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Study of Serum Lipid Profile in Pregnancy Induced Hypertension

KEYWORDS

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Hypertension is one of the common medical complications of pregnancy and contributes significantly to maternal and perinatal morbidity and mortality.

Changes in the plasma lipids during pregnancy have been recognized, described & are thought to be done mostly to alterations in hormonal milieu. Plasma lipids & lipoproteins undergo both qualitative & quantitative changes during pregnancy. These changes revert towards normal shortly after delivery[1].

The association of alteration of serum lipid profile in essential hypertension is well documented. An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on endothelial dysfunction. The most important feature in toxaemia of pregnancy is hypertension which is supposed to be due to vasospastic phenomenon in kidney, uterus, placenta and brain.[2] Altered lipid synthesis leading to decrease in PGI:TxA_2 ratio is also supposed to be an important way of pathogenesis in pregnancy induced hypertension (PIH).[3] Thus abnormal lipid metabolism seems important in the pathogenesis of pregnancy induced hypertension too. Obviously the association of serum lipid profile with gestational proteinuric hypertension is highly suggested to reflect some new diagnostic tools. Moreover, the hormonal imbalance is a prime factor for the etiopathogenesis of PIH and this endocrinal imbalance is well reflected in alteration of serum lipid profile. Therefore, simple measurements of serum lipid parameters may be of good predictive value in toxaemia of pregnancy, avoiding the costly endocrinal investigations.

Despite considerable research, the causes of preeclampsia remain unclear and there are no clinically useful screening tests to identify women in whom it will develop. Early pregnancy dyslipidemia is associated with an increased risk of Pre-eclampsia.[4] Women with a history of pre-eclampsia have significant differences in lipid parameters and an increased susceptibility to lipoprotein oxidation when compared with women who had normal pregnancy. Disorders of lipoprotein metabolism are reported to be a major cause of hypertension and proteinuria in Pre-eclampsia.[5]

This study was designed to investigate the alteration in lipid profile (Cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol and VLDL) in normal, pre-eclamptic and eclamptic women .

The study was conducted with following objectives:

- To analyze the lipid profile in normotensive patients
- To analyze the lipid profile in pregnancy induced hypertension patients
- To identify most significant lipid in pregnancy induced hypertension
- To assess abnormal lipid profile and maternal outcome
- To assess abnormal lipid profile and perinatal outcome
- Lipid profile in relation to severity of hypertension in pregnancy

Study Type
Comparative observational study.

Study Setting
The present study was conducted on 60 randomly selected pregnant women coming to the Obstetrics and Gynecology OPD of Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune.

Study Period
The period of data collection was beginning from September 2013 till the end of October 2015.

Sampling Method & Sample Size
Sixty randomly selected pregnant women ranging in age from 18-35 years were divided into two groups.

Group A includes 30 normal normotensive pregnant women at third trimester

Group B includes 30 pregnancy induced hypertension patients at third trimester who will be diagnosed by the presence of persistent hypertension (140/90mm of Hg), gross proteinuria.

Patients were included in the study after taking their voluntary informed consent.

Study subjects:
Inclusion criteria
Pregnant women in third trimester in the age group of 18-35 years presented in Dr. D. Y. Patil Medical College, Hospital and Research Centre, Pimpri, Pune including inpatient & Outpatient department.

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PIH cases diagnosed by presence of persistent hypertension (140/90mm of Hg), gross proteinuria.

Exclusion criteria
People with past history of cardiac, renal, hepatic dysfunction or dyslipidemia will be excluded from the studies

Study Tools
A predesigned semi-structured questionnaire was prepared based on the review of literature on Pregnancy induced hypertension.

The questionnaire included the information regarding age, parity, height and weight. It also included information regarding clinical symptoms, blood pressure measurement, past history of abortions and family history. The information regarding laboratory parameters like Hemoglobin, fasting blood sugar level, Serum triglycerides, Total cholesterol, HDL, LDL, VLDL and serum uric acid were also noted. 4ml of blood sample will be drawn from all the subjects following a fast of 12 hours and will be analyzed for-

Serum cholesterol levels- CHOD-PAP method (with LCF), END POINT

Modified Roeschlau's method.
Serum LDL levels- Enzymatic end point method.
Serum HDL levels- Enzymatic end point method.
Serum Triglycerides- GPO – TRINDER method, END POINT.
Serum VLDL- Automated calculation.

Statistical Analysis
Data management and analysis was done using Microsoft excel and Epi-info software. The categorical variables were assessed using Pearson chi-square. Mantel Hanzel Odds Ratio (OR) and corresponding 95% Confidence Interval (CI) were calculated for dichotomous variables.

RESULTS
Table 1: Comparison of Lipid profile with presence of PIH

Lipid Profile	PIH	Normal	P value
Cholesterol (mg/dl)	208.8 ± 12.64	163.8 ± 8.83	<0.001
HDL (mg/dl)	38.06 ± 3.01	49.56 ± 4.08	<0.001
LDL (mg/dl)	140.36 ± 10.8	120.2 ± 7.98	<0.001
VLDL (mg/dl)	52.76 ± 4.96	35.4 ± 3.62	<0.001
Triglyceride (mg/dl)	201.06 ± 10.67	158.8 ± 9.96	<0.001

Above table shows the comparison of lipid profile parameters with normal cases and PIH cases. It was seen that mean Cholesterol level in PIH cases was 208.8 ± 12.64 mg/dl and in normal cases was 163.8 ± 8.83 mg/dl, mean HDL level in PIH cases was 38.06 ± 3.01mg/dl and in normal cases was 49.56 ± 4.08 mg/dl, mean LDL level in PIH cases was 140.36 ± 10.8 mg/dl and in normal cases was 120.2 ± 7.98mg/dl, mean VLDL level in PIH cases was 52.76 ± 4.96 mg/dl and in normal cases was 35.4 ± 3.62 mg/dl and mean Triglyceride level in PIH cases was 201.06 ± 10.67 mg/dl and in normal cases was 158.8 ± 9.96 mg/dl. The association of Mean cholesterol, HDL, LDL, VLDL and Triglyceride level among normal and PHT cases are statistically significant. (p<0.05)

Table 2: Relation of lipid profile with severity of HTN

Lipid levels	Normal	Mild PIH	Moderate PIH	Eclampsia
Cholesterol	163.8±8.83	203.0±7.46	215.8±13.47	224.0±14.69
LDL levels	120.2±7.98	139.7±11.64	141.4±6.45	148.5±11.0
HDL levels	49.5±4.08	38.53±3.09	36.4±2.57	34.75±2.98
VLDL levels	35.4±3.62	54.47±4.67	56.0±4.32	57.3±3.30
Triglyceride level	158.8±9.96	200.9±10.23	204.57±12.0	209.5±6.19

It was seen from the above table cholesterol level, LDL levels, VLDL levels and triglyceride level was gradually increasing from Mild PIH to Moderate PIH to Eclampsia while HDL levels was gradually decreasing from Mild PIH to Moderate PIH to Eclampsia

Discussion
Pregnancy–Induced Hypertension (PIH) is defined as the occurrence of hypertension after 20 weeks of gestation in a woman without prior hypertension.[6]It is usually defined as systolic blood pressure of at least 140 mmHg and/or diastolic blood pressure of at least 90 mmHg.[7]When accompanied by proteinuria, the disorder is termed preeclampsia and when it is without significant proteinuria it is termed gestational or transient hypertension.

In the present study, It was seen that mean Cholesterol level in PIH cases was 208.8 ± 12.64 mg/dl and in normal cases was 163.8 ± 8.83 mg/dl, mean HDL level in PIH cases was 38.06 ± 3.01mg/dl and in normal cases was 49.56 ± 4.08 mg/dl, mean LDL level in PIH cases was 140.36 ± 10.8 mg/dl and in normal cases was 120.2 ± 7.98mg/dl, mean VLDL level in PIH cases was 52.76 ± 4.96 mg/dl and in normal cases was 35.4 ± 3.62 mg/dl and mean Triglyceride level in PIH cases was 201.06 ± 10.67 mg/dl and in normal cases was 158.8 ± 9.96 mg/dl. The association of Mean cholesterol, HDL, LDL, VLDL and Triglyceride level among normal and PIH cases are statistically significant. (p<0.05)

In the study conducted by Urmila Singh[8] , it was seen that the association of Mean cholesterol, LDL, VLDL and Triglyceride level among normal and PIH cases are statistically significant. (p<0.05) .Our results, when taken together with those of earlier prospective studies[9] indicate that dyslipidemia, particularly hypertriglyceridemia and elevated lipoprotein, precede the clinical manifestation of preeclampsia and thus may be of etiologic and pathophysiologic importance in this relatively common complication of pregnancy.

In the present study, it was seen that cholesterol level, LDL levels, VLDL levels and triglyceride level was gradually increasing from Mild PIH to Severe PIH to Eclampsia while HDL levels was gradually decreasing from Mild PIH to Severe PIH to Eclampsia. The cholesterol, LDL, VLDL, Triglyceride and S.Uric acid was positively correlated while HDL is negatively correlated. All the correlation are statistically significant. It was seen from the above table cholesterol:HDL level ratio, LDL:HDL level ratio, and triglyceride:HDL level ratio was gradually increasing from Mild PIH to Severe PIH to Eclampsia while HDL:VLDL level ratio was gradually decreasing from Mild PIH to Severe PIH to Eclampsia.

In the study conducted by Amandeep Singh Kaloti,[10] it was seen that the association of HDL, VLDL and Triglyceride level among normal and PIH cases are statistically significant. (p<0.05).Similar findings were seen in the study conducted by P.Josephine Latha.[11]

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Elevated plasma lipid levels are believed to be the probable cause of endothelial cell dysfunction. In the endothelial cell, oxidative stress is stimulated by linoleic acid. During pregnancy serum lipoprotein levels increase considerably and is two times higher in PIH. Alterations that take place during pregnancy include insulin resistance, hyper – lipidaemia and up – regulation of inflammatory markers.[12] Our study also showed that rise in serum triglycerides was statistically significant ($p<0.001$) in PIH patients when compared to women with normal pregnancy. The major modulator of this hypertriglyceridemia is estrogen as pregnancy is linked with hyperestrogenemia. Hypertriglyceridemia may be linked to hypercoagulability.[13] In the present study cholesterol concentration increased in patients of PIH but no significant changes in total cholesterol were observed. The finding in our study of 16.8% lower value of HDL –C in PIH patients over patients of normal pregnancy is consistent with the study on Finnish and Peruvian population.[14] Statistically the variation was highly significant, ($p<0.001$). Estrogen is responsible for induction of triglycerides and HDL and inhibition of serum LDL and estrogen level falls in PIH.[14] Low levels of HDL in PIH is not only because of hypoestrogenemia but also due to insulin resistance.

In our study, serum VLDL levels rose significantly ($p<0.001$) in the patient PIH group which may be due to hypertriglyceridemia leading to increased entry of VLDL that carries the endogenous triglycerides into the circulation. Similar results are shown by another study[15] and one study from China.

CONCLUSION

The association between dyslipidemia and risk of preeclampsia is biologically plausible and is compatible with what is known about pathophysiology of preeclampsia. Three hypothesized mechanism for dyslipidemia and preeclampsia association has been described. First, investigator noted that elevated plasma lipid and lipoprotein may induce endothelial dysfunction secondary to oxidative stress. They also noted that dyslipidemia may impair trophoblast invasion thus contributing to a cascade of pathophysiologic events that lead to the development of preeclampsia

Second, mechanism is pathologic process of preeclampsia via dysregulation of lipoprotein lipase resulting in a dyslipidemic lipid profile. Enderssen et al and Lorentzen et al showed that sera from preeclamptic women had both a higher ratio of free fatty acids to albumin and increased lipolytic activity, resulting in enhanced endothelial uptake of free fatty acids, which are further esterified to triglycerides. Third, possible mechanism may be via metabolic syndrome

Alteration in serum lipid profile was directly proportional to maternal and fetal morbidity in cases of PIH. Rise in serum cholesterol, LDL, VLDL and triglycerides was directly proportional to rise in rate of maternal and fetal morbidity in cases of PIH.

Serum lipid profile can be used as one of the prognostic markers for PIH outcome.

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