



## **Malondialdehyde and Its Correlation with Ascorbic Acid in Patients with Pre - Eclampsia: A Case - Control Study**

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**Conflicts of Interest:** Nil

### **ABSTRACT**

#### **Background**

Pre-eclampsia is a hypertensive disorder seen during late pregnancy and is commonly linked with placental dysfunction and hypoxia. In preeclampsia, there is an increased accumulation of lipid peroxidation products, which causes a reduction in levels of plasma antioxidants except for uric acid. In this view, the current study was done to measure changes in plasma levels of lipid peroxide among women with pre-eclampsia.

#### **Objective**

To measure the levels of serum malondialdehyde in preeclampsia patients compared to normal pregnancy and to correlate the levels with ascorbic acid.

#### **Methods**

This comparative case control study was conducted at

a tertiary care centre among 100 patients who were diagnosed to have pre-eclampsia during their pregnancy (cases) and normal pregnant women (controls). The study was done from July 2022 to December 2022. 50 patients were cases and 50 were controls. Patients with serious liver and renal, cardiac disorders that interrupt data collection were excluded from the study. Fasting venous blood sample was collected to assess the plasma levels of malondialdehyde from all patients.

#### **Results**

Most of the cases belonged to the age group 26-30 years. There is no significant difference in the mean gestational age. Blood pressure and fasting blood glucose levels were significantly more in cases

compared to controls. Malondialdehyde levels were significantly more in cases compared to controls. There is a positive correlation between malondialdehyde and ascorbic acid levels in cases.

### **Conclusion**

Serum malondialdehyde levels were significantly more in preeclampsia cases. This indicates that regular monitoring of malondialdehyde helps in the early detection of pre-eclampsia, which in turn helps to provide early management for better clinical outcomes.

### **Keywords**

Malondialdehyde, pre-eclampsia, case-control study, correlation, lipid peroxidation

### **INTRODUCTION**

Pre-eclampsia is defined as a pregnancy-specific hypertensive disorder detected after the 20th week of pregnancy with systolic blood pressure (SBP) of  $\geq 140$  mm of Hg or diastolic blood pressure (DBP) of  $\geq 90$  mm of Hg. It is associated with significant proteinuria, in which the urinary excretion is more than 0.3g of protein during 24 hours. Globally, pre-eclampsia is a leading reason for maternal and fetal morbidity and mortality.<sup>1</sup> It is a hypertensive disorder that develops during late 2<sup>nd</sup> trimester usually and is linked with placental dysfunction and hypoxia.<sup>2</sup> Factors responsible for pre-eclampsia include immune, genetic, immune, vascular and oxidative stress.<sup>3</sup> Oxidative stress raises during normal pregnancy. In normal pregnancy, lipid hydroperoxide levels are increased and total antioxidant capacity is reduced. Lipid peroxides are synthesized free radicals, that interact with polyunsaturated fatty acids present in the plasma membrane and in plasma lipoproteins. This process can become self-perpetuating, causing a cascade of lipid peroxidation. More oxidative stress,

seen in pre-eclampsia, causes more accumulation of lipid peroxides, reactive oxygen species (ROS) and superoxide radicals. This leads to increased cytokines, neutrophil activation, superoxide production and finally endothelial injury and dysfunction. This is like a vicious cycle. There will be a reduction in the levels of antioxidants like Vitamins A, C, and E, and glutathione and glutathione peroxidase and superoxide dismutase. There is also raise in the levels of serum uric acid in preeclampsia, but is not just a reflection of kidney damage, but a sign of antioxidative response.<sup>4</sup> BP again becomes normal after few days to weeks after delivery.<sup>5</sup> In view of less literature, the current study was undertaken to measure changes in serum levels of peroxidation product, which is Malondialdehyde (MDA) and antioxidant levels like ascorbic acid in pregnant women with pre-eclampsia.

### **OBJECTIVES**

1. To measure the levels of serum MDA and ascorbic acid in patients with preeclampsia compared with normal pregnant women.
2. To correlate the serum MDA levels with ascorbic acid levels in pre-eclampsia patients.

### **MATERIALS AND METHODS**

Source of data: This comparative case-control study was done on pregnant women attending a tertiary center named Kurnool medical college, Andhra Pradesh, from July 2022 to June December 2022.

Inclusion criteria for cases:

- Primipara pregnant women
- Patients aged below 30 years
- Patients with gestational age above 20 weeks.
- Patients diagnosed to have pre-eclampsia as per ACOG criteria<sup>6</sup>
- Patients who provided informed consent to participate in the study.

Inclusion criteria for controls:

Primipara pregnant women aged below 30 years with a healthy pregnancy and a gestational age above 20 weeks.

Exclusion criteria:

- Patients with family history of pre-eclampsia
- Patients with severe systemic illnesses- severe renal, cardiac and liver disorders that interrupt data collection.
- Patients with chronic hypertension
- Patients with gestational diabetes
- Patients with type 2 diabetes mellitus
- Patients with incomplete data
- Smokers
- Alcoholics
- Patients with acute infections
- Patients with bacteriuria.

Sample size calculation: The prevalence of pre-eclampsia in India was 10% as per the National health portal of India.<sup>7</sup>

At 80% confidence intervals, taking 5% error, the minimum sample size came to be 59 in each group. Since, 10 members didn't provide informed consent and due to 8 drop outs, 50 patients were included for final data analysis in each group.

Parameters assessed:

- Age
- Gestational age
- Serum MDA in cases and controls
- Serum ascorbic acid in cases and controls
- Correlation between ascorbic acid and serum MDA

## **METHODOLOGY**

100 patients were divided into two groups.

Group A included cases (n=50).

Group B included controls (n=50). After taking informed consent from each subject, pre-tested proforma was used to collect the data. Data on demographic features, detailed medical history, clinical examinations and relevant investigations were collected.

## **SPECIMEN**

5 ml plain venous blood sample was collected after overnight fasting by venepuncture from every subject, which is followed by centrifugation. The sample was processed immediately.

Malondialdehyde was measured using TBA method.<sup>8-10</sup>

Ascorbic acid was measured using (2, 4 - Dinitrophenyl hydrazine Method.<sup>11</sup>

## **STATISTICAL ANALYSIS**

This was done using Epi Info software version 7.2.5. Numerical parameters were compared using student's t test between cases and controls. Pearson correlation was used to assess correlation between ascorbic acid and MDA levels. P value < 0.05 was considered significant.

## **ETHICAL CONSIDERATIONS**

Ethical committee approval was taken before conducting the study. Informed consent form was taken from every subject who participated in the study.

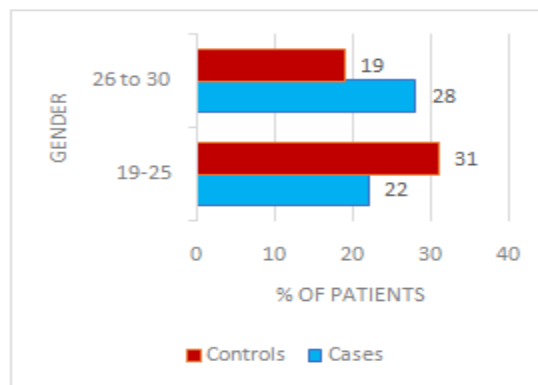
**RESULTS**

**DEMOGRAPHY**

Age: There is a significant difference in the mean age of cases and controls. Age of cases is significantly more compared to controls.

Group	Mean age	P value
Cases	24.3±2.1 years	0.0001
Controls	28.9±3.1 years	

Table 1 illustrates mean age of cases and controls



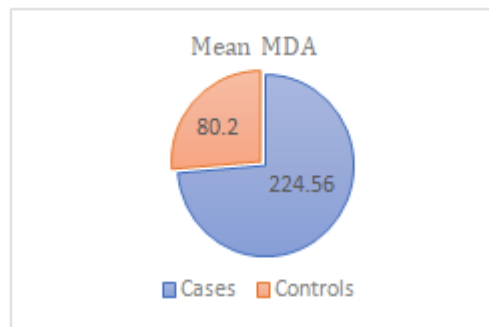
Graph 1: shows age distribution of cases and controls

Gestational age of cases and controls: There is no significant difference in the mean gestational age between cases and controls.

Group	Mean gestational age	P value
Cases	32.3±3.4 weeks	0.114
Controls	31.1±4.1weeks	

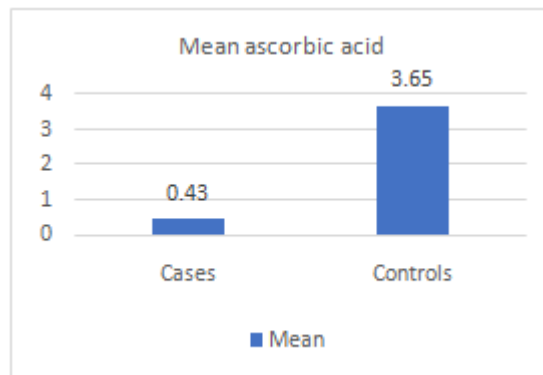
Table 2: shows means gestational age in cases and controls.

**Serum MDA levels:** There is a significant difference in serum MDA levels between cases and controls ( $p=0.0001$ ). It was more in cases.



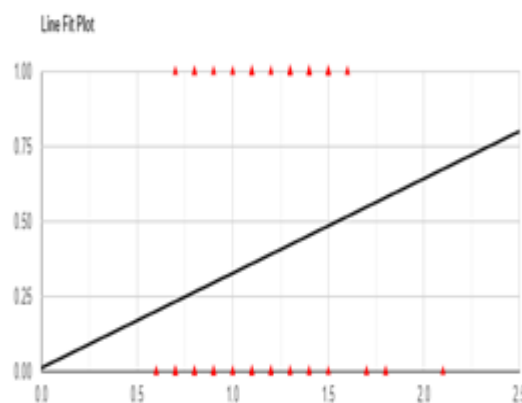
Graph 2: shows mean MDA levels in cases and controls.

**Serum ascorbic acid levels:** There is a significant difference in serum ascorbic acid levels between cases and controls ( $p=0.0001$ ). It was less in cases.



Graph 3 shows mean ascorbic acid levels in cases and controls

**Correlation between serum ascorbic acid and MDA levels:** There is weak positive correlation between serum ascorbic acid and MDA levels.



Graph 3 shows person's correlation. Results show non-significant small positive relationship between X and Y, ( $r(60) = .221, p = .084$ ).  $\hat{r} = 0.2213$

## DISCUSSION

Preeclampsia is a pregnancy-specific syndrome that happens after mid-gestation, and is defined by denovo appearance of hypertension along with the new-onset of proteinuria.

Risk factors include primigravida, central obesity, previous preeclampsia, presence of migraine, age below 20- or 35-years during pregnancy.

In the current study, 100 pregnant women were included. They were divided into cases and control groups. Each group contained 50 subjects. There is no significant difference in the mean gestational age between cases and controls. Hence the comparison is justifiable. But the mean age is more in cases compared to controls, implying that increasing age as a risk factor for the development of pre-eclampsia.

Serum malondialdehyde levels were significantly more in cases compared to controls. Serum ascorbic acid levels were significantly less in cases compared to controls. There is a weak positive correlation between cases and controls.

**Uotila et al**<sup>12</sup> and **Hideaki**<sup>13</sup> studies indicated that serum levels of lipid peroxidation products were raised in patients with preeclampsia compared to normal pregnancy. **Poranen et al**<sup>14</sup> showed that raised synthesis of lipid peroxides in placenta to be linked to an increased incidence of preeclampsia.

Ascorbic acid is 1<sup>st</sup> antioxidant that is exhausted by oxidative stress in preeclampsia.<sup>15</sup> **Y. Wang et al**,<sup>16</sup> showed reduced levels of ascorbic acid in women with preeclampsia compared to normal pregnant women, similar to our study findings. **Madazli et al**, suggested that reduction in plasma antioxidant levels among preeclampsia could be probably linked to increased lipid peroxidation.<sup>17</sup>

The study is self-sponsored.

There were no conflicts of interest.

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## CONCLUSION

Serum malondialdehyde levels were significantly more in preeclampsia cases. This indicates that regular monitoring of malondialdehyde helps in the early detection of pre-eclampsia, which in turn helps to provide early management for better clinical outcomes.

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