

# Study of Malondialdehyde(MDA) as a Marker of Oxidative Stress in Anaemic Pregnant Women

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## Research Article

**Abstract:** Anaemia during pregnancy is a commonest medical disorder that can have deleterious effects on mother as well as on foetus in the form of maternal morbidity and mortality, intrauterine growth retardation, poor weight gain, premature labour, preterm delivery and peri-natal morbidity and mortality. Iron deficiency anemia is the most widespread pregnancy associated pathological condition. The objective of this study was to determine the serum Malondialdehyde (MDA) in anaemic pregnant women and to compare them to that of non anaemic pregnant women. Materials and Methods: Present Cross sectional study was carried out in the Department of Biochemistry MGM Medical College, Aurangabad during March 2011 to March 2013. A total of 50 pregnant women of 15-35 yrs age with hemoglobin level < 10.5 g% were compared with 50 non anaemic pregnant women. Anaemia was diagnosed based on haemoglobin levels (<10.5gm/dl). Serum malondialdehyde (MDA) was estimated by method of Nourooz-zadeh J et al. using trichloro acetic acid and thiobarbituric acid. Mean and standard deviation were calculated for Hb%, Serum MDA. Statistical analysis was done using SPSS no. 17 and student t test. In the present study, statistically significant increase in levels of lipid peroxidation(MDA) was observed in pregnant anaemic women as compared to those in non anaemic pregnant controls.

**Keywords:** Malondialdehyde, Anaemia, Pregnant Woman.

## Introduction

Anaemia during pregnancy is a commonest medical disorder that can have deleterious effects on mother as well as on foetus in the form of maternal morbidity and mortality, intrauterine growth retardation, poor weight gain, premature labour, preterm delivery and perinatal morbidity and mortality.<sup>1</sup> Among pregnant women at least half of all anaemic cases have been attributed to iron deficiency. In India about 90% of anaemia cases are reported to be due to iron deficiency, because high iron requirements during pregnancy are not easily fulfilled by dietary intake alone, especially when iron bioavailability is poor.<sup>2</sup> WHO has estimated that prevalence of anaemia in pregnant women is 14 per cent in developed and 51 per cent in developing countries and 65-75 percent in India.<sup>3</sup> Anaemia in pregnancy is known to be associated with preterm delivery and small for gestational age foetus. Pregnancy itself is known to induce oxidative stress.<sup>4</sup> Anemia is known to promote oxidative stress due to

inadequate tissue oxygen supply leading to increased free radical production and very low level of circulating red blood cells and mobile free radical scavengers which provide protection to tissues from ROS mediated damage.<sup>5</sup> Malondialdehyde (MDA) is a product of lipid peroxidation and has been found to be elevated in conditions of oxidative stress. PUFA gets oxidized to form lipid peroxides which are unstable and undergo decomposition to form reactive carbonyl compounds. Malondialdehyde is a major breakdown product of lipid peroxides.<sup>6</sup> So the aim of the present study was to assess the markers of oxidative stress in pregnant anaemic women.

## Materials and Methods

Present Cross sectional study was carried out for duration of two years in the Department of Biochemistry MGM Medical College, Aurangabad during March 2011 to March 2013 after the permission from institutional ethical committee. A total of 50 pregnant women of 15-35 yrs age with haemoglobin level < 10.5 g% were considered as test group and control group of 50 non anaemic pregnant women. Anaemia was diagnosed based on haemoglobin levels (<10.5gm/dl). All cases and controls chosen for the study were free from any other complications like preeclampsia and gestational diabetes. Presence of any other causes of anemia like thalassemia, haemolytic diseases, hypersplenism, chronic infections, renal and hepatic diseases were also ruled out in them. Both groups were normotensive, non diabetic subjects having no history of malignancy, heart diseases, infections and endocrine disorders.

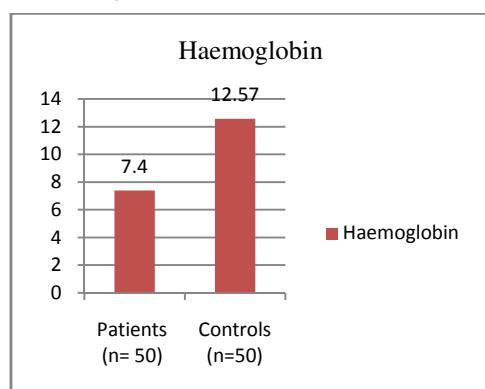
## Collection and storage of blood samples

3-5ml of fresh blood samples collected in EDTA were used for complete blood count (CBC) by ADVIA 2120i 5 Part Cell Counter (SIEMENS), on the same day of collection. 3-5ml of venous blood were drawn from the participants in vacutainers. After clot formation, the tubes were centrifuged at 4000 rpm for 10 minutes. Serum thus separated was analyzed immediately for

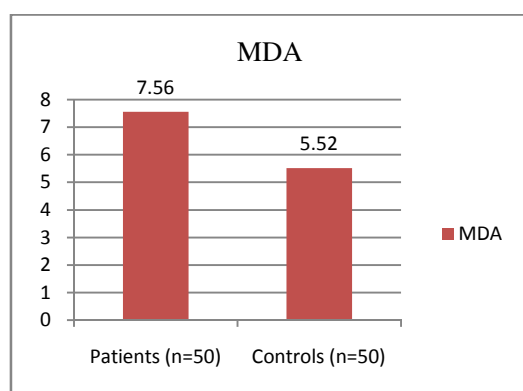
MDA. Serum malondialdehyde (MDA) was estimated by method of Nourooz-zadeh J et al.<sup>7</sup> Statistical analysis was done using SPSS and student t test.

## Results

There was a consistent significant increase in lipid peroxidation (MDA) in all anaemic pregnant women as compared to non anaemic pregnant controls ( $P < 0.001$ ). The values obtained on analyzing specimens collected from pregnant women and control groups are tabulated. The mean values and standard deviation also have been calculated for comparative study of pregnant women with anaemia and controls. The values of subject and controls groups are also graphically represented for comparison. p value  $< 0.001$  is significant



**Figure 1:** Comparison of Hemoglobin in anaemic pregnant women with controls



**Figure 2:** Comparison of MDA in anaemic pregnant women with controls

## Discussion

Pregnancy is a physiological state accompanied by a high-energy demand and an increased oxygen requirement. Various compensatory adaptive changes, including increased ventilation for enhanced oxygen demand, occur with advancing pregnancy to meet the increasing requirements for proper bodily functions of

The graphs were plotted using values of all the study parameters. The graphs show significant decreases of Haemoglobin level in subjects were observed compared to the controls. MDA significantly increases in pregnant women with anaemia as compared to non anaemic pregnant women. Table 1 shows mean, standard deviation and p values of all the study parameters in anaemic pregnant women and non anaemic pregnant women.

**Table 1:** Showing the comparable values of Pregnant anaemic women and Controls

Sr. No.	Parameter	Patients		Controls		p Value
		Mean	SD	Mean	SD	
1	Haemoglobin	7.4	0.302	12.57	0.611	0.0001
2	MDA	7.56	0.170	5.52	0.561	0.0001

mother to fulfill the needs of the fetus.<sup>8</sup> Such a condition may be responsible for raised oxidative stress in pregnancy. Decreased erythrocyte survival, which is secondary to an increased susceptibility to oxidant damage, has been reported in iron deficiency anaemia (IDA).

WHO reports show that 35-75% of pregnant women in developing countries and 18% of women from industrialized countries are anaemic. The prevalence of iron deficiency is more than the prevalence of anemia.<sup>9</sup> Iron is an essential element in all living cells.<sup>10</sup> Iron deficiency in the body limits synthesis of heme and decreases production of red blood cells in the marrow resulting in anemia. Since cellular energy metabolism is dependent on oxygen, anemia has a wide range of clinical consequences.<sup>10,11</sup> Anemia leads to increased oxidative stress and increased lipid peroxidation.<sup>10</sup> In anemia there are fewer RBCs and less oxygen in tissues.<sup>12,13</sup> A normal hemoglobin level does not exclude iron deficiency because an individual with normal body iron stores must lose a large portion of body iron before hemoglobin levels fall below the laboratory definition of anemia.<sup>13</sup> Iron is required by the enzymes involved in oxidative metabolism.<sup>13</sup> At the same time it must be considered that ferrous iron-used for oral iron therapy in pregnancy-itself is a potent pro oxidant and several studies have suggested that iron deficient women were more susceptible to this iron therapy induced oxidative stress.<sup>4</sup> In the present study, the serum concentration of malondialdehyde (MDA) is higher in pregnant women with iron deficiency anemia. This is in agreement with earlier study by Sujata Maitra *et al* (2012).<sup>6</sup> This could be due to increased generation of ROS because of increased oxygen demand during pregnancy<sup>14</sup>, reduction in the activities of antioxidant enzymes such as superoxide dismutase and glutathione peroxidase.<sup>15</sup> Although previous studies have suggested that IDA may be related to increased lipid peroxidation<sup>16,17</sup>, however, its mechanism has not been completely clarified.

## Conclusion

On the basis of the results of the present study, it may be concluded that iron deficiency anemia is associated with generation of free radical ; abnormalities and peroxidation of vital body molecules which implies increased risk for pregnant women as well as for foetus. However, further studies are needed to assess the oxidative stress in pregnancy related anaemia.

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