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Original article:

A comparative study of oxidative status in pregnant and non-pregnant women

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Abstract

Introduction: Pregnancy is a normal physiological phenomenon with many biochemical changes. This study was aimed at determining the oxidative status in pregnant and apparently healthy non pregnant women.

Materials and methods: Product of lipid Peroxidation, Malondialdehyde (MDA) and enzymatic antioxidant, Superoxide dismutase (SOD) were estimated in serum of 100 pregnant women and 100 non pregnant apparently healthy controls in the age group of 18-40 yrs.

Observation: It was observed that pregnant women are more susceptible to Oxidative Stress as compared to non-pregnant women.

Result: Findings were, the mean plasma level of MDA was significantly increased in pregnant group compared to non pregnant group ($p<0.0001$), also there was a significant decrease in SOD levels in pregnant women as compared to Non-Pregnant women ($p<0.0001$)

Conclusion: .The conclusion of the research was that pregnant women have increased levels of oxidative stress.

Key Words: Oxidative stress, MDA, SOD, Pregnancy

Introduction

Pregnancy is a stressful condition in which many physiological and metabolic functions are altered to a considerable extent [1]. Consequently remarkable and dramatic events occur during this period for sustaining mother and fostering the growth and maintenance of fetus [2]. In Normal Pregnancy, there is increased **oxidative stress** because of high energy demand and increased requirements for tissue oxygen. Lipid peroxidation is an oxidative process which occurs at low levels in all cells and tissues [3]. Oxidative Stress occurs due to an imbalance between the reactive oxygen species and the antioxidant levels [4], [5]. This balance leads to damage of important biomolecules & organs with potential impact on the whole organism [6]. Oxidative stress is estimated by measure the product of lipid Peroxidation i.e.,

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Malondialdehyde (MDA) level. Disturbances in the normal redox state of cells can cause toxic effects through the production of peroxides and free radicals that damage all components of the cell, including proteins, lipids, and DNA. Oxidative stress from oxidative metabolism causes base damage, as well as strand breaks in DNA. Base damage is mostly indirect and caused by reactive oxygen species (ROS) e.g., O_2- (superoxide radical), OH (hydroxyl radical) and H_2O_2 (hydrogen peroxide) [7]. Free radicals are defined as molecules with one or more unpaired electrons in their outer electron orbit. Although the generation of **free radicals** is a normal physiological process but increased production of **free radicals** can act on lipids to cause **lipid peroxidation**[8].

The level of the oxidants is controlled by antioxidant enzymes and small molecule antioxidants [5], [9]. An antioxidant is a molecule that inhibits the oxidation of other molecules. These antioxidant defense mechanisms can be categorized into two types- free radical scavenging and chain breaking antioxidants. The free radical scavenging mechanisms include enzymatic antioxidants like Superoxide dismutase (SOD), Catalase, Glutathione peroxidise (GSH-Px) and Glutathione reductase (GSH-Rx), which limit the cellular concentration of free radicals and prevent excessive oxidative damage [1].

Certain biochemical indices are useful in assessing the progression of pregnancy. Hence, the aim of the present study is to assess the lipid peroxidation and enzymatic antioxidant activities in the normal pregnant women as compared to non – pregnant women.

Aims & objectives

Aim: The aim of present study was to compare the oxidative status in pregnant and apparently healthy non-pregnant women.

Objectives:

1. To estimate the Malondialdehyde levels in pregnant and non pregnant women.
2. To estimate the Superoxide dismutase levels in pregnant and non pregnant women.

Materials and methods

This study was conducted in the Department of Biochemistry and Dept. of Obs. & Gynae, Integral Institute of Medical Sciences & Research, Integral University, Lucknow. It comprised of total 200 women in the age group of 18-40 years, of which 100 were pregnant and 100 were non-pregnant. Based on the inclusion/exclusion criteria, with their written and informed consent, the subjects were enrolled. Smokers, alcoholics and subjects with chronic and acute infections were excluded from the study.

4ml of blood was drawn from the subjects under aseptic conditions. After centrifugation, the serum was used for the analysis of MDA and SOD using **Systronics UV-Visible Double Beam Spectrophotometer 2205.**

Estimation of Malondialdehyde (MDA) was done by Satoh K. (1978) Method [10]

Principle**-** Serum is deproteinised and the precipitate is treated with thiobarbituric acid at

90^{O}C for 10 minutes. The pink colour formed gives the measure of thiobarbituric acid reactive substances (TBARS) which will be read at 535nm.

Estimation of Superoxidedismutase (SOD) was done by Nitroblue tetrazoliu (NBT) method [11]

Principle- The assay of SOD is based on the inhibition of formation of NADH–phenazine methosulphate – nitroblue tetrazolium formazan. The colour formed at the end of the reaction can be extracted into butanol and measured at 560nm.

Statistical Analysis

Unpaired t-test was used to compare the study parameters between cases and controls. Pearson correlation coefficient was calculated among the study parameters. p value <0.05 was considered to be significant.

All the analysis was carried out by using Statistical Package for Social Sciences (SPSS) version 22.

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Table-1: Comparison of MDA levels between cases and controls

Study variable	Controls (n=100) Mean±SD	Cases (n=100) Mean±SD	p- value
MDA (µmol/L)	1.48±0.78	2.44±0.79	<0.0001

Fig-1: Graphical representation of MDA levels between cases and controls

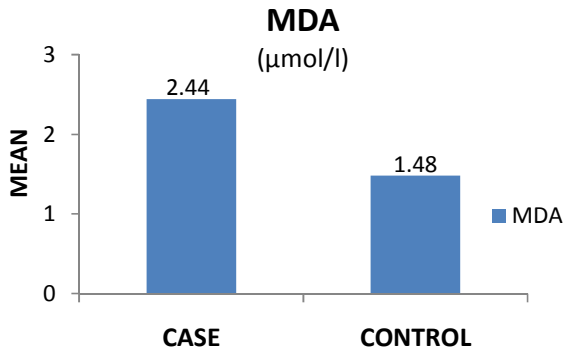

Table-2: Comparison of SOD levels between cases and controls

Study variable	Controls (N=100) Mean±SD	Cases (N=100) Mean±SD	p value
SOD (units/mg protein/min)	0.94±0.05	0.44±0.05	<0.0001

Fig-2: Graphical representation of SOD levels between cases and controls

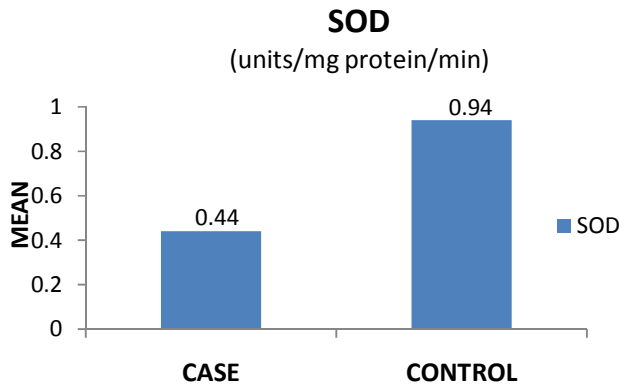

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Table-3: Pearson correlation coefficient among the study parameters in cases

		MDA	SOD
MDA	Pearson Correlation	1	-.302
	Sig. (2-tailed)		.074
	n	100	100
SOD	Pearson Correlation	-.302	1
	Sig. (2-tailed)	.074	
	n	100	100

Observations & results

A highly significant increase ($p<0.0001$) was found in the levels of Malondialdehyde (MDA) (table-1, figure-1) and a highly significant decrease ($p<0.0001$) was found in the levels of Superoxide dismutase (SOD) (table-2,figure-2) in Pregnant women as compared to Non-Pregnant women.

Discussion

It is well documented that MDA is a stable end product of free radicals induced by lipid peroxidation. Thus MDA serves as a reliable marker for the assessment of free radical induced damage to tissue. In this study the levels of serum MDA and SOD were evaluated. The values were compared between Pregnant and Non-Pregnant women.

The mean plasma level of MDA in cases was 2.44±0.79 and 1.48±0.78 in controls. The level of SOD was 0.44±0.05 in pregnant women and 0.94±0.05 in Non-Pregnant women; both the differences were highly statistically significant.

We observed an increase in MDA levels and decrease in SOD levels in pregnant women which corroborates with the results of similar studies. Similar findings were reported by Wisdom et al [12]

Ishihara et al., [13] studied, lipid peroxide levels in non-pregnant and normal pregnant and reported remarkable increased levels of lipoperoxides in pregnancy as compared to non-pregnant women. This finding is in agreement with the findings of Toescu et al.,(2002) [14], Upadhyaya et al.,(2005) [15] and Patil et al., (2007) [16] who reported Markers of **lipid peroxidation** (MDA) to be increased during the progression of normal pregnancy.Similar observation was made by Kodliwadmath et al.[17]

Although some reports[18], [19], [20] have shown that LPO increases during the course of pregnancy certain other reports have observed that LPO decreases as pregnancy progresses[21] Since the scope of present study was limited, further large scale studies are required to establish the above fact.

Conclusion

Increased oxidative stress during pregnancy can be deleterious to the health of the fetus and the mother both. Therefore, the above fact should be kept in mind during management of pregnancy

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