHg, at least on two occasions six or more hours apart [7–10]. Preeclampsia is also characterized by the presence of proteinuria ≥ 300 mg protein / day and oedema occurring in the second half of pregnancy [11–14]. It is the most common of the dangerous pregnancy complications and likely it may affect the mother and the unborn child.

Also, preeclampsia is often asymptomatic and so its detection depends on signs and investigations. It affects

approximately 6 – 8% of all pregnancies world wide [15–16].

The preeclampsia syndrome is thought in many cases to be caused by a shallowly implanted placenta which becomes hypoxic, leading to an immune reaction characterized by secretion of upregulated inflammatory mediators from the placenta and acting on the vascular endothelium [17–18]. This shallow implantation is thought to stem from the maternal immune system's response to the placenta. Oxidative stress has been implicated in the pathophysiology of preeclampsia as it results in increased production of reactive oxygen species, superoxide radicals and lipid peroxides; hence causing endothelial injury and dysfunction [19–20]. Therefore, there is indisputable evidence that the normal role of this cell layer is severely compromised. These observations have given rise to increased interest in antioxidant enzymes. In this study, the level of lipid peroxidation product as well as antioxidant enzymes were evaluated in women with preeclampsia to provide information on their status.

2. Materials and methods

Subject: 200 women attending antenatal clinic of the General Hospital Owerri were selected. (100 preeclampsia and 100 healthy pregnant women). They are between

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the ages of 20 and 32 years having more than 30 weeks of gestation. Patients with past history of a hypertension, diabetes, renal disease, were excluded from the study. Their consent was obtained as well as ethical approval from the ethical committee of the hospital. The height and weight of the subjects were measured to calculate their body mass index (BMI).

Blood collection: In all subjects, 5ml of fasting venous blood was collected into plain and EDTA bottles. The serum was separated by centrifuging the whole blood a westerfuge (model 684) centrifuge at 5000g for 5 minutes.

Estimation of biochemical assay:

Malondialdehyde level was assayed based on MDA reaction with thiobarbituric acid (TBA)^[21]. Superoxide dismutase was assayed using the autoxidation of haematoxylin^[22] while GPX was assayed by NADPH oxidation.

CAT activities was measured by using hydrogen peroxide as substrates^[23].

Statistical analysis

The results were expressed as mean \pm standard deviation and student t – test was used to calculate the level of significance.

3. Results

Table I

MDA, level, antioxidant enzyme activities and BMI in preeclamptic and healthy pregnant women.

| Parameter | Preeclamptic(n=100) | Healthy control (n=100) |
|--------------------------|---------------------|-------------------------|
| MDA (nmol/l) | 3.91 \pm 0.86* | 1.68 \pm 0.73 |
| SOD(IU/ml) | 64.81 \pm 5.96* | 72.75 \pm 8.66 |
| CAT(IU/ml) | 66.49 \pm 8.11* | 78.31 \pm 7.92 |
| GPX(IU/ml) | 0.71 \pm 0.05 * | 0.54 \pm 0.05 |
| BMI (kg/m ²) | 24.69 \pm 3.48 | 25.01 \pm 3.01 |

*Significantly different from control

4. Discussion

The endothelial cell injury or damage may be the initiator of the pathophysiological events of the preeclampsia. The free radicals and reactive oxygen species are increased during preeclampsia^[1].

In this present study, it was observed that lipid peroxidation product (MDA) was significantly increased in preeclampsia when compared with control ($P < 0.05$). Earlier, it has been reported by Mohol *et al*^[2] that preeclamptic placenta contains higher MDA than those from normal pregnancies. Actually, this may lead to a greater potential of endothelial damage which ultimately results in enhanced diastolic

pressure. This is consistent with the work of Kaur *et al*^[3]. Various reports indicate that the levels of lipid peroxidation products are elevated in women with preeclampsia^[24–25]. The placental production of lipid peroxidation products have been demonstrated to be abnormally high in preeclampsia^[3,26,27].

Furthermore, it was observed that the level of superoxide dismutase was significantly depleted in preeclampsia when compared with the control ($P < 0.05$). The SOD protects, revitalizes cells and reduced the rate of cell damage. It counteracts some of the superoxide radicals before they can damage the cells. Also superoxide production perpetuates oxidative stress and lipid peroxidation through the oxidation of mitochondrial iron–sulphur clusters such as aconitase which subsequently stimulate membrane phospholipids peroxidation by alkoxyl radicals.

SOD is an important parts of defense system and an important enzyme possessing an antitoxic effect against superoxide anion and catalyses the reaction in which superoxide radicals are converted to hydrogen peroxide and oxygen. Hence, it decreases superoxide anion concentration in the vascular cell. This mechanism could probably counteract the development of hypertension.

In the same vein, the level of catalase in preeclamptic women was significantly reduced when compared with the control ($P < 0.05$). Catalase promotes the conversion of hydrogen peroxide, a powerful and potential harmful oxidizing agent to water and molecular oxygen. It also uses hydrogen peroxide to oxidize toxins. This is in line with the work of Kanuri *et al*^[3].

Also the level of GPX was significantly decreased in preeclampsia when compared with the control. The main function is to protect against damage from the endogenously produced hydroxyperoxides by glutathione. GPX along with SOD and catalase controls the level of oxygen derived free radicals in cells. Preeclampsia is associated with increased utilization of antioxidant.

In conclusion, antioxidant enzymes may utilize to a greater extent to counteract lipid peroxidation of cellular components, hence resulting in the depletion of these antioxidant enzyme activities.

Conflict of interest statement

We declare that we have no conflict of interest.

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