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Original Research Paper

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STATUS OF OXIDANT (MDA) ANTIOXIDANT (SOD) IN FIRST AND THIRD TRIMESTER OF NORMAL PREGNANCY IN TERTIARY CENTER OF CENTRAL INDIA

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ABSTRACT

INTRODUCTION: Pregnancy is associated with high metabolic demand and increased demand for tissue oxygen. Consequently increased production of reactive oxygen species. This leads in increased oxidative stress and decreases antioxidant status during gestational age of normal pregnant women.

Aim: Aim of this study was to evaluate the level of oxidant and antioxidant in 1st and 3rd trimester of normal pregnant women.

MATERIAL AND METHODS: The present study included total 150 cases attended ANC Clinic at the department of Gynae LNMC & J K Hospital was screened for the study. Level of MDA was estimated by Jean et al and SOD was Marklund and Marklund.

RESULTS: Findings were, that there was significantly increase in Malondialdehyde levels ($p<0.001$) and significantly decrease in superoxide dismutase activities ($P<0.001$) in 1st and 3rd trimester of normal pregnant women.

Conclusion: present study concludes that there was difference in oxidative status due to dynamic changes. During pregnancy oxidative stress is increased and antioxidant decreased that can be fatal to the health of the mother and the fetus. Therefore antioxidant supplements should be prescribed in early pregnancy to prevent the overwhelming of oxidative stress in pregnant females.

KEYWORDS : Oxidative stress, Antioxidants, Normal pregnancy, Malondialdehyde (MDA), superoxide dismutase (SOD), Reactive Oxygen Species (ROS).

INTRODUCTION

Oxidative Stress occurs due to the imbalance between the reactive oxygen species and antioxidant levels[1, 2]. Normal pregnancy is associated with high metabolic demand and increased demand for tissue oxygen. Consequently increased production of reactive oxygen species[3]. This leads in increased oxidative stress. Several organs during pregnancy show increased basal oxygen consumption and changes in substrate energy use, leading increased mitochondrial mass and production of reactive oxygen species (ROS)[4]. The placenta is another local source of free radicals. It produces nitric oxide (NO), and because it is rich in free radical producing macrophages, it promotes the development of oxidative stress[5,6]. Oxidative stress is a common feature of normal pregnancy, but continuous and overwhelming OS leads to consumption and decline of antioxidants, affecting placental antioxidant capacity with successive damage of placental tissue components[7], thus leading to an accelerated placental ageing[8]. Oxidative stress is toxic and damages lipids, proteins, and DNA[9-11]. Oxidation of lipids by using free radicals produces malondialdehyde. Thus MDA is regarded to be a good oxidative stress marker[10, 12]. Its level has been proven to Increase with gestational age[13].

Antioxidants are our first line of defense against free radical damage, and are critical for maintaining optimum health and wellbeing. An antioxidant can be defined as: "any substance that, when present in low concentrations compared to that of an oxidisable substrate, significantly delays or inhibits the oxidation of that substrate"[14]. Antioxidants play a crucial role in the development and growth of the fetus, maintenance of a healthy pregnancy and even before pregnancy, in fertility and conception[15]. Antioxidants are chemical compounds which possess monohydroxy/polyhydroxy phenol; they only slow down the lipid peroxidation reaction[16]. These compounds have low activation energy to provide hydrogen atom and therefore, cannot initiate the second free radicals. The free radical electrons are stable and thus, slow down the oxidation. Cells possess many antioxidant systems to prevent damage. Prevention of excessive ROS and repair of cellular damage are vital for cell's life[17]. Normally, ROS are neutralized by a wide spectrum of naturally occurring defensive antioxidants, such as Superoxide dismutase (SOD), so as to prevent oxidative stress[18]. Superoxide dismutase (SOD) is an antioxidant enzyme that maintenances and reduces of cells damage that caused by superoxide free radical, which is the most common in the body. SOD catalyzes the dismutation of superoxide radicals to hydrogen peroxide (H2O2) and molecular oxygen. Under pathological and physiological conditions, SOD acts as the first line from oxidative stress protection[19].

MATERIAL & METHOD

Study type, study setting and study duration

This was an observational prospective study conducted at Clinical Biochemistry LNMC in associated with the Department of Obs. & Gynae LNMC & J.K.Hospital Bhopal, the present study included total 150 cases attended ANC Clinic at the department of Gynae LNMC & J.K.Hospital from May 2019 onwards, were screened for the study.

Study Comprised Of Two Groups Of Patients.

Group - A. 150 normal pregnant women of 1st trimester of pregnancy.

Group - B. 150 same normal pregnant women of 3rd trimester of pregnancy.

Sample Collection And Processing:

Pregnant women were taken from 20-35 years of age group, 3-5 ml of blood sample was withdrawn from the anticubital vein, and the blood sample was collected in ethylenediaminetetraacetic acid vacutainers. The blood sample was centrifuged for 15 minute, at 3000 rpm at room temperature. The serum was stored at 4°C for biochemical investigations. Estimation of Plasma Malondialdehyde (MDA) was done by **Jean et al.** (1983)[20]. Estimation of Superoxide dismutase (SOD) was done by **Marklund and Marklund** (1974)[21].

Inclusion Criteria
Normal Pregnant women 1st and 3rd trimester of pregnancy.

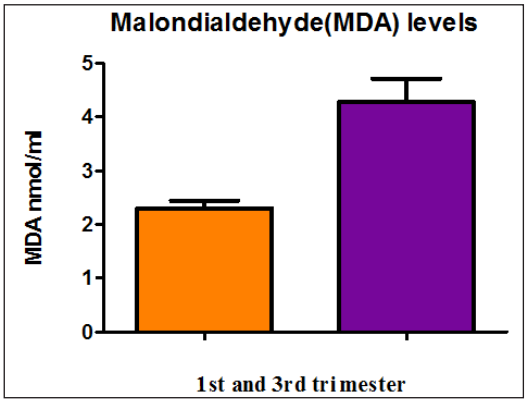
Exclusion Criteria
Pregnant women of 2nd trimester, thyroid disease and suffering from asthma / hypertension / diabetes mellitus and / any other systemic disease.

Trimester-specific Visits Were Planned As Follows:
- First trimester of pregnancy: 8–10 weeks
- Third trimester of pregnancy: 30–32 weeks.

Ethics
Study was approved by the Ethical committee of institutes. Informed consent was obtained from all patients

Statical Analysis
Statistical analysis was done by Graph Pad Prism version 5. Analysis was done by unpaired't' test $p<0.05$ was considered as statistically significant.

OBSERVATION AND RESULTS



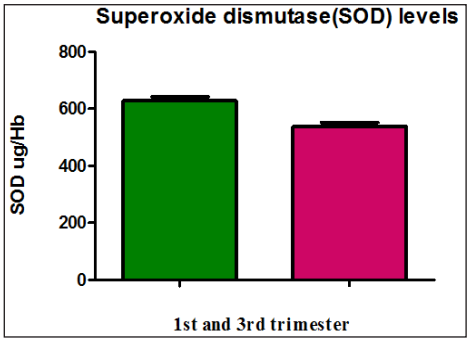
Graph 1:

Table 1: MDA Level In 1st & 3rd Trimester Of Normal Pregnant Women

Groups	Pregnant women -1st trimester Malondialdehyde (MDA nmol/ml) Mean ±SD	Pregnant women -3rd trimester Malondialdehyde (MDA nmol/ml) Mean ±SD	P value (<0.001)
MDA nmol/ml Level	2.306 ± 0.1436	4.287± 0.4308**	<0.001

In 1st trimester, plasma level of malondialdehyde (MDA) was 2.306 (nmol/ml) while in 3rd trimester serum level of malondialdehyde (MDA) was 4.287 (nmol /ml).
However, difference between 1st trimester serum level of malondialdehyde (MDA) and 3rd trimester serum level of malondialdehyde (MDA) was significant.

Although the plasma level of malondialdehyde (MDA) at 3rd trimester was significantly increased in third trimester as compared to 1st trimester



Graph 2:

Table 2: SOD Level In 1st & 3rd Trimester Of Normal Pregnant Women

Groups	Pregnant women -1st trimester Superoxide dismutase(SOD) Mean ±SD	Pregnant women -3rd trimester Superoxide dismutase(SOD) Mean ±SD	P value (<0.001)
SOD ug/Hb Level	628.2 ± 14.31	537.6 ± 14.55**	<0.001

In 1st trimester, superoxide dismutase level (SOD) was 628.2 (ug/Hb) while in 3rd trimester superoxide dismutase levels (SOD) was 537.6 (ug/Hb).

Although, difference between 1st trimester superoxide dismutase levels (SOD) and 3rd trimester superoxide dismutase levels (SOD) was significant.

However, superoxide dismutase a level (SOD) at 3rd trimester was significantly decreased as compared to 1st trimester superoxide dismutase levels (SOD).

DISCUSSION
Oxidative stress increase in normal pregnancy because of high metabolic need and increase demand of tissue oxygen. MDA serves as a reliable marker to assess damage to tissue induced free radical. MDA is a stable end product of free radicals which is produced by lipid peroxidation. The physiological state of pregnancy leads to an increase in the amount of lipid peroxidation products in the blood[22]. Reported a significant increase in thiobarbituric acid levels during normal pregnancy. Lipid peroxides are formed when lipids interact with oxygen free radicals. The human placenta produces lipid peroxides, which are mainly secreted on the maternal side of the placenta[23]. Marker of lipid peroxidation increased during normal pregnancy[24]. Malondialdehyde is a major breakdown product of lipid peroxidation[25].

SOD is the essential antioxidant enzyme having an antitoxic effect against super oxide anion. SOD essential part of the defense system. It protects and revitalizes cells and brings down the rate of cell destruction. It is one of the most important antioxidant enzyme, it can be neutralize some of the most dangerous free radicals, superoxide radicals to prevent their excessive accumulation, and may help to contribute to the continuation of pregnancy [26, 27, 28]. It scavenges the superoxide radical through catalyzing its dismutation into H_2O_2 and O_2[29].

In the Present study the levels of serum MDA and SOD were assess. The values were compared between first and third trimesters of normal pregnant women. In our study observed that the level of malondialdehyde (MDA) significantly increased in 1st and 3rd trimester (Table 1), and the level of SOD significantly decreased in 1st and 3rd trimester (Table 2). All the differences were statistically significant. Plasma level of malondialdehyde (MDA) was found to be higher in progressing gestational age. This is an agreement with previous study by **Ishihara et al 1978[30], Wisdom et al 1991[31], Patil et al 2006[32], Lekharu et al 2014[33] and Oghahbon SE et al 2016[34]** However **Basu et al 2015[35] and YÜKSEL et al 2015[36]** observed that value of MDA activity significantly decreased over the course of pregnancy, this statement was contradictory to our results.

According to my study the erythrocyte antioxidant enzyme superoxide dismutase (SOD) activities significantly decreased in 1st and 3rd trimester of normal pregnant women (Table 2) . This shows similar findings with earlier study by **Wisdom et al 1991[31], Patil et al 2006[32], Lekharu et al 2014[33], YÜKSEL et al 2015[36], and Salman Khan et al 2019[37]** Contradictory results were found **Oghahbon SE et al 2016 [34] and Bassi R et al 2017[38].**

CONCLUSION
This study showed an altered oxidant (MDA) and antioxidant

(SOD) level 1st and 3rd trimester of normal pregnant women. During normal pregnancy oxidative stress is increased and antioxidant decreased 1st and 3rd trimester, that can be fatal to the mother and the fetus. Therefore, the above facts should be kept in mind while managing pregnancy.

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