



Original Research Article

Estimation of malondialdehyde and catalase in pregnant & non-prenant women

Shashi Prabha Singh¹, Preeti Sharma^{1,*}, Pradeep Kumar¹, Rakesh Sharma²¹Dept. of Biochemistry, Santosh Medical College and Hospital, Santosh deemed to be University, Ghaziabad, Uttar Pradesh, India²Dept. of Biochemistry, Government Medical College, Saharanpur, Uttar Pradesh, India

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ABSTRACT

Backgrounds: Pregnancy is a period of increased demands of metabolism with changes in physiology of pregnant women and the requirements of oxygen increase in both mother and fetus. In Pregnancy due to increase demand of oxygen lead to development of oxidative stress within maternal circulation as well as in the placenta. The objective was to estimate Oxidative stress and antioxidant level in pregnancy as compare to non pregnant women.

Materials and Methods: An observational cross sectional study was conducted in Obstetrics and Gynaecology departments at Santosh Medical College and Hospital, Ghaziabad and SMMH Medical College, Saharanpur, from November 2019 to April 2020. A total sample of 74 cases was taken of which 37 non pregnant and 37 pregnant women were within the age group of 18 - 40 years. 3 ml of venous blood was collected using a disposal syringe under aseptic condition in a, EDTA vial. 2.0 ml blood (plasma) was used for estimation of MDA and 1.0 ml blood for estimation of CATALASE.

Results: The assessment of oxidants and antioxidants reveal highly significant increase ($p < 0.0001$) in the levels of Malondialdehyde in Pregnant women when compared to non-Pregnant women and highly significant decrease ($p < 0.0001$) was found in the levels of Catalase in Pregnant women when compared to non Pregnant women. Karl Pearson's Coefficient Correlation, showed negative correlation between MDA and Catalase.

Conclusion: The present study revealed that MDA level is significantly increased antioxidant and Catalase is significantly decreased in pregnant women as compared to non –pregnant women. Hence, the hypothesis that oxidative stress occurred in pregnancy was strongly supported due to increased concentration of Malonadialdehyde and decreased concentration of Catalase in pregnant women.

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1. Introduction

Pregnancy is a stressful condition which is characterized by a extreme rise in energetic and oxygen demands for proper growth and development of fetus. In pregnancy many physiological functions and metabolic status are altered to a considerable degree. Pregnancy is a physiological development still mother and fetus experience oxidative stress, at the time of pregnancy.^{1,2} Development of oxidative stress; lead to lipid peroxidation and decreased antioxidant activity in pregnancy, may be due to negative

energy equilibrium also contribute in development of complications in pregnancy.^{3,4}

In normal Pregnancy, because of increased requirements of tissue oxygen there is increase level in oxidative stress. Oxidative stress can be defined as a state of imbalance between reactive oxygen species and the mechanisms of detoxification. Reactive oxygen species(ROS) contains an atom of oxygen with an unpaired electron Correspondingly, reactive nitrogen species (RNS) such as nitrous oxide (NO) or peroxy nitrite (ONOO-) ROS react with the most important structures and cellular molecules and alter the biological functions of the cells.⁵

* Corresponding author.

E-mail address: prcdri2003@yahoo.co.in (P. Sharma).

Oxidative damage to lipids is known to as lipid peroxidation. Lipid per-oxidation markers have been estimated and confirmed in many diseases such as neurodegenerative disease, ischemic heart disease and diabetes mellitus.⁶ Lipid peroxides, derived from polyunsaturated fatty acids and arachidonic acid metabolism, are unstable and they include reactive carbonyl compounds, which is malondialdehyde (MDA); most reliable marker of lipid peroxidation measured by Thiobarbiturate assay reacts readily with amino groups on proteins, lipoproteins, and DNA functional groups. MDA-modified proteins may show altered physico-chemical behavior and antigenicity.

There are lots of counter acting defence mechanisms which can be categorized in to two types- free radical scavenging and chain breaking antioxidants. The free radical scavenging mechanisms include antioxidant enzymes like Superoxide dismutase (SOD), Glutathione peroxidase (GSH-P), Glutathione reductase (GSH-R) and Catalase. These antioxidants limit the cellular concentration of free radicals and prevent oxidative damage.¹ SOD catalyses the conversion of superoxide radicals to H_2O_2 and O_2 and H_2O_2 is further detoxified by catalase.^{7,8}

Catalase is a hemoprotein found in almost every organism; animals and plants. Most organisms have more than one type of catalase produce in the blood, bone marrow, mucous membranes, kidney and liver.⁹ Catalase is a homotetramer protein that use Fe as a cofactor and encoded by gene in 11th chromosome, inactivating this gene lead to an condition known as acatalesemia characterised by low catalase level.¹⁰

In recent years to study the role of increasing oxidative stress and decreasing antioxidants is significant.¹¹ Thus, in this study it was aimed to investigate the status of MDA & Catalase in age matched pregnant & non pregnant women with objectives to compare the level of Malondialdehyde and Catalase between pregnant women and non pregnant women and to find out the correlation between MDA and Catalase in pregnant and non pregnant women.

2. Materials and Methods

This observational case-control study was conducted in the Department of Obstetrics and Gynaecology and Department of Biochemistry at Santosh Medical College and Hospital, Ghaziabad, and SMMH Medical College, Saharanpur from November 2019 to April 2020. Ethical clearance was obtained from Institutional Ethical Committee. The total sample size was 74, out of which Cases were 37 and 37 Control. Clinically diagnosed & confirmed cases of pregnant women and healthy normal non-pregnant women in the age group 18 to 40 years were selected from those attending SMC&H and SMMH, OPD. Those cases suffering from severe anaemia, diabetes mellitus under medication and untreated diabetes, acute infection and any chronic disease were not included in study. 3 ml of venous blood was

collected using a disposal syringe under aseptic condition in a, EDTA vial. 2.0 ml blood (plasma) was used for estimation of MDA and 1.0 ml blood for estimation of CATALASE.

Biochemical measurements was done as estimation of Malondialdehyde (MDA) by Satoh K. (1978) Method¹² and estimation of Catalase activity by Ashok k. Sinha et al. (1972) method.¹³

Statistical analysis was done by using Statistical Package for Social Sciences (SPSS) version 22. The results were presented in mean \pm SD. The MDA and catalase levels were compared by using Unpaired t- test between cases and control. The Pearson's correlation coefficient were calculated among the study parameters. The p- value <0.05 was considered significant.

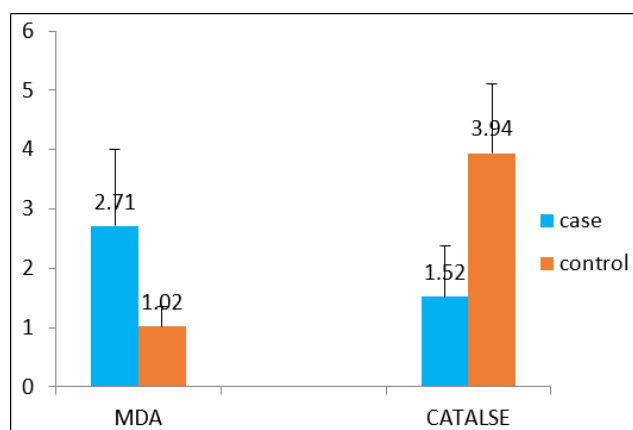


Fig. 1: Show mean and standard deviation graph of MDA & Catalase

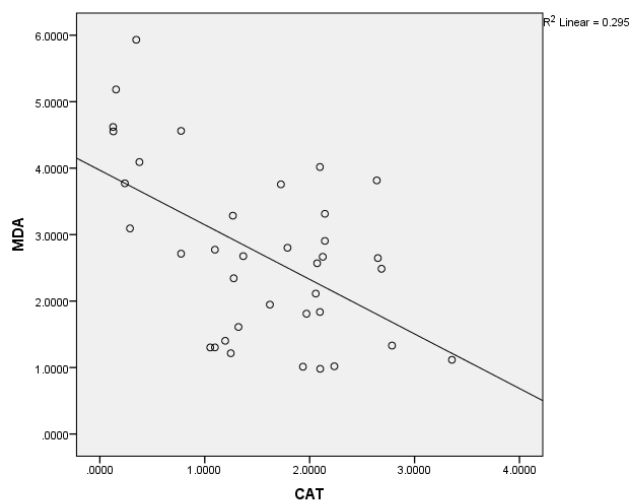


Fig. 2: Scatter diagram showing correlation between MDA and Catalase in cases

Table 1: Comparison of malonaldehyde levels between cases and control

S. No.	Group	Cases (N)	Mean	Standard Deviation	p value
1	Case	37	2.77	±1.26	p<0.0001
2	Control	37	1.06	±0.39	

Table 2: Showing comparison of catalase between cases and control

S. No.	Group	Cases (N)	Mean	Standard Deviation	p value
1	Case	37	1.55	± 0.89	p<0.0001
2	Control	37	3.98	±1.15	

Table 3: Pearson correlation coefficient among the study parameters in cases

Variables	Pearson Correlation	MDA	CAT	AGE	WEIGHT
	Pearson Correlation	1	-0.543**	-0.097	0.034
MDA	Sig. (2-tailed)		0.001	0.566	0.844
	N	37	37	37	37
	Pearson Correlation	-0.543**	1	-0.079	-0.127
CAT	Sig. (2-tailed)	0.001		0.642	0.454
	N	37	37	37	37
	Pearson Correlation	-0.097	-0.079	1	0.443**
AGE	Sig. (2-tailed)	0.566	0.642		0.006
	N	37	37	37	37
	Pearson Correlation	0.034	-0.127	0.443**	1
WEIGHT	Sig. (2-tailed)	0.844	0.454	0.006	
	N	37	37	37	37

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4: Comparison between MDA, Catalase, age, weight

Particular	N	Minimum	Maximum	Mean	Std. Deviation
MDA	37	0.9800	5.9320	2.778081	1.2604217
CAT	37	0.1260	3.3560	1.553216	0.8941492
AGE	37	20	35	26.03	4.705
WEIGHT	37	36	69	52.86	6.382

3. Results and Discussion

In normal pregnancy oxidative stress is generated because of high demand of tissue oxygen. MDA is an end product of lipid peroxidation and it is stable so used as reliable marker to measure level of damage to tissue induced by free radical.

In the present study, MDA was significantly ($p=0.0001$) higher among cases 2.77 ± 1.26 than controls in 1.06 ± 0.39 and catalase is 1.55 ± 0.89 in Pregnant women and 3.98 ± 1.15 in non- Pregnant women, this result was in accordance with that of Ishihara et al.¹⁴ and similar finding was also reported by Wickens D, Toescu, Upadhyaya C and Patil S.B.^{15–18}

The balance between the reactive oxygen species (ROS) and antioxidant mechanisms protects the tissues from damage and prevent from disorders. Antioxidant system is stronger than peroxidation during pregnancy reported by Stipek et al and Uotila et al.^{19,20}

Qanungo S²¹ in his studies also reports that LPO decreased as pregnancy progressed but Pentieva K, Saikumar P and Kawashiro Y studies were negatively correlated that LPO increased during the course of pregnancy.^{22–24}

According to Walsh in normal pregnancy, lipid production in placental is controlled by placental antioxidant system. Reactive oxygen species function as signal transduction in normal cases, but overproduction may result in human health problem. Although the body's own mechanism plays a crucial role in controlling the free radicals antioxidants that counterbalance these oxidative radicals get impaired themselves. Jauniaux, E²⁵ stated that Ca²⁺ is strong inducer of uterine contraction that potentially lead to preterm labour. Thus, suppression of oxidative stress by antioxidant system, primarily by catalase, play very important role in preventing preterm labour. Mirjana Bogavac in his study indicate that with previous miscarriages levels of OS increased in pregnant

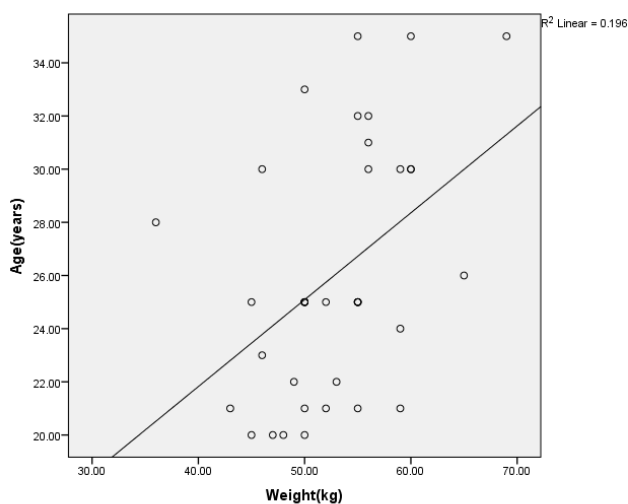


Fig. 3: Scatter diagram showing correlation between age and weight in cases

women and exhaustion of the antioxidant system is one of the reasons for the poor pregnancy outcome.^{26,27} In this study decrease in catalase and increase of Malonaldehyde were statistically significant. This study was planned to detect lipid peroxidation product MDA in pregnant and non-pregnant women

4. Conclusion

The present study was designed to estimate Malonaldehyde and Catalase level in pregnant women. MDA levels was significantly increased in pregnancy as compared to non-pregnant women and the level of enzymatic antioxidant i.e. Catalase is significantly decreased in pregnant women as compared to non-pregnant women. Karl Pearson's Coefficient of Correlation, also shows that MDA was negatively correlated with Catalase i.e. MDA is increased and Catalase is decreased in pregnant women. Hence, the hypothesis that oxidative stress occur in pregnant women was supported due to increased concentration of Malonaldehyde and decreased concentration of Catalase in pregnant women.

5. Source of Funding

Nil.

6. Conflicts of Interest

None.

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Author biography

Shashi Prabha Singh Ph.D. Scholar

Preeti Sharma Associate Professor

Pradeep Kumar Professor

Rakesh Sharma Professor

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