

## Antioxidant Status in Preeclampsia

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### ABSTRACT

**Aim of Study:** To find out the activity of antioxidant status in preeclampsia.

**Methods:** The study was conducted in the Dept. of Obstetrics and Gynecology in collaboration with Dept. of Biochemistry at Chandulal Chandrakar Memorial Medical College Kachandur, Durg (CG). Investigation was carried out in 50 women suffer from preeclampsia and compared with 50 normal control group composed of age matched healthy pregnant women.

**Results:** The mean serum MDA levels were significantly higher in preeclampsia than that of normal pregnant women ( $p < 0.001$ ). Pre-eclampsia is characterized by increase blood pressure associated with proteinuria diagnosed usually in second and third trimester of pregnancy although exact etiology of the disease is not known but several researches have pointed toward it association with lipid peroxidation and endothelial cell dysfunction we have observed significant increase in MDA levels (a lipid peroxidation product) in pre-eclamptic women as compared to nonmotensive pregnant women

**Conclusion:** Increased levels of oxidative stress markers and decreased levels of antioxidants in pre-eclamptic women suggest that oxidative stress markers play a significant role in

the pathophysiology of pre-eclampsia. There is association of lipid peroxidation and preeclampsia. Deficiency of enzymatic antioxidants is also observed in women with preeclampsia. Oxidative markers and antioxidants serially throughout pregnancy may be able to substantiate the association of elevated lipid peroxidation and diminished antioxidant levels with preeclampsia.

**Keywords:** Antioxidant, Preeclampsia, Oxidative Stress Markers.


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### Article History:

Received: 15-01-2018, Revised: 12-02-2018, Accepted: 13-03-2018

### Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2018.4.2.068	

### INTRODUCTION

Pregnancy is a physiological condition in which women are more prone to oxidative stress, which results due to an imbalance between the prooxidant-antioxidant levels.<sup>1</sup> Oxidative stress results because of the presence of placenta which is rich in mitochondria. Fully developed placenta consumes about 1% of the basal metabolic rate of the pregnant woman. It is also highly vascular and is exposed to high maternal oxygen partial pressure. Pregnancy is characterized by increased basal oxygen consumption and changes in energy substrate use by different organs.

Formerly also known as toxemia, preeclampsia is a condition that pregnant women develop. It is marked by high blood pressure in women who have previously not experienced high blood pressure before; the condition begins after 20 weeks of pregnancy. Preeclamptic women will have a high level of protein in their urine and often also have swelling in the feet, legs, and hands. This condition usually appears late in pregnancy although it can occur earlier.

In severe disease there may be red blood cell breakdown, a low blood platelet count, impaired liver function, kidney dysfunction,

swelling, shortness of breath due to fluid in the lungs, or visual disturbances.<sup>2</sup> Pre-eclampsia increases the risk of poor outcomes for both the mother and the baby. Undiagnosed, preeclampsia can lead to eclampsia, a serious condition that can put you and your baby at risk, and in rare cases, cause death. Women with preeclampsia who have seizures are considered to have eclampsia.<sup>3</sup>

There's no way to cure preeclampsia except for delivery, and that can be a scary prospect for moms-to-be. But you can help protect yourself by learning the symptoms of preeclampsia and by seeing your doctor for regular prenatal care. Risk factors for pre-eclampsia are obesity, prior hypertension, older age, and diabetes mellitus.<sup>4</sup> It is also more frequent in a first pregnancy and carrying twins. The underlying mechanism involves abnormal formation of blood vessels in the placenta amongst other factors.

Most cases are diagnosed before delivery. Rarely, pre-eclampsia may begin after delivery. For diagnosis high blood pressure and protein excreted in urine, some definitions also include those with hypertension and any associated organ dysfunction. Blood pressure is defined as high when it is greater than 140/90 mmHg

at two separate times, more than four hours apart in a woman after twenty weeks of pregnancy.<sup>3</sup> Pre-eclampsia is routinely screened during prenatal care.<sup>5,6</sup>

Recommendations for prevention include: aspirin in those at high risk, calcium supplementation in areas with low intake, and treatment of prior hypertension with medications. In those with pre-eclampsia delivery of the baby and placenta is an effective treatment. When delivery becomes recommended depends on how severe the pre-eclampsia and how far along in pregnancy a woman is.<sup>4</sup> Blood pressure medication, such as methyldopa, may be used to improve the mother's condition before delivery. Magnesium sulfate may be used to prevent eclampsia in those with severe disease. Salt intakes have not been found to be useful for either treatment or prevention.<sup>7,8</sup>

Pre-eclampsia affects 2–8% of pregnancies worldwide. It is one of the most common causes of death in pregnancy. They results 46,900 deaths in 2015.<sup>9</sup> Pre-eclampsia usually occurs after 32 weeks; however, if it occurs earlier it is associated with worse outcomes. Women who have had pre-eclampsia are at increased risk of heart disease and stroke later in life.<sup>5</sup>

Human cells have developed a wide range of antioxidant systems to limit production of ROS, inactivate them, and repair cell damage. ROS are a dual-edged sword—they are key messengers in maintaining physiological functions in the female reproductive tract, however, excessive and unrelenting ROS generation causes various pathologies. Pregnancy is characterized by increased generation of ROS. The generation of ROS is enhanced by increased placental mitochondrial activity<sup>2</sup> and the greatly increased placental production of the radical superoxide. This increase in the generation of superoxide is also reported to be associated with decreased levels of superoxide dismutase (SOD)<sup>3</sup> an antioxidant enzyme, in the placental trophoblast. One of the most important lipid peroxidation products is malondialdehyde

(MDA) which serves as a potential biomarker of oxidative damage and disease severity.<sup>10</sup> In preeclamptic women, it was found that MDA levels correlate with the severity of the disease and are a good indicator of lipid peroxidation and oxidative stress levels.<sup>11,12</sup> In the present study, our aim to find out antioxidant level (SOD, MDA) in preeclampsia and compare with normal healthy pregnant women at Chandulal Chandrakar Memorial Medical College Kachandur, Durg (CG).

## MATERIALS AND METHODS

### Selection of Patients

The study was conducted in the Dept. of Obstetrics and Gynecology in collaboration with Dept. of Biochemistry at Chandulal Chandrakar Memorial Medical College Kachandur, Durg (CG).

Investigation was carried out in 50 women suffer from preeclampsia and compared with 50 normal control group composed of age matched healthy pregnant women.

### Collection of Blood Samples

Overnight fasting 5ml blood samples were collected from preeclampsia and normal healthy pregnant women in plain bulb. The plasma was separated from plain vacuum tube, aliquoted and stored at -4°C -17°C and used for the estimate of Superoxide dismutase (SOD), Malondialdehyde (MDA). Serum SOD and MDA activity were measured by using ELISA and reagents kits will purchased from RANDOX Laboratories Ltd.<sup>13,14</sup>

### Data Analysis

Data were expressed as mean  $\pm$ SD. Mean values were assessed for significance by paired student  $-t$  test. A statistical analysis was performed using the Statistical Package for the Social Science program (SPSS, 23.0). Frequencies and percentages were used for the categorical measures. Probability values  $p < 0.05$  were considered statistically significant.

**Table 1: Age wise distribution of patients.**

Age group	Cases		Control	
	No	%	No	%
20-22	10	20.0	14	14.0
23-25	25	50.0	24	62.0
26-28	14	28.0	10	20.0
More than 36	1	2.0	2	4.0
Total	50	100.0	50	100.0

**Table 2: Level of SOD and MDA In patients group and normal control group.**

Parameter	Patient Group	Normal Pregnant Group	'P' Value
SOD in %	12.94 $\pm$ 9.43	28.54 $\pm$ 17.93	<0.001
MDA in mol/mg	4.27 $\pm$ 1.63	3.13 $\pm$ 1.09	<0.001

## RESULTS AND DISCUSSION

The mean serum MDA levels were significantly higher in preeclampsia than that of normal pregnant women ( $p < 0.001$ ). Preeclampsia is characterized by increase blood pressure associated with proteinuria diagnosed usually in second and third trimester of pregnancy although exact etiology of the disease is not known but several researches have pointed toward it association with lipid peroxidation and endothelial cell dysfunction we have observed significant increase in MDA levels (a lipid peroxidation product) in pre-eclamptic women as compared to nonmotensive pregnant women also observed by other workers<sup>15,16</sup>, but the activity of

serum SOD were significantly decreased found in preeclampsia patients group. Levels of antioxidant enzymes SOD was taken as marker of oxidative stress. Antioxidant levels in PE are found to be uniformly low in most of the studies on this subject.<sup>17</sup> Decreased activity of SOD is one of the markers of PE. This enzyme is considered one of the most important antioxidant defense mechanisms and its lower activity was used for screening for low antioxidant status and was even predictive of PEE development.<sup>18</sup> There are no surprise of our result and some previous researches and is a no surprise.

Increased levels of ROS and decreased levels of antioxidants found both in normal pregnancy and in the PE are pathophysiological basis for vitamin supplementation.

According to T.O.Scholl et. al. Supplementation with vitamins has been decrease infant morbidity and mortality.<sup>17</sup> In our study we found that in the uncomplicated pregnancy group's multivitamin-mineral supplementation did not influence the levels of lipid peroxidation product MDA and the activities of the antioxidant enzymes SOD.

## CONCLUSION

Increased levels of oxidative stress markers and decreased levels of antioxidants in pre-eclamptic women suggest that oxidative stress markers play a significant role in the pathophysiology of pre-eclampsia. There is association of lipid peroxidation and preeclampsia. Deficiency of enzymatic antioxidants is also observed in women with preeclampsia. Oxidative markers and antioxidants serially throughout pregnancy may be able to substantiate the association of elevated lipid peroxidation and diminished antioxidant levels with preeclampsia.

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**Source of Support:** Nil. **Conflict of Interest:** None Declared.

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**Cite this article as:** Anjana Chaudhary, Rekha Ratnani, Monika Jindal. Antioxidant Status in Preeclampsia. *Int J Med Res Prof*. 2018 Mar; 4(2):298-300. DOI:10.21276/ijmrp.2018.4.2.068