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Research Article

EVALUATION OF OXIDATIVE STRESS IN ANEMIC PREGNANT WOMEN OF ALIGARH CITY, UTTAR PRADESH

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ABSTRACT
Mother and foetus have harmful effects if mother is having anemia during pregnancy. Iron deficiency anemia is the most widespread pregnancy associated pathological condition. The objective of this study was to evaluate oxidative stress by measuring the serum Malondialdehyde (MDA) in anaemic pregnant women and to compare them to that of non anaemic pregnant women. Present Cross sectional study was carried out in the Department of Biochemistry Aligarh Medical College, Aligarh during March 2009 to March 2010. A total of 40 pregnant women of 20-35 yrs age with hemoglobin level < 10.5 g% were compared with 20 non anaemic pregnant women. Anaemia was diagnosed based on haemoglobin levels (<10.5gm/dl). Serum maondialdehyde (MDA) was estimated. 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: *Malonyldialdehyde(MDA), Oxidative Stress, Iron Supplementation, Anemia during Pregnancy*

INTRODUCTION
Iron balance is critical to maintain normal erythropoiesis (Sloan *et al.,* 2002; Rehema *et al.,* 2004). Optimum balance is highly needed for growing children and pregnant women. Daily requirement for iron is 6 times greater for women in the last trimester of pregnancy than for non pregnant women. Currently 100mg elemental iron for 100 days is given during pregnancy in India (Kumar, 1999). National Health and Family welfare Survey (NFHS-III, 2006) reported 57.9% anemia (Hb<11gm/dl) among pregnant women. It is higher than 49.7%, reported in 1999 NFHS-II. Several factors are identified for increasing burden i.e. low bioavailability of iron in Indian diet, high phytates, low content, high worm load & malaria prevalence (Awasthi and Pande, 1997), poor outreach and quality of iron supplementation, non-compliance and logistics difficulties (Vijayaraghavan *et al.,* 1990). Free radical is any atom (e.g. oxygen, nitrogen) with at least one unpaired electron in the outermost shell, and is capable of independent existence. There are numerous types of free radicals, some common ones are superoxide anion (O^{2-}), the hydroxyl radical (OH·), singlet oxygen, and hydrogen peroxide (H_2O_2). Raised oxidative stress has been implicated in many diseases. It has been found altered with pregnancy, iron deficiency and overdoses (Kurtoglu *et al.,* 2003; Scanlon *et al.,* 2000). 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. So the aim of the present study was to assess the markers of oxidative stress in pregnant anaemic women.The present study reports on the relative changes in oxidative stress markers in pregnant women with low iron anemia as compared to that of normal pregnancies. Pregnancy is a physiological state, which is accompanied by a high-energy demand and an increased oxygen requirement. Both of these may lead to increased oxidative stress. Oxidative stress may be defined as a condition where there is disturbance in the pro-oxidant antioxidant balance in favour of the prooxidant, leading to potential damage producing oxidative stress (Granot, 2004). Lipid peroxidation is an oxidative process which occurs at low levels in all cells and tissues. Under

normal conditions a variety of antioxidant mechanisms serve to control this peroxidative process (Sies, 1991). The generation of free radicals is a normal physiological process but increased production of free radicals can act on lipids to causes lipid peroxidation. The cells have evolved a number of counter acting antioxidant defenses. Free radical scavenging mechanisms includes enzymatic and non-enzymatic antioxidants which limit the cellular concentration of free radical and prevent excessive oxidative stress. The aim of the present study was to assess the markers of oxidative stress and antioxidative enzymes in pregnant anemic women.

MATERIALS AND METHODS

This study was undertaken in the Department of Biochemistry, J.N. Medical College, AMU, Aligarh. The protocol for this study was approved by the Institutional Ethical committee. The participants gave informed consent after the study design was fully explained. Non-anaemic pregnant females in the age group of 20-35 years with Hb level ≤ 11 gm% were used as control. . The subjects were neither suffering from diabetes mellitus, hypertension or any other disease nor on iron therapy. Venous blood from anaemic pregnant women of same age group as that of control was taken after informed consent. The Hb level of this group was ≤ 11 gm%. The study comprised of samples from 20 non-anaemic pregnant women and samples from 40 anaemic pregnant women. Four ml of venous blood of each subject / case was collected using 4% (w/v) sodium citrate as an anti-coagulant after taking informed consent. These samples were stored in refrigerator and used for estimation of MDA. The data collected was subjected to standard statistical analysis. The data was expressed as mean ± SD.

RESULTS AND DISCUSSION

Result

An attempt was made to evaluate the comparative MDA level in non-anemic pregnant women's erythrocytes versus anemic pregnant women's erythrocytes. Our result depicted in Table-1 (Figure 1) shows an appreciable augmentation in the MDA levels in anemic pregnant women's erythrocytes undertaken in this study in comparison to non-anemic women's erythrocytes. As can be observed from Table 1 (Figure 1) non-anemic pregnant women's erythrocytes of age group of 20-35 years (n=20) showed MDA levels to the order of 3.20±0.40 µmol/L. On the contrary, augmented MDA levels to the order of 4.19±0.32 µmol/L were recorded in anemic pregnant women's erythrocytes of the age groups 20-35 years (n=40).

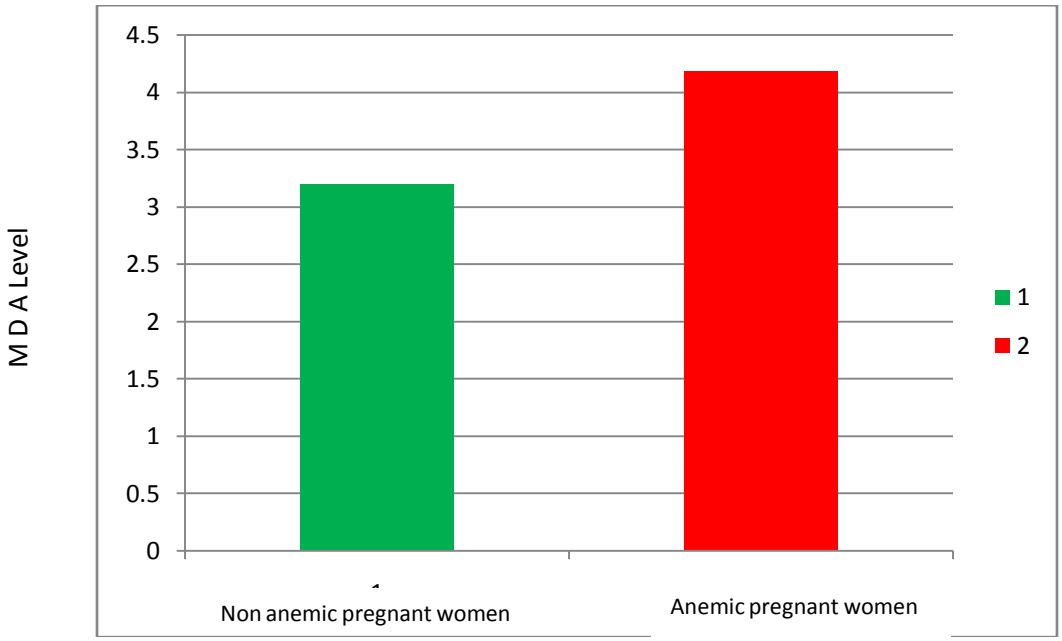

Figure 1: MDA levels in anemic and non-anemic pregnant women

Table 1: MDA levels in anemic and non-anemic pregnant women's erythrocytes

Parameter	Mean ± SD	Range
Non-anemic pregnant women (n=20)	3.20 ± 0.40	1.00 – 5.12
Anemic pregnant women (n=40)	4.19 ± 0.32	2.49 – 6.00

p < 0.05

Thus, the results obtained show augmentation of MDA levels in patients undertaken in this study when compared to respective age group healthy controls. The results are expressed as mean ± standard deviation.

Discussion

Pregnancy is a state that increases susceptibility to oxidative stress, in which basal oxygen consumption increases and oxidant/antioxidant balance disturbs. Oxidative stress occurs when there is imbalance between oxidant agents and/or insufficient antioxidant defence mechanism (Shah and Channon, 2004). Reactive oxygen species (ROS) plays an important role in oxidative stress and malondialdehyde (MDA), the lipid peroxidation end product, is one of the indicators of oxidative stress. Iron deficiency anemia (as determined by low hemoglobin and hematocrit) is considered the most widespread pregnancy-associated pathological condition. Severe anemia (Hemoglobin less than 70 gm/L) in the first half of pregnancy is proved to be associated with preterm delivery and small for gestational age fetus (Scanlon *et al.*, 2000; Rasmussen, 2001; Schumann, 2001). Riazantsev *et al.*, (1996) suggested that spontaneous lipid peroxidation as judged by the accumulation of MDA increased with severity of anemia and along with MDA there is also an increased in GHS-peroxidase and GSH-reductase in red blood cells.

Our results clearly show an appreciable augmentation in the MDA levels in anemic pregnant women's (defined by Hb) erythrocytes undertaken in this study in comparison to non-anemic pregnant women's erythrocytes. The high MDA levels in erythrocytes of anaemic pregnant women are the consequence of uncontrolled lipid peroxidation and suppressed antioxidative defense. The process of uncontrolled lipid peroxidation in biological system may be associated with loss of essential polyunsaturated fatty acids, and the formation of toxic hydro peroxide and other free radicals. 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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