



## Hypertriglyceridemia in Pregnancy Induced Hypertension

Authors

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### ABSTRACT

**AIM:** *Pregnancy-induced hypertension (PIH) is a common medical complication of pregnancy with a high incidence. Hormonal imbalance leading to altered lipid profile in serum is attributed to be one of the prime factors in etiopathogenesis of pregnancy-induced hypertension (PIH). So, the serum lipid profile in women with pregnancy induced hypertension and healthy pregnant women, in third trimester was evaluated in an attempt to study the etiopathogenesis and relationship of lipid levels to its complications, in the rural population attending our Medical College Hospital*

**METHODS:** *This is a case control study comprising of 50 normal and 50 PIH cases in their third trimester of pregnancy. The serum Triglycerides (TG), Total cholesterol (TC), HDL-cholesterol (HDL-C), very low density lipoprotein (VLDL) and LDL- cholesterol (LDL-C) were evaluated and analyzed by auto analyzer.*

**RESULTS:** *There was a significantly higher fasting triglycerides, total cholesterol, VLDL and LDL-C levels in PIH cases ( $P < 0.01$ ), as compared to healthy pregnant women.*

**CONCLUSION:** *Elevated serum total cholesterol and LDL cholesterol observed in PIH cases indicates abnormal lipid status and further studies are required to find out the implications of this on etiopathogenesis of PIH and foetal outcome in these cases.*

**KEYWORDS:** *lipid profile, pregnancy-induced hypertension (PIH), Triglycerides (TG), Total cholesterol (TC), HDL-cholesterol (HDL-C), Very low density lipoprotein( VLDL) and LDL- cholesterol (LDL-C).*

### 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<sup>1</sup>. Pregnancy-Induced Hypertension (PIH) is defined as the occurrence of hypertension after 20 weeks of gestation in a woman without prior hypertension<sup>2</sup>. It is usually defined as systolic

blood pressure of at least 140 mmHg and/or diastolic blood pressure of at least 90 mmHg<sup>3</sup>. When accompanied by proteinuria, the disorder is termed preeclampsia and without significant proteinuria, it is termed gestational or transient hypertension.

The association of alteration in serum lipid profile in essential hypertension is well documented.

Hormonal imbalance leading to altered lipid profile in serum is attributed to be the prime factor in etiopathogenesis of pregnancy-induced hypertension (PIH)<sup>18</sup>. Altered lipid synthesis leading to decrease in PGI<sub>2</sub>: TXA<sub>2</sub> ratio causes the vasospastic phenomenon in kidney, uterus, placenta and brain as seen in PIH<sup>4</sup>. Hence the present study was designed to study the lipid profile in PIH patients in comparison with healthy pregnant women.

## 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 was 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.

Serum lipid profile included Triglycerides (TG), Total cholesterol (TC), HDL cholesterol (HDL-C) by enzymatic colorimetric methods in the auto analyser.

Serum LDL-cholesterol and VLDL were calculated using FREDERICKSON-FRIEDWALD'S formula which is  $LDL-C = TC - (VLDL + HDL-C)$  and  $VLDL = TG/5$ .

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

## RESULTS

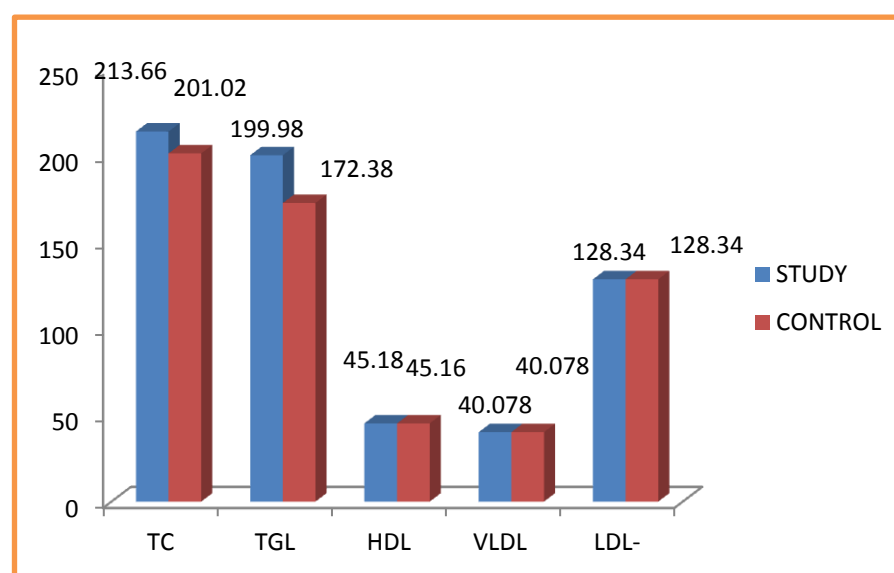
There was a significantly higher fasting triglycerides, total cholesterol and LDL-C levels in PIH ( $P < 0.01$ ), as compared to healthy pregnant women.

**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 <sup>2</sup> )	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 Profile in Study and Control Group

Parameter	Control Group (n=50) Mean±SD	Study Group PIH (n=50) Mean±SD	P value
TC(mg/dl)	201.02±30.51	213.66±39.60	0.001 significant
TGL(mg/dl)	172.38±42.03	199.98±55.39	0.013 significant
HDL-c (mg/dl)	45.16±3.77	45.18±4.049	0.820 not significant
VLDL (mg/dl)	33.91±8.38	40.078±11.09	0.014 significant
LDL-c(mg/dl)	120.18±31.50	128.34±37.65	0.0346 significant



## DISCUSSION

Pregnancy-Induced Hypertension (PIH) is defined as the occurrence of hypertension after 20 weeks of gestation in a woman without prior hypertension<sup>2</sup>. It is usually defined as systolic blood pressure of at least 140 mmHg and/or diastolic blood pressure of at least 90 mmHg<sup>3</sup>. When accompanied, by proteinuria, the disorder is termed preeclampsia and when it is without significant proteinuria it is termed gestational or transient hypertension.

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<sup>7</sup>. Alterations that take place during pregnancy include insulin resistance, hyper

lipidaemia and up – regulation of inflammatory markers<sup>7</sup>. Our study also showed that serum triglycerides was significantly higher ( $p < 0.001$ ) 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<sup>8</sup>. In the present study significant changes in total cholesterol were observed. In our study, serum VLDL levels were significantly higher ( $p < 0.001$ ) in the patient of PIH group which may be due to hypertriglyceridemia leading to increased entry of VLDL that carries the endogenous triglycerides into the circulation. The principle modulator of this hypertriglyceridemia is hyperestrogenemia in pregnancy that induces hepatic biosynthesis of

TGs<sup>9</sup>. Serum TG levels were significantly higher in PIH as reported by other studies<sup>10,11</sup> and as seen in our study also. Increased TG levels results in endothelial cell dysfunction and lipids get deposited in predisposed vessels<sup>12</sup>, causes generation of small dense LDL<sup>13</sup> and hypercoaguability<sup>14</sup>.

The serum TC levels were significantly higher in PIH as compared to normal pregnancy in our study, which was similar to other reports<sup>12,15</sup> however other studies reported no alteration in TC levels<sup>13,15</sup>. In our study there was significantly lower HDL-C in PIH cases, as compared to healthy pregnant women.

A significantly higher LDL-C levels was seen in PIH as compared to controls in our study and also studied in other studies<sup>16,17</sup>.

In the study conducted by Urmila Singh<sup>5</sup>, it was seen that the association of Mean cholesterol, LDL, VLDL and Triglyceride levels in PIH cases are significantly higher as compared to normal pregnant women. ( $p < 0.05$ ) 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 significantly higher in PIH cases. While HDL levels was not significant. In the study conducted by Amandeep Singh Kaloti<sup>6</sup> it was seen that the association of HDL, VLDL and Triglyceride levels are significantly higher in PIH cases as compared to normal pregnant women. ( $p < 0.05$ ).

Altered lipids could be a possible cause in the pathogenesis of PIH<sup>18</sup>. Thus the assessment of blood lipids maybe helpful in the prevention of complications of preeclampsia.

The association between dyslipidemia and risk of PIH is biologically plausible and is compatible with what is known about pathophysiology of PIH. Three hypothesized mechanisms for dyslipidemia and PIH 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 the 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. Serum lipid profile can be used as one of the prognostic markers for PIH outcome.

## CONCLUSION

The present study clearly indicates that significantly higher serum lipid levels are possible causative factors for the pathogenesis of PIH. Hence analysis of these parameters would help in management of PIH cases for a better maternal and fetal outcome.

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