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Original Research Article

A Comparative Study of Serum Fasting Lipid Profile in Hypertensive and Normotensive Women in 3rd Trimester of Pregnancy

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ABSTRACT

Introduction: In India, the estimated maternal mortality is around 254/1, 00,000 of pregnancies during the period of 2004-2006 as published in the special bulletin of MMR in India 2004-2006. Eclampsia is an acute disorder of pregnancy, labour and puerperium, characterized by Preeclampsia with convulsion followed by loss of consciousness with or without oedema. The incidence and prevalence of hypertensive disorders in pregnancy is about 7-10%. In some of studies it was found that Serum lipid profile is raised during the gestational hypertension.
Aim: So this study was undertaken to assess serum Fasting Lipid profile level and also to correlate any difference found in hypertensive and normotensive women in their 3rd trimester of pregnancy.
Methods: The present study comprised of 100 cases of normotensive pregnant women and 100 cases of clinically established Hypertensive Pregnant women in their 3rd trimester. Serum fasting lipid profile was estimated in Semi-auto analyzer from the study sample. Statistical analysis of the data was performed by using Microsoft Excel software.
Results: The serum fasting lipid profile was found to be significantly lower ($p<0.01$) in hypertensive study participants than in the normotensives participant.
Conclusion: Fasting lipid profile can very well be used as biochemical markers of the new onset hypertensive pregnant women and also can be used in better management of established cases of eclampsia or preeclampsia patients.

Key words: Pre-eclampsia, Eclampsia, Cholesterol, Triglyceride, HDL, LDL, VLDL.

INTRODUCTION

Hypertensive disorders during pregnancy are one of the main causes of maternal death worldwide. Hypertensive disorders complicating pregnancy are common and form one of the deadly triad, along with haemorrhage and infection that contribute greatly to maternal morbidity and mortality. Hypertensive disorder during the period of pregnancy is a major cause of maternal death in India and also the rest of the world. In India, the estimated maternal mortality is around 254/1, 00,000 of pregnancies during the period of 2004-2006 as published in the special bulletin of MMR in India 2004-2006. Eclampsia is an acute disorder of pregnancy, labour and puerperium, characterized by Preeclampsia with convulsion followed by loss of consciousness with or without oedema. The incidence and prevalence of hypertensive disorders in pregnancy is about 7-10%. [1]

In some of studies it was found that total cholesterol was raised during the gestational hypertension. Kaaja *et al.*, (1995) postulated that lipid abnormalities

play a role in the pathogenesis of gestational hypertension, causing altered endothelial function and vascular damage. [2]

Hyperinsulinemia and dyslipidemia are known to be associated with essential hypertension but their role in PIH remains unclear. Sillman *et al., (1994)* in his study concluded that insulin resistance may contribute to pathogenesis of PIH. Insulin has an important role in lipid metabolism. High concentration of free fatty acids in PIH is due to their increased mobilization from adipose tissues. [3]

The Free Fatty Acids and Triglyceride levels begin to rise 15-20 weeks of gestation before clinical parameters of preeclampsia are seen. The dramatic increase in Triglyceride results in an increase in VLDL, small changes in LDL and decreased HDL. Elevation of Free Fatty Acids and Triglyceride deposition in endothelial cells may point out oxidative stress induced by cytokines. Serum Triglyceride, Low Density Lipoprotein Cholesterol (LDL-C) was found to be significantly higher in PIH case than normal controls. [4]

In the 3rd trimester of pregnancy plasma Triglyceride concentration are increased 23 times with lesser increases being seen in total cholesterol and in phospholipids and nonesterified free fatty acid. These increases result from a change in the major plasma lipoprotein classes of LDL and HDL. LDL concentration rises steadily but levels off during the last 10 weeks of pregnancy whereas HDL concentration also increases with gestation but levels off half way through gestation. The triglyceride and VLDL levels were positively and significantly correlated with the severity of proteinuria. Preeclampsia leads to a further increase in lipid levels. TAG level in the LDL fraction was found to be higher in PIH patients than in controls. [5]

MATERIALS AND METHODS

The present study comprised of 100 cases of normotensive pregnant women and 100 cases of clinically established Hypertensive Pregnant women in their 3rd trimester. The clinically established hypertensive 100 cases of pregnant women who were admitted in the antenatal ward in the Department of Obstetrics & Gynaecology, at Assam Medical College & Hospital, Dibrugarh were taken as study case group. The 100 cases of age matched normotensive pregnant women in their 3rd trimester were taken as control group.

So this study was undertaken to assess serum Fasting Lipid profile level and also to correlate any difference found in hypertensive and normotensive women in their 3rd trimester of pregnancy.

Inclusion criteria

- Pregnant women in 3rd trimester (> 24 weeks of gestation) suffering from hypertension were taken as 'Hypertensive Study Group'.
- The cases for study were composed of already diagnosed cases of hypertension on the basis of following criterion: Blood pressure > 140/90 mm of Hg on at least two occasions 6 or more hours apart after 24 weeks of gestation.
- Only those cases were included from whom informed consent could be taken.

Exclusion criteria

- Patients with history of hypertension, renal disease, collagen vascular disease, diabetes mellitus, severe anaemia, hydatidiform mole, multiple pregnancies were excluded from the study.

The venipuncture was done in the cubital fossa. About 2 ml of blood was transferred to sterile empty vials and samples were centrifuged at 5,000 rpm for 10 minutes as soon as after formation of the clot. The supernatant clear serum was then pipetted out using dry piston pipettes with disposable tips. The samples were analysed on the same day. Serum Fasting Lipid profile were estimated in Semi-auto analyzer from the study sample.

Serum Triglyceride estimation (GPO/PAP method): [6]

Principle: Triglycerides are hydrolysed by lipase to glycerol and free fatty acids. Glycerol is phosphorylated by ATP in the

presence of glycerol kinase to glycerol 3-phosphate, which is oxidized by the enzyme glycerol 3-phosphate oxidase (GPO) producing hydrogen peroxide. Hydrogen peroxide so formed reacts with phenolic compound and 4-aminoantipyrine to give a red coloured quinoneimine complex which is proportional to the amount of Triglyceride present in the sample.

Serum Cholesterol estimation: (CHOD/PAP method): [7]

Principle: Cholesterol esterase (CHE) hydrolyses cholesterol ester to free cholesterol. Free cholesterol is oxidized to hydrogen peroxide. Hydrogen peroxide formed reacts with 4amino antipyrine and phenol in the presence of Peroxidase (POD) to produce red coloured quinoneimine dye complex. Intensity of the colour formed is directly proportional to the amount of cholesterol present in the sample.

HDL cholesterol estimation (PEG/ CHOD/PAP method): [8]

Principle: When the serum is reacted with the Polyethylene Glycol contained in the precipitating reagent, all the VLDL and LDL are precipitated. The HDL remains in the supernatant and is then assayed as a sample for cholesterol using the Cholesterol (CHOD/PAP) reagent.

LDL Cholesterol estimation:

LDL Cholesterol is calculated by using Friedwald's formula.

LDL Cholesterol in mg/dl = Total cholesterol/5 - (HDL-Cholesterol)

Estimation of VLDL:

VLDL is the primary triglyceride carrying form in the fasting state; its concentration can be approximated by dividing the amount of plasma triglyceride by 5.

RESULT AND OBSERVATIONS

The present study is a randomised case control study. Results were analysed by using unpaired student's t-test.

In the 100 hypertensive cases which were studied, the maximum number of 49 cases (49%) belonged to the 21-25 years age group. The next highest number of cases 24 (24%) were from the age group ≤ 20 years. we get the highest number of 73 cases were less than 25 years age. It was also observed that 67 (67%) cases were primigravidas and 33 (33%) cases were multigravidas in the hypertensive study group.

Table 1: Comparison of mean Serum Lipid profile in hypertensive and normotensive study participants

Parameters	Hypertensive (mg/dl)		Normotensive (mg/dl)		p-value
	Mean	S.D	Mean	S.D	
Total Cholesterol	194.3	44.20	137.9	41.0	<0.01
Triglyceride	204.0	49.98	152.7	40.33	<0.01
HDL Cholesterol	44.7	8.00	38.0	7.35	<0.01
LDL Cholesterol	108.0	33.37	69.1	31.82	<0.01
VLDL Cholesterol	41.1	10.02	30.5	8.11	<0.01

The mean serum levels of Total Cholesterol in hypertensive were 194.3 ± 44.20 mg/dl and in normotensive were 137.9 ± 41.0 mg/dl. Student t-test revealed significant differences (p <0.01) in Total Cholesterol values in between hypertensive and normotensive groups.

The mean serum levels of Triglyceride in hypertensive are 204.0 ± 49.98 mg/dl and in normotensive were 152.7 ± 40.33 mg/dl. Student t-test revealed significant differences (p <0.01) in Triglyceride values in between hypertensive and normotensive groups.

The mean serum levels of HDL Cholesterol in hypertensive were 44.7 ± 8.0 mg/dl and in normotensive were 38.0 ± 7.35 mg/dl. T-test revealed significant differences (p <0.01) in HDL Cholesterol values in between hypertensive and normotensive groups.

The mean serum levels of LDL Cholesterol in hypertensive were 108.0 ± 33.37 mg/dl and in normotensive were 69.1 ± 31.82 mg/dl. T-test revealed significant differences (p <0.01) in LDL Cholesterol values in between hypertensive and normotensive groups.

The mean serum levels of VLDL Cholesterol in hypertensive were 41.1 ± 10.02 mg/dl and in normotensive were 30.5 ± 8.11 mg/dl. T-test revealed significant differences (p <0.01) in VLDL Cholesterol values in between hypertensive and normotensive groups.

DISCUSSION

In the 100 hypertensive cases which were studied, the maximum number of 49 cases (49%) belonged to the 21-25 years age group. The next highest number of cases 24 (24%) were from the age group ≤ 20 years. we get the highest number of 73 cases were less than 25 years age . A study done in Saudi Arabia showed that women at extremes of maternal age, the nulliparous women, and high-parity women are at an increased risk of developing pre-eclampsia. [9] According to another study maximum incidence of developing pre-eclampsia was in the age group of 15-25 years. [10]

In the present study there were 67 (67%) cases were primigravidas and 33 (33%) cases were multigravidas in the hypertensive study group. Eclampsia is a very common pregnancy associated disorder in our country mostly affecting primigravida of early age group with poor socioeconomic background. [11] According to another study they found that Pre-eclampsia is mainly affects in first pregnancy. [12]

The analysis of total cholesterol in the study participants, show that serum total cholesterol was found to be significantly higher (p<0.01) in hypertensive study participants (194.3±44.20 mg/dl) than in the normotensives (137.9±41.0 mg/dl). M. T. M. Anceschi *et al.*, (2005) also found that serum cholesterol levels were higher in normotensive and gradually increased more in preeclampsia. [13] Total Cholesterol levels did not increase during normal mid trimester pregnancy, but cholesterol levels were significantly higher in cases with severe hypertension. [14]

Serum Triacylglycerol in our study was found to be (204.0±49.98 mg/dl) in the hypertensive study participants and (152.7±40.33 mg/dl) in the normotensives, which statistically shows a significant difference (p<0.01). This finding is consistent with study such as Jayanta D.*et al., (*2006), (p<0.001). They found higher Triglyceride levels in hypertensive patients than normotensive controls. [15]

The VLDL Cholesterol was calculated from Triglyceride level and similarly, the VLDL Cholesterol showed a significant difference (p<0.01) between hypertensive cases (41.1±10.02 mg/dl) and normotensive cases (30.5±8.11 mg/dl).

The analysis of HDL cholesterol in the study participants, show that serum HDL Cholesterol was found to be higher (p<0.01) in hypertensive study participants (44.7±8.0 mg/dl) than in the normotensives (38.0±7.35 mg/dl). Milan S. *et al.,* (2009) {(1.48±.24 mmol/l) vs (1.38±.20 mmol/l)}, found similar results. [16]

The analysis of LDL cholesterol in the study participants, show that serum LDL Cholesterol was found to be significantly higher (p<0.01) in hypertensive study participants (108.0±33.37 mg/dl) than in the normotensives (69.1±31.82 mg/dl). Shalini M. *et al., (*2011) {(115.56 ± 12.02 mg/dl) vs (135.71 ± 32.20) mg/dl, (P < 0.01)} found that Lipid abnormalities, mostly elevated levels of Triglyceride, Total Cholesterol, LDL, and VLDL were present in pre-eclamptics. High Triglyceride levels and maternal obesity are associated with preeclampsia among pregnant women. [17]

So, it can be stated that the elevation of blood pressure in hypertension of pregnancy was influenced by the lipid profile and thus the lipid profile of a hypertensive pregnant women can with all probabilities be used as a biochemical marker of the disease.

CONCLUSION

High lipid profile concentration may be a physiological phenomenon, but it may represent a risk factor for Hypertensive disease of pregnancy. The high lipid levels concentration could lead to hypertension and pathological lipid deposition in

predisposed vessels which may lead to peroxidation of lipid and free radical damage to the vessels. Therefore lipid profile can be used as a biomarker for this disease. Serial estimation of serum Lipid Profile can very well be used as biochemical markers of the disease and also can be used in better management of established cases of eclampsia or preeclampsia. The metabolic disorder that occurs during hypertension of pregnancy may be important and may be a predictor of future systemic diseases in these women. Therefore more investigations are warranted into the implications of hypertension in pregnancy.

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