



ROLE OF DYSLIPIDEMIA IN PROGRESSION OF PREECLAMPSIA

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ABSTRACT **Background-** Preeclampsia is defined as a pregnancy-specific multi-systemic syndrome of widespread endothelial malfunction and vasospasm developing after 20 weeks of gestation, defined by increased blood pressure (>140/90mmHg), fluid retention and proteinuria. Women with preeclampsia experience more dramatic lipid changes compared with normotensive women. Hyperlipidemia results in their accumulation within endothelial cells, which decreases the release of prostacyclin, resulting in oxidative stress via endothelial dysfunction, a key mechanism in the pathophysiology of preeclampsia. **Material And Methods-** Analytical cross sectional study conducted at biochemistry department IGGMC Nagpur, on 75 preeclamptic and 75 normal pregnancies. Serum TC, TG, LDL, VLDL and HDL levels were estimated in all patients and compared between two groups. Data was analyzed using students t-test for level of significance (P<0.01). **Result-** TC, TG, VLDL and LDL levels are increases, whereas HDL levels are decreases in preeclampsia as compared to normal pregnancy. Mean TC level (267.54±34.26, 234.20±19.39), TG (255.03±43.31, 222.30±17.79), VLDL (50.68±8.65, 44.49±3.53) and Mean LDL level (179.65±32.88, 147.86±17.07) in cases and controls respectively showing positive significant correlation (P<0.01). Mean HDL level was 37.21±3.716 and 42.06±3.37 in cases and controls respectively, showing negative association (P<0.01). **Conclusions-** Timely estimation of lipid profile during pregnancy could help in early detection and prompt treatment of preeclampsia and also can prevent the adverse outcomes of pregnancies.

KEYWORDS : pre eclampsia, dyslipidemia

INTRODUCTION:-

Preeclampsia is defined as a pregnancy-specific multi-systemic syndrome of widespread endothelial malfunction and vasospasm developing after 20 weeks of gestation. It is characterised by increased blood pressure ($\geq 140/90$ mm Hg), fluid retention and proteinuria. Preeclampsia and eclampsia complicates 6–8% of all pregnancies and lead to various maternal and fetal complications. Pregnancy is a state in which there is insulin resistance leading to hyperinsulinemia. Insulin increases lipogenesis in mother. Insulin also inhibits the enzyme hormone sensitive lipase, required for lipolysis. In pregnancy due to increased synthesis of cholesterol and triglycerides in the liver and decreased activity of lipoprotein lipase there is increase in total serum cholesterol and triglyceride levels.

Preeclamptic women experiences more dramatic lipid changes compared to normotensive women. Increased levels of circulating lipids result in their accumulation within endothelial cells, which decreases the release of prostacyclin, resulting in oxidative stress via endothelial dysfunction, a key mechanism in the proposed pathophysiology of preeclampsia.^[1] Significant dyslipidemia can increase the risk of complications for both the mother and the fetus.^[2]

Pregnancy is associated with a physiological increase in lipid levels, particularly during the second and third trimesters. This increase is necessary to support fetal development and provide energy for both the mother and the growing fetus.^[3,4,5]

Triglycerides: Levels can increase by 2- to 4-fold, particularly in the third trimester.

Total Cholesterol: Increases by 25-50%, with rises in both LDL (low-density lipoprotein) and HDL (high-density lipoprotein) cholesterol.

LDL Cholesterol: Increases to fulfill adequate cholesterol supply (Cholesterol required for steroid Hormone formation) for fetal development.

HDL Cholesterol: Increases initially but may decrease slightly in the

later stages of pregnancy.

Preeclampsia is associated with insulin resistance, there is increased lipolysis, leading to elevated levels of free fatty acids (FFA) in circulation. The liver responds to elevated FFA levels by increasing the synthesis of very-low-density lipoproteins (VLDL), leading to higher circulating triglyceride levels. This results in **hypertriglyceridemia**, a hallmark of dyslipidemia in preeclampsia.^[6]

Preeclampsia is characterized by an imbalance between oxidative stress and antioxidant defenses. The excess free radicals produced in this state lead to the peroxidation of lipids, especially polyunsaturated fatty acids (PUFAs). Lipid peroxidation generates reactive lipid species, such as **malondialdehyde (MDA)**, which further contribute to vascular damage and ultimately aggravates hypertension.^[7]

Dyslipidemia plays a role in the activation of endothelial cells, a key feature of preeclampsia. Elevated levels of oxidized LDL (ox-LDL) in particular are toxic to endothelial cells. Ox-LDL triggers an inflammatory response and the production of adhesion molecules, promoting the recruitment of immune cells (monocytes) to the vascular wall, leading to atherosclerosis-like changes.^[8]

Elevated leptin levels are associated with increased lipid synthesis, while decreased adiponectin, an anti-inflammatory and insulin-sensitizing adipokine, is linked to dyslipidemia and insulin resistance. This imbalance contributes to the worsening of lipid profiles in preeclampsia.

Poor placental perfusion in preeclampsia triggers the release of pro-inflammatory cytokines, such as tumor necrosis factor-alpha (**TNF- α**) and interleukin-6 (**IL-6**), which exacerbate systemic inflammation and insulin resistance, further promoting dyslipidemia. The placenta plays a critical role in lipid transport to the fetus. In preeclampsia, the deregulated lipid metabolism can impair placental lipoprotein lipase activity, leading to altered lipid transport and accumulation of atherogenic lipoproteins.^[9]

Preeclampsia is associated with elevated levels of low-density

lipoproteins (LDL) and triglycerides. LDL can undergo oxidation in an oxidative stress environment, forming oxidized LDL (ox-LDL), which contributes to endothelial damage.

High-density lipoprotein (HDL), which plays a protective role in lipid metabolism by mediating reverse cholesterol transport and protecting against oxidative stress, is often reduced in preeclampsia. This reduction diminishes its anti-inflammatory and antioxidant functions, worsening endothelial dysfunction.

Dyslipidemia has impact on maternal as well as fetal health in terms of preeclampsia, gestational diabetes mellitus, cardiovascular complications, macrosomia, preterm birth, low birth weight, IUGR and some long term metabolic complications like obesity, insulin resistance, and metabolic syndrome.

Aim = to compare the levels of lipid profile (TC, TG, VLDL, LDL, HDL) in preeclampsia with normal pregnancy.

MATERIALS AND METHODS

After obtaining institutional ethics committee clearance, this hospital based comparative cross-sectional study was at department of biochemistry, IGGMC Nagpur. 75 preeclamptic and 75 normal pregnancies were selected after fulfilling inclusion and exclusion criteria, by simple random sampling method.

Inclusion Criteria

- Pregnancy with >24 weeks of gestation
- Singleton pregnancy

For Cases

- Blood pressure \geq 140/90 mmhg
- Urine protein – positive

For Controls

- Blood pressure < 140/90 mmhg
- Urine protein - negative

Exclusion Criteria For Cases And Controls

- Patients, with hypertension <20 weeks.
- Preexisting diabetes mellitus, renal disease, liver disorders, thyroid disorders, epilepsy, heart disease
- Patient with Twin or multiple babies
- Those who do not willing to participate in study.

Under aseptic precautions 5 ml of venous blood sample was collected from antecubital vein in plain vacutainer. This blood sample was allowed to clot and centrifugation done at 3000rpm for 10 minutes. The serum separated and was used to estimate Total Cholesterol, Triglyceride, VLDL, LDL, HDL on XL640 autoAnalyzer (Transasia erba).

Statistical Analysis

Data was compiled in MS Office Excel spreadsheet and analysed using SPSS V: 20. Data variables are expressed in mean and standard deviation. Student's t test applied to see the level of significance (P<0.01).

RESULTS

Total Cholesterol levels, Triglycerides, VLDL and LDL levels are significantly increases, whereas HDL levels are decreases in preeclampsia as compared to normal pregnancy. Average age of PE was 28.19 \pm 5.0 and for normal group was 26.84 \pm 4.4 years. Preeclampsia was higher among primigravida (40% in PE) when compared to multigravida women (29% in PE).

Table 1 : Association of TC, TG, VLDL, LDL, HDL-C with Case and Control

	Group	N	Mean	S.D.	T value	P value
CHOL	Case	125	267.54	34.264	9.46	<0.01
	Control	125	234.20	19.394		
TG	Case	125	255.03	43.315	7.81	<0.01
	Control	125	222.30	17.792		
VLDL	Case	125	50.68	8.650	7.41	<0.01
	Control	125	44.49	3.532		
LDL	Case	125	179.65	32.885	9.59	<0.01
	Control	125	147.86	17.072		

HDL-C	Case	125	37.21	3.716	-10.81	<0.01
	Control	125	42.06	3.379		

Mean total cholesterol level was 267.54 \pm 34.26 and 234.20 \pm 19.39, triglyceride was 255.03 \pm 43.31 and 222.30 \pm 17.79, VLDL was 50.68 \pm 8.65 and 44.49 \pm 3.53 and Mean LDL concentration was 179.65 \pm 32.88 and 147.86 \pm 17.07 in cases and controls respectively. This shows a positive significant correlation with P < 0.01. Mean HDL concentration was 37.21 \pm 3.716 and 42.06 \pm 3.37 in cases and controls respectively. This shows significant negative association with P < 0.01.

DISCUSSION

Pregnancy is a state in which there is insulin resistance leading to hyperinsulinemia. Insulin increases lipogenesis in mother. Insulin also inhibits the enzyme hormone sensitive lipase, required for lipolysis. Total serum cholesterol and triglyceride levels increase during pregnancy due to increased synthesis in the liver and decreased activity of lipoprotein lipase.

The present study was conducted to compare serum cholesterol, triglycerides, LDL, VLDL, HDL levels between preeclamptic and normal pregnancy group. In this study, preeclampsia was more common among the primigravida (40% of preeclampsia were primigravida). Similar results are found in the study conducted by Guhan VN et al and Indumati V. et al^[7].

Seyede Hajar Sharami, et al^[10] conducted a study and observed that Mean cholesterol level was 238.31 \pm 49.65 and 214.32 \pm 42.12 in cases and controls respectively. This does not show a positive significant correlation. Mean level of triglyceride was 340.29 \pm 106.45 and 202.85 \pm 63.27 in cases and controls respectively. This shows very significant association with P < 0.001. Mean LDL concentration was 138.24 \pm 47.34 and 124.07 \pm 40.27 in cases and controls respectively. This does not show significant association. Mean HDL concentration was 43.12 \pm 12.00 and 48.95 \pm 9.48 in cases and controls respectively. This does not show significant association.

Julia T. Stadler et al^[11] said that low HDL-C levels and raised triglycerides are observed in pre eclampsia. There is no much difference in cases and controls in the levels of Total cholesterol, VLDL and LDL.

FARHANA HAIDER et al^[12] found that in cases there is higher levels of Total cholesterol, HDL-C, LDL-C, VLDL-C and triglycerides as compare to normal pregnancy with significant p-values.

CONCLUSION

This study observes that, Dyslipidemia is more prominent in pre eclamptic patient as compare to normal pregnant women. LIPID PROFILE, are to be estimated timely in pregnancy to predict pre eclampsia and to avoid fetal maternal complications.

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