

# Comparative Study of Serum Lipid Profile in Normotensive Pregnant Women and in Patients with Pre-Eclampsia- A Case Control Study.

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## ABSTRACT

**Background:** The objective of the present study was to compare the changes in serum lipid profile in normal pregnant women with those in patients with pre-eclampsia. **Methods:** In this study total 140 study subjects were evaluated, 70 normotensive pregnant women as a control group and 70 pre-eclamptic patients as a study group. Study Subjects were between the age group of 20-35 years and in the second and third trimester of pregnancy. Fasting blood samples were collected and serum level of Triglycerides (TG), Total Cholesterol (TC), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL), and Very Low Density Lipoprotein (VLDL) were measured by enzymatic colorimetric method. **Results:** There was a significant rise in TC, TG, LDL and VLDL and significant decrease in HDL level in pre-eclamptic group as compared to normal pregnant women. **Conclusion:** The findings of the present study are consistent with previous studies suggesting an altered lipid profile has a potential role in the genesis of endothelial dysfunction and expression of pre-eclampsia.

**Keywords:**Pre-eclampsia, Lipid Profile, TG, TC, HDL, LDL, VLDL.

## INTRODUCTION

Pre-eclampsia (PET) is a pregnancy specific multisystem disorder of unknown etiology and accounts for a significant proportion of maternal and foetal morbidity and mortality worldwide. Nearly 5% - 10% are complicated with pre-eclampsia in developing countries. The incidence in primigravidae is about 10% and in multigravidae 5%.<sup>[1]</sup> It is characterized by blood pressure of  $\geq 140/90$  mm Hg or rise in systolic blood pressure of  $\geq 30$  mm Hg or diastolic blood pressure of  $\geq 15$  mm Hg with proteinuria after 20 weeks of gestation in previously normotensive and non-proteinuric patients. Proteinuria is defined as 300 mg or more of urinary protein per 24 hours or persistent 30 mg/dl (1+ dipstick) in random urine sample.<sup>[2]</sup>

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The risk of developing pre-eclampsia appears to be greater in women who have a family history of essential hypertension, and there may be a relationship between risk of pre-eclampsia and the metabolic syndrome.<sup>[3]</sup> The underlying basic

pathology is endothelial dysfunction and vasospastic phenomenon affecting almost all the vessels, particularly those in kidney, uterus, placenta and brain.<sup>[4]</sup> Altered lipid synthesis leading to decrease in PGI<sub>2</sub>:TXA<sub>2</sub> ratio is also supposed to be an important way of etiopathogenesis in pre-eclampsia.<sup>[5]</sup>

Thus abnormal lipid metabolism seems important in the etiopathogenesis of pre-eclampsia. Significantly elevated plasma concentration of Triglyceride (TG), phospholipids and total lipids and reduced high density lipoprotein- cholesterol (HDL-C) concentration were found in woman with pre-eclampsia compared to normotensive pregnant woman.<sup>[6,7]</sup>

Lipid values in normal pregnancies change with gestational age. The lipids are a heterogeneous group of compounds closely related to the fatty acids. Normal pregnancy is associated with a state of hyperlipidemia. These changes are reported to be secondary to hormonal changes like increase in female sex hormones and placental lactogen during pregnancy.<sup>[8-10]</sup> This physiologic hyperlipidemia of a normal pregnancy is potentially significant from several standpoints—(1) The rise in plasma triglyceride may enhance the availability of essential and non-essential triglyceride fatty acids for the placental transfer to the foetus. (2) The cholesterol rise may increase the supply of cholesterol needed for placental progesterone synthesis and transplacental cholesterol transfer to

the foetus. (3) The plasma triglyceride elevation may be the barometer of a general metabolic adaptation by the mother to augment nutrient flow to the foetus (4) The hyperlipidaemia may stress maternal lipid homeostasis to an extent that subclinical or mild hyperlipidaemia (pre-lipemia) becomes clinically detectable, analogous to the prediabetes recognized in a women when she develops gestational diabetes (5) The hyperlipidaemia of pregnancy could itself function as an arteriosclerotic risk factor.

Therefore, simple measurement of serum lipid profile may be of good predictive value in patient with pre-eclampsia. Keeping this view in mind the present study was conducted to assess the serum lipid profile in patients with pre-eclampsia and normal healthy pregnant women.

**MATERIALS AND METHODS**

This was a case control study. It was conducted in the department of Obstetrics and Gynaecology of Rohilkhand Medical College and Hospital, Bareilly. A total of 140 cases attended the Out Patient Department and those were admitted as indoor patient in RMCH, Bareilly. Women between the age group of 20-35 years and in the second and third trimester of pregnancy were selected in the study after taking informed consent. They were grouped as follows-

- Group I (controls) – This group included 70 normotensive pregnant women.
- Group II (cases) – This group consisted of 70 pregnant women with pre-eclampsia.

Exclusion Criteria:-

- Chronic Hypertension
- Diabetes mellitus
- Renal diseases
- Obesity
- Endocrine disorders like Hypothyroidism
- Drugs influencing lipid profile

The pre-eclamptic patients were diagnosed by the persistent raised blood pressure  $\geq 140/90$  mmHg, gross proteinuria ( $\geq 300$  mg in 24 hour urine) with or without oedema. For estimation of serum lipid profile, blood samples were obtained from an antecubital vein from all the subjects following an overnight fasting of 8-10 hours and all samples were analyzed for serum total cholesterol, serum triglyceride, HDL-C, LDL and VLDL. Serum triglyceride (TG), total cholesterol and HDL-cholesterol (HDL-C) were analyzed with the help of Glaxo kits on ERBA Chem-5 semi auto analyzer. Serum LDL cholesterol (LDL-C) was calculated by Frederickson-Friedwald’s Formula,  $LDL-C = TC - (HDL-C + VLDL-C)$ . VLDL cholesterol was calculated as  $1/5^{th}$  of triglyceride

(TG). Statistical analysis was done using the T-test and significance was expressed in ‘p’ value.

**RESULTS**

**Table 1: Age Distribution**

Age Group (Years)	GROUP 1 Normal Pregnant Women (n=70)		GROUP 2 Pre-Eclampsia(n=70)	
	No of cases	%	No of cases	%
20-25	16	22.86%	20	28.57%
26-30	41	58.57%	38	54.29%
30-35	13	18.57%	12	17.14%
Total	70	100	70	100
Mean $\pm$ SD	26.7 $\pm$ 3.10		26.32 $\pm$ 2.90	
‘p’ value	>0.05		>0.05	

**Table 2: Gravidity**

Gravida	GROUP 1 Normal Pregnant Women (n=70)		GROUP 2 Pre-Eclampsia (n=70)	
	No of cases	%	No of cases	%
G1	41	58.57	38	54.29
G2-G3	21	30.0	25	35.71
$\geq$ G4	8	11.43	7	10.0

**Table 3: Socio-Economic Status**

Socio-Economic Status	Normal Pregnant women		Pre-Eclampsia	
	No of cases	%	No of cases	%
Upper	3	4.29	6	8.57
Middle	52	74.29	41	58.57
Lower	15	21.42	23	32.86
Total	70	100	70	100

In our study, maximum number of patients were in the age group of 26-30 years. In group 1 (normal pregnant women) 41 women (58.57%) were in the age group of 26-30 years while in group 2 (pre-eclamptic patients) 38 women (54.29%) were in the same age group. The mean value of maternal age in group 1 is  $26.7 \pm 3.1$  and in group 2,  $26.32 \pm 2.90$ .

**Table 4: Demographic & Clinical Characteristics of Normal Pregnant Women and Pre-Eclampsia**

Parameters	Group 1= Controls (n=70)	Group 2= Cases (n=70)	‘p’ value
Mean Age (yrs.) Mean $\pm$ SD	26.70 $\pm$ 3.10	26.32 $\pm$ 2.90	0.4979 (NS)
Gestational age (wks.) Mean $\pm$ SD	33.25 $\pm$ 5.18	34.48 $\pm$ 3.07	0.1362
BMI	25.66 $\pm$ 2.02	26.68 $\pm$ 1.29	0.0021
Systolic BP (mmHg) (mean)	114.65 $\pm$ 8.17	149.09 $\pm$ 11.34	<0.0001

Mean ± SD			
Diastolic BP (mmHg) (mean)	73.54 ± 7.24	100.33 ± 7.09	<0.0001
Mean ± SD			

**Table 5:** Lipid Profile in Normal Pregnant Women & in Pre-Eclampsia

Lipid Profile	Group 1= Controls (n=70)	Group 2= Cases (n=70)	'p' value
Total Cholesterol (mg/dl)	219.07 ± 22.22	255.80 ± 33.93	< 0.0001
TG (mg/dl)	237.55 ± 30.20	299.25 ± 47.40	< 0.0001
HDL (mg/dl)	48.88 ± 6.68	42.24 ± 3.65	< 0.0001
LDL (mg/dl)	123.59 ± 25.00	155.16 ± 39.59	< 0.0001
VLDL (mg/dl)	47.93 ± 6.40	58.45 ± 9.48	<0.0001

There was no statistically significant difference between the two groups ( $p > 0.05$ ) [Table 1]. In the present study, nearly half of the cases i.e. 41 (58.57%) were primigravida in group 1 and 38 (54.29%) in group 2 [Table 2]. About two-third of total no. of cases, 52 (74.29%) pregnant women in group 1 belonged to middle socio-economic status while in group 2, 41 (58.57%) pre-eclamptic women belonged to same socio-economic status [Table 3]. There was no significant difference in gestational age between group 1 and group 2. The mean BMI (Body Mass Index) in group 1 was  $25.66 \pm 2.02$  and in group 2, it was  $26.68 \pm 1.29$ , which was statistically significant ( $p = 0.0021$ ). The mean value of systolic blood pressure in group 1 was  $114.65 \pm 8.17$  mmHg and in group 2 it was  $149.09 \pm 11.37$  mmHg which was statistically significant ( $p < 0.0001$ ).

The mean value of diastolic blood pressure in group 1 was  $73.54 \pm 7.24$  and in group 2,  $100.33 \pm 7.09$ , there being a significant difference between group 1 and group 2 ( $p < 0.0001$ ) [Table 4]. Lipid profile of group 1 (control) and group 2 (cases) are shown in [Table 5]. In our study TC, TG, LDL and VLDL were significantly increased in patients with pre-eclampsia compared to normotensive pregnant women while HDL was decreased in group 2 compared to group 1. This difference was statistically significant.

### DISCUSSION

Pregnancy influences every aspect of lipid metabolism. Normal pregnancy is associated with a state of hyperlipidemia characterized by a two to four fold rise in plasma triglyceride and 10%-50% rise in plasma cholesterol at term. Hyperlipidemia in normal pregnancy is physiological and has important implications for foetal growth and

development. High estrogen concentration and increasing insulin resistance in late pregnancy are considered to be responsible for hypertriglyceridemia. This estrogen induces hepatic biosynthesis of endogenous triglyceride which is carried out by VLDL.<sup>[11]</sup>

In our study, serum total cholesterol in pre-eclampsia was markedly elevated ( $p < 0.0001$ ) compared to normal healthy pregnant women. This finding was corroborated with the JM Potter<sup>[10]</sup>, who reported a significant increase in total cholesterol and triglyceride in pre-eclampsia as compared to normal pregnant women. Our finding was also corroborated by the findings of many other studies.

In our study, the rise in serum triglyceride was statistically significant ( $p < 0.0001$ ) in pre-eclamptic patients in contrast to normal pregnant women. Our finding was also well matched with findings of other studies<sup>[12-19,20]</sup>. In the present study, HDL level is significantly low in patients with pre-eclampsia as compared to normal healthy pregnant women. Our finding was corroborated with Ware Jauregui S<sup>[13]</sup>, who showed that low HDL level and high TG concentration are important risk factors for pre-eclampsia. They suggested that dyslipidaemia is likely to play an important role in the pathophysiology of pre-eclampsia. This result was also well matched with the result of other studies<sup>[15-17,19]</sup>. In our study, there was a significant rise in LDL and VLDL in pre-eclamptic patients as compared to normotensive pregnant women. These findings were well matched with the findings of other studies<sup>[14-19]</sup>.

### CONCLUSION

In conclusion, the findings of the present study suggest that the women who developed pre-eclampsia had altered lipid profile due to abnormal lipid metabolism. Increased triglyceride level and its delayed clearance and raised blood pressure appeared to be of immense value for the development of pathological process of pre-eclampsia. Therefore, it is important that effort is put to developing antenatal care system that allow close vigilance prevention, early detection and management of pre-eclampsia.

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