Available online at www.journalijmrr.com

INTERNATIONAL JOURNAL OF MODERN RESEARCH AND REVIEWS

Int. J. Modn. Res. Revs.
Volume 4, Issue 10, pp 1341-1344,October, 2016

ISSN: 2347-8314

ORIGINAL ARTICLE

SERUM LIPID PEROXIDATION AND ANTIOXIDANT STATUS IN WOMAN WITH PREGNANCY INDUCED HYPERTENSION.

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Article History: *Received 15th October ,2016, Accepted 30th October ,2016, Published 31st October ,2016*

ABSTRACT

AIM: Pregnancy-induced hypertension (PIH) is a common medical complication of pregnancy with a high incidence. Oxidative stress is one of the important factor in the etiopathogenisis of PIH. So this study is designed to evaluate the serum lipid peroxidation and antioxidant status in women with pregnancy induced hypertension and healthy pregnant women in third trimester. **METHODS:** This is a Case control study comprised of 50 healthy pregnant women and 50 PIH cases in their third trimester of pregnancy. Serum Malondialdehyde level (MDA), and ferric reducing ability of plasma (FRAP) were estimated in all these cases in their third trimester of pregnancy. **RESULTS:** There was a significantly higher Serum Malondialdehyde levels (MDA) and lower FRAP levels in PIH (P=<0.001), as compared to healthy pregnant women. **CONCLUSION:** Elevated serum malondialdehyde (MDA) and lowered ferric reducing ability of plasma (FRAP) status in women with pregnancy induced hypertension in third trimester. It indicates that there is elevated oxidative stress in PIH patients which may contribute to the complications of PIH, but further studies are required to assess the influence of the oxidative stress on the outcome of the PIH. Early detection of these parameters are going to aid in better management of PIH cases.

Keywords: pregnancy-induced hypertension (PIH), FRAP (ferric reducing ability of plasma), malondialdehyde (MDA), oxidative stress.

1.INTRODUCTION

Hypertensive disorders are common medical complications of pregnancy with a reported incidence of about 10% of first pregnancies and 20–25% of women with chronic hypertension(Kamath,2006).Oxidative stress occurs when the production of ROS overwhelms the antioxidant capacity resulting in overall damage to cells and has been implicated in the pathology of many hypertensive pregnancy-related conditions including pre-eclampsia (PE) and gestational hypertension (GH)(Burton. and Jauniaux,2011). Placentation occurs at low oxygen tensions up to 10 weeks of gestation(Burton. and Jauniaux,2011; Rodesch et al., 1992), a hypoxic environment being essential for trophoblast proliferation and invasion of the maternal spiral arteries for the restructuring of these blood vessels. The successful completion of spiral artery remodeling at around 10–12 weeks' gestation, results in unplugging of these vessels, which have been transformed into flaccid conduits with no resistance, enabling uteroplacental blood to flow unimpeded(Pijnenborg et al., 1991). This restoration of blood flow results in a rapid rise in the tissue oxygen tension which triggers the production of human chorionic gonadotrophin (HCG) and enzymes such as P-450 cytochrome aromatase, involved in the synthesis of oestrogens(Burton and Jauniaux,2011), this gives rise to acceleration of placental tissue growth. The rapid increase in oxygenation will also stimulate production of ROS and concomitant increases in the production and activity of antioxidant enzymes(Burton and Jauniaux,2011).

However, in pathological conditions such as PIH, one of the underlying mechanisms of this condition is the shallow invasion of trophoblasts during these early stages of placentation. Incomplete remodeling of the spiral arteries leads to intermittent, more pulsatile, blood flow giving rise to ischaemia/reperfusion–type injury(Hung and Burton,2006) with subsequent increases in ROS. Antioxidant capacity(Madazli et al., 2002; Mistry and Williams,2011) is

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lower than in normal pregnancy, further augmenting the ROS concentration with the subsequent rise in oxidative stress so characteristic of PIH and other hypertensive-pregnancy disorders.

So this study has been designed to analyse MDA, a lipid peroxidation product as a measure of oxidative stress and FRAP assay as a measure of antioxidant status in PIH and healthy pregnant women.

2.MATERIALS AND METHODS

The present case control study was conducted in the Department of Obstetrics and Gynaecology and Department of Biochemistry, Rajah Muthiah Medical College and Hospital, Annamalai University, Chidambaram. Institutional Human Ethical Committee approval was obtained for the study and Informed consent was taken from all participants of the study. The study comprised of 50 normal healthy pregnant women and 50 PIH cases attending antenatal OPD or labour room in their third trimester of pregnancy.

Patients with gestational diabetes mellitus, chronic hypertension, cardiac diseases, renal diseases, liver diseases, hormonal diseases (patient with thyroid diseases) and multiple pregnancy were excluded from the study.

Detailed history was taken, general and physical examination done and routine examination was done for all cases.

Fasting blood sample (5ml) was collected from antecubital vein by venepuncture and the following parameters were estimated in both cases and controls. The lipid peroxidation was estimated by method of Mahfouz et al, (1986) method.

The total antioxidant capacity was estimated by method of Benzie & Srain method (1996) Principle.

Statistical analysis of the data was done by student's T test and expressed in terms of 'P' value.

3.RESULTS

The lipid peroxidation product, MDA was significantly higher, ie 1.90±0.78 nmol/ml in PIH cases as compared to 1.69±1.03 nmol/ml in healthy pregnant women. (P=<0.001).

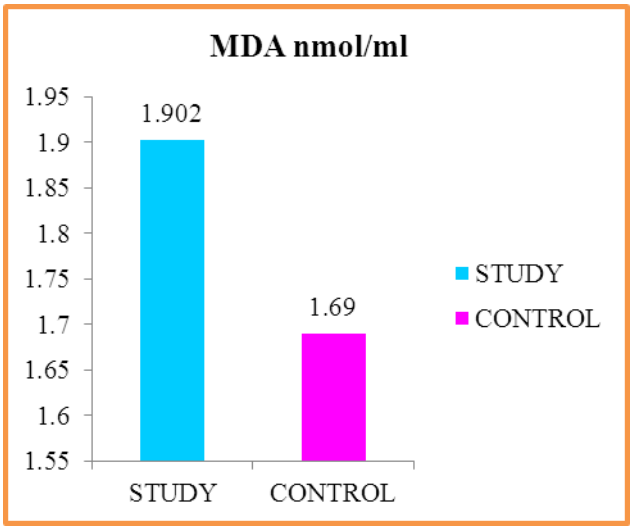
The antioxidant product, FRAP was significantly lower, ie 194.84±66.88 µmol/l in PIH cases as compared to 215.08±69.59 µmol/l in healthy pregnant women. (P=<0.001). The levels were 11% lower in PIH women, when compared to healthy pregnant women.

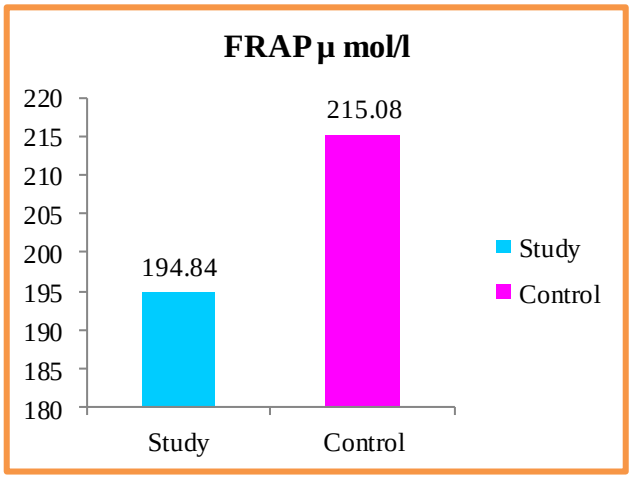
TABLE-1: BASELINE CHARACTERISTICS OF STUDY AND CONTROL GROUP

PARAMETER	CONTROL GROUP (n=50) Mean±SD	STUDY GROUP PIH (n=50) Mean±SD	P value
Maternal age (years)	24.72±3.75	25.58±3.53	not significant
Gestational age (weeks)	36.18	36.62	not significant
Systolic BP (mm Hg)	114.80±7.88	141.40±4.04	<0.001 significant
Diastolic BP (mm Hg)	74.40±5.40	90.80±3.95	<0.001 significant
BMI(kg/m^2)	24.01±1.57	26.36±1.50	<0.001 significant
HB(gms%)	10.14±0.81	9.97±0.61	not significant
RBS(mg/dl)	83.76±23.5	89.26±26.6	not significant
Sr total bilirubin (mg/dl)	0.756±0.06	0.786±0.06	0.02 significant
Sr direct bilirubin (mg/dl)	0.16±0.049	0.186±0.04	0.004 significant
AST (IU/l)	26.66±8.47	30.64±11.01	0.04 significant
ALT (IU/l)	26.78±12.28	26.76±8.8	0.99
ALP (IU/l)	117.52±4.02	133.9±64.91	0.07
Sr uric acid (mg/dl)	4.138±0.68	5.057±1.01	<0.001 significant

TABLE-2: LIPID PEROXIDATION AND ANTI OXIDANT LEVELS IN STUDY AND CONTROL GROUP.

GROUP	CONTROL GROUP (n=50) Mean±SD	STUDY GROUP PIH (n=50) Mean±SD	P value
MDA (nmol/ml)	1.69±1.03	1.90±0.78	<0.001 significant
FRAP (µmol/l)	215.08±69.59	194.84±66.88	<0.001 significant





4.DISCUSSION

Pregnancy **per se** leads to an increased oxidative burden as high maternal and fetal oxygen demand increases oxygen metabolism(Roes et al., 2006; Morris et al., 1998). Longitudinal studies of oxidative stress and antioxidant status in pregnancy(Hung and Burton,2006; Little and Gladen,1999), indicate that lipid peroxides rise in pregnancy with highest levels of peroxidation markers being in the 2nd trimester and either being maintained or declining slightly in the 3rd trimester.

Earlier than 30 weeks of gestational age, even in normal healthy pregnant women , Antioxidant status as measured by FRAP, has been shown to be lower than non-pregnant women and increased toward the end of the 3rd trimester and staying high until 6–8 weeks postpartum[5]. But in some studies the contribution of dietary antioxidants to this overall increase cannot be ruled out. Specific endogenous antioxidants, such as ascorbic acid, vitamin E and zinc, in all three trimesters of normal pregnancies were shown to be inversely related to gestational age, decreasing gradually as pregnancy proceeds toward term(Patilvvvvvvv et al., 2007; Anetor et al., 2010). Smoking in mothers has a deleterious effect on both maternal and fetal oxidative and antioxidant status, increasing free radical damage and decreasing antioxidant potential(Broughton Pipkin,2008), but none of our cases in our study had the habit of smoking.

In our study, lipid peroxidation as shown by MDA levels was significantly higher in PIH cases when compared to normal cases. MDA was 1.90±0.78 nmol/ml in the PIH cases as compared to .69±1.03 nmol/ml the healthy pregnant women. The Anti oxidant status as shown by FRAP assay was significantly lower in PIH cases (194.84±66.88) mol/l as compared to normal cases (215.08±69.59 µmol/l.)

In our study, uric acid showed significantly higher levels in PIH cases($p<0.001$) where as lipid peroxidation showed significantly higher levels in PIH cases and the Total anti oxidant status shown by FRAP assay showed significantly lower levels in PIH cases. This could be due to enhanced oxidative stress found in PIH women. This could be one of the factor in etiopathogenisis of PIH, Further studies are required to correlate oxidative stress ,antioxidant status with perinatal outcome.

5.CONCLUSION

Elevated serum malondialdehyde (MDA) and lowered ferric reducing ability of plasma (FRAP) status in pregnancy induced hypertensive women in third trimester. It indicates that there is elevated oxidative stress in PIH patients which may contribute to the complications of PIH, but further studies are required to assess the influence of the oxidative stress on the outcome of the PIH. Early detection of these parameters are going to aid in better management of PIH cases.

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