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EVALUATION OF OXIDANT, ANTIOXIDANT STATUS, SERUM LIPID AND THYROID PROFILE IN NON-PREGNANT, PREGNANT AND PRE-ECLAMPTIC WOMEN.

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ABSTRACT

Background: Pre-eclampsia can be defined as, increased blood pressure with proteinuria, edema or both. Normally pregnancy is associated with oxidative stress and this is increased during pre-eclampsia. **Aim:** The aim of our study was to evaluate oxidative stress, serum lipid and thyroid profile in healthy non pregnant, pregnant and pre-eclamptic women. **Method:** Our study included 75 subjects out of which 25 were non pregnant, 25 were pregnant and 25 were pre-eclamptic women. All pregnant women were at ≥30 weeks of gestation. The lipid parameters were estimated by enzymatic method, MDA level was estimated by thiobarbituric acid (TBA) method, Thyroid profile (T3, T4 and TSH) were measured using CLIA system and vitamin E was estimated by the method of Baker et al. **Result:** The mean serum T_3 and T_4 in normally pregnant woman were significantly higher when compared with non-pregnant women. In women with preeclampsia, the mean serum T_3 and T_4 were significantly higher when compared with non-pregnant women. The mean serum T_3 level decreased significantly in preeclamptic women when compared to normally pregnant while mean T_4 level increased non-significantly in pre-eclamptic women when compared with healthy pregnant women. The mean TSH level increased significantly in pre-eclampsia when compared either with healthy non-pregnant or with normal pregnant women. The mean serum Total Cholesterol, Triglyceride, LDL-c, VLDL-c and MDA levels increased significantly in pre-eclampsia when compared either by non-pregnant or normal pregnant women while the levels of Vit-E and HDL-c decreased significantly in pre-eclampsia when compared with normal pregnant women.

KEYWORDS: Pre-eclampsia, Oxidative Stress, Lipid profile, Thyroid function, Vitamin E.

INTRODUCTION

Preeclampsia is a hypertensive disorder unique to pregnancy. It is one of the most leading cause for maternal and fetal mortality and it occurs in approximately 0.4% - 2.8% of all pregnancies in developed countries and many more in developing countries, leading to as many as 83,70,000 cases worldwide per year. Preeclampsia occurs during second and third trimester of pregnancy and it is more common in nulliparous women. It is characterized by 1) BP 140/90 mm Hg or greater at least on two occasions, six or more hours apart 2) Proteinuria 300 mg/24 hours or greater.[1] The whole thyroxine (T_4) hormone is originated from thyroid secretion, But 80% of triiodothyronine (T_3) hormone is produced from peripheral deiodination of T_4 in the liver, kidney and muscles.[2]

It has been observed that ROS are increased, and the levels of several detoxifying enzymes are reduced in pre-eclampsia. In preeclamptic women, it was found that MDA levels correlate with the severity of the disease and are a good indicator of lipid peroxidation and oxidative stress levels. Antioxidant vitamin has been studied in normal and preeclamptic pregnancies. In normal pregnancy, by 10 to 12 weeks of gestation, the onset of maternal blood flow in the placenta results in a local increase in oxygen tension and parallel elevation in the expression and activity of the antioxidant enzyme.[3]

The most affected organs in preeclampsia are liver, kidney and brain. Due to autointoxication, functional disorders in these organs are evident. As liver, kidney and muscles are the main organs of peripheral deiodination of T_4 to T_3, the serum concentration of T_4 and T_3 may different in preeclampsia than in normal pregnancy.[4]

Preeclampsia may be associated with complications like visual disturbances, oliguria, eclampsia, hemolysis, elevated liver enzymes, thrombocytopenia, pulmonary oedema and fetal growth restriction.[5]

MATERIALS AND METHODS

The prospective study was carried out in Department of Biochemistry and Department of Obstetrics and Gynecology, in Muzaffarnagar Medical College and Santosh Medical College, Ghaziabad with a study period from May 2009 to August 2010. This study was approved by Institutional Ethical Committee and informed consent was taken from all subjects. This study was conducted on 25 healthy non pregnant, 25 healthy pregnant and 25 pre-eclamptic women attending antenatal OPD in the third trimester of pregnancy.

Exclusion Criteria

Patients of Diabetes, asthma, chronic obstructive pulmonary disease (COPD), malignancies, patients with STDs, cardiac disease, renal diseases, hepatic diseases, myocardial infarction, gout and arthritis were excluded from the study.

Collection of Sample

Blood from overnight fasting subjects was collected into tubes without anticoagulant in order to obtain serum. Blood was obtained by venous arm puncture and serum was separated by centrifugation at 3000 rpm for 15 min. Separated serum was used for biochemical analysis.

Biochemical Analysis

MDA level was measured by thiobarbituric Acid (TBA) method described by Kei Satoh (1978).[6] Thyroid profile (T_3, T_4 and TSH) was measured using CLIA (Chemiluminescence ImmunoAssay) system. Serum vitamin E was estimated by the method of Baker et al(1968).[7]

Total cholesterol, HDL and triglycerides were estimated by enzymatic method. (Siemens, Gujarat, India). Low Density lipoprotein (LDL) and (Very Low Density lipoprotein) VLDL were calculated by Friedwald's Equation.

Statistical analysis

Results were statistically analyzed by 'GraphPad QuickCals t-test calculator'. Student's t-test was used to assess the significance of difference between the groups. All results are presented as mean ± S.D. A '*p*' value of less than 0.05 was considered significant.

RESULT

Table – 1 shows the demographic characteristics of the study group. All the studied groups had a similar mean age and mean gestational age. Mean systolic and diastolic blood pressure was significantly increased in pre-eclamptic women when compared with normal pregnant and non-pregnant women.

Table – 2 shows the serum lipid parameters, MDA and antioxidant vitamin (Vit-E) levels in non-pregnant, pregnant and pre-eclamptic women. The levels of total cholesterol, triglyceride, VLDL-C, LDL-C, and MDA were increased significantly in pregnant as well as in pre-eclamptic women when compared to non-pregnant healthy women. The mean serum HDL-C and vitamin E levels were decreased significantly in normotensive pregnant as well as in pre-eclamptic women when compared to non-pregnant healthy women.

Table – 3 shows thyroid status (T_3, T_4, and TSH) of non-pregnant, normotensive pregnant and pre-eclamptic women. The mean serum T_3 and T_4 and TSH levels were significantly increased in normotensive pregnant as well as in pre-eclamptic women when compared to non-pregnant healthy women.

Table 1. Shows the demographic characteristics of study population in non-pregnant, pregnant and preeclepsia subjects.

Parameters	Non-pregnant	Healthy pregnant	Pre-eclampsia
Total no. of Subject	25	25	25
Age (mean ±SD, Years)	29.20±4.64	27.60±4.83*	32.32±4.63#
SBP(mm of Hg)	116.80±6.90	118.48±6.49**	146.24±6.13#
DBP (mm of Hg)	73.76±6.99	77.56±2.20***	95.92±2.14#
Gestation period(average in wks)		35	34

Preeclamptic women compared with non-pregnant women ($p < 0.001$)
*Normal pregnant women compared with non-pregnant women(Non-significant p=0.2)
**Normal pregnant women compared with non-pregnant women (Non-significant p=0.3)
*** Normal pregnant women compared with non-pregnant women (significant p=0.01)

Table-2:- Showing mean and standard deviations of lipid parameters, Vitamin E and MDA of non-pregnant, healthy pregnant and pre-eclamptic women.

Parameters	Non-pregnant	Healthy pregnant	Pre-eclampsia
T. Cholesterol(mg/dl)	175.88±10.01	202.16±13.70***	235.72±16.12#
Triglyceride(mg/dl)	108.80±13.48	118.60±12.38*	217.40±12.34#
HDL(mg/dl)	53.28±3.95	50.76±4.29**	37.48±2.62#
LDL(mg/dl)	100.84±14.20	127.68±13.98***	154.76±15.97#
VLDL(mg/dl)	21.76±2.70	23.70±2.48*	43.48±2.47#
Vit-E(mg/dl)	1.49±0.20	0.82±0.17***	0.43±0.05#
MDA(nmol/ml)	2.24±0.83	3.32±1.03***	9.28±1.75#

Normal pregnant women compared with non-pregnant women ($p < 0.01$)
**Normal pregnant women compared with non-pregnant women (*$p < 0.05$)
***Normal pregnant women compared with non-pregnant women (*$p < 0.001$)
Preeclampsia women compared with Non-pregnant women (#$p < 0.001$)

Table No-3:- Thyroid Profile of of non-pregnant, healthy pregnant and pre- eclamptic women

Parameters	Non-pregnant	Healthy pregnant	Pre-eclampsia
T_3(ng/ml)	1.60±0.38	3.10±0.56*	2.71±0.54#
T_4(µg/dl)	7.99±1.15	11.70±1.34*	11.88±1.17#
TSH(µIU/ml)	2.50±0.35	3.98±0.54*	5.09±0.48#

Normal pregnant women compared with non-pregnant women ($p < 0.001$)
#Preeclampsia women compared with Non-pregnant women (#$p < 0.001$)

DISCUSSION

Pre-eclampsia is characteristically associated with hypertriglyceridemia. The main modulator of hypertriglyceridemia is oestrogen. Oestrogen induces hepatic production of triglycerides that causes hypertension and endothelial dysfunction through the generation of LDL and VLDL. Endothelial dysfunction is the most important event in the pathogenesis of hypertension during pregnancy and abnormal levels of lipid parameters play their critical role in the induction of endothelial dysfunction.[8]

In the present study, we evaluated the thyroid profile, lipid profile, MDA and vitamin E level. A significantly increase in the levels of total cholesterol, TG, VLDL-c, LDL-c was found while the levels of HDL-c in pre-eclamptic women were significantly decreased when compared to non-pregnant healthy women.[8,9,10]

Pre-eclampsia is the most important disease and a specific syndrome of pregnancy. Pre-eclampsia is associated with hyperlipidemia which may lead to its pathogensis as there is consistent positive association seen between hyperlipidemia and pre-eclampsia. The increased free radicals and lipid peroxide causes peroxidation of lipids to produce MDA as its end product. LDL gets oxidized by MDA to form oxidized LDL that is even more toxic.[11]

We found significantly elevated level of MDA in pre-eclamptic women as compared to non-pregnant as well as normotensive pregnant women while the levels of antioxidant vitamin E were significantly reduced.[12,13]

The levels of thyroid hormones were found to be significantly increased (T_3, T_4 & TSH) in pre-eclamptic women as compared to non-pregnant women in accordance with results obtained by Satyanarayan et. Al,[14] Larijani et. Al,[15] Palanisamy et. Al,[16] and Kaveti et. Al.[17] The increase in serum binding forms of thyroid hormones may be due to increase in the circulatory levels of thyroid binding globulin. During pregnancy, increased estrogen levels cause increased production of thyroid binding globulin by the liver. High estrogens on the other hand, due to oligosaccharide modification, reduces peripheral degradation of thyroid binding globulin. As a result the content of thyroid binding globulin in the serum is increased. As the binding capacity of plasma is increased the total plasma concentration of thyroid hormone is increased.[4]

CONCLUSION

Normally human pregnancy results in physiological hyperlipidemia involving increase in triglycerides and cholesterol. Women with preeclampsia display additional alteration in lipids reflecting a disordered lipid and lipoprotein metabolism. Thus, considering the results in this study correlating with the various other studies, it can be concluded that dyslipidemia and thyroid disorder is significantly evident in preeclampsia which may play an important pathological role. Future studies with adequate sample size are required to evaluate causative factors for altered lipid profile, thyroid profile oxidant and antioxidant status in preeclampsia, also the thyroid hormonal assay can be considered as a screening test for early diagnosis and treatment of pre-eclampsia to prevent further complications.

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Conflict of interest
None

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