Serum lipid profile in pregnancy and its correlation with preeclampsia and its impact on severity of preeclampsia

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ABSTRACT

Aims: To compare the changes in the lipid profile in pre-eclampsia, eclampsia and normal pregnancy and to know the severity of preeclampsia depending on the lipid derangement.

Methods: This is the hospital based observational analytical study with 30 pregnant women in each study and comparison group at Vydehi Institute of Medical Sciences. India. Lipid profile was run in each participant and statistical analysis was performed by STATA 11.2.

Results: The mean value of serum total cholesterol, serum triglycerides, low density lipoprotein and very low-density lipoprotein in the study group were significantly raised compared to comparison group. The mean high density lipoprotein levels were lower in study group compared to comparison group which was statistically significant. Total cholesterol, LDL and VLDL was increased in eclampsia group and severe preeclampsia group. No significant difference was found between serum triglyceride levels, HDL and severity of preeclampsia.

Conclusions: LDL and VLDL were significantly higher in severe preeclampsia and eclampsia; but no significant difference found between serum triglyceride levels and HDL levels.

Keywords: dyslipidemia, lipoprotein, preeclampsia

INTRODUCTION

Pre-eclampsia is a common pregnancy related multiorgan disorder characterized by hypertension and proteinuria occurred after 20 weeks of gestation. It is the most common cause of maternal and prenatal morbidity and mortality.[1] The incidence of preeclampsia in India is reported to be 2%-15% of all the pregnancies.[2] The etiopathogenesis of pre-eclampsia is not clearly understood but it is believed that decreased uteroplacental perfusion due to abnormal spiral artery remodeling resulted in hypertension and proteinuria. Raised plasma lipid levels and lipoproteins causes endothelial dysfunction secondary to oxidative stress and it was also seen that dislipidemia impairs trophoblast invasion which led to preeclampsia.[3,4].

Various studies have shown lipid profile abnormalities might be associated with the risk of pre-eclampsia. Lipid profiles such as triglycerides (TG), low density lipoprotein (LDL), total cholesterol (TC) and very low-density lipoprotein (VLDL) levels are higher in pre-eclamptic women as compared with normal pregnancies; but high-density lipoprotein (HDL) level is lower in pre-eclamptic women as compared with normal pregnancies.

Pregnancy is a state of both anabolism and catabolism. There is accumulation of the fat that occurs during the first trimester of pregnancy which is considered to be a state of anabolism. In the latter half of pregnancy is a state of metabolism where there is increase in the serum triglyceride levels and is the state of catabolism. It is well known that, during pregnancy there is a physiological rise in the triglyceride levels and the cholesterol levels due to hormonal changes and the problem worsens as the gestational age increases[5,6].

Though many studies have proven the correlation between the dyslipidemia and preeclampsia, few studies have shown that there are no statistically significant differences in serum lipid concentrations between women with pre-eclampsia and normal pregnant women. In this context, the present study was undertaken to compare the changes in the lipid profile in pre-eclampsia, eclampsia and normal pregnancy in third trimester and also to know the severity of preeclampsia depending on the lipid derangement.

METHODS

This is the observational analytical study done in the Department of Obstetrics and Gynecology from October 2018 to June 2020 at Vydehi institute of medical sciences, India. The study was approved by the institutional ethics committee. The antenatal women recruited from outdoor consultation with written informed consent. Proteinuric hypertension (≥140/90 mmHg) were compared with the normotensive women, 30 in each group. Women with chronic hypertension, diabetes mellitus, renal, thyroid disorders and multiple gestation were excluded. Lipid profile was determined from blood sample of 5 ml from each participant.

The statistical analysis was performed by STATA 11.2 (College Station TX USA). Shapiro Wilk test was used to find the normality. Lipid profile values of total cholesterol, HDL, LDL, VLDL and Triglycerides were compared; and these expressed as Mean and standard deviation. $P<0.05$ considered as statistically significance.

RESULT

A total of 60 women were included in the study with 30 in each group. Majority of the women were in the age group of 20-30 years in both the groups; and majority cases fell in 37-40 weeks of gestation. Two-third had non-severe preeclampsia followed by 20.2% of severe preeclampsia and 13.3% eclampsia. [Table-1]

Table-1: Demographic characteristics

Variable		Study group, N (%)	Comparison group, N (%)
Age in years	<20	0 (0%)	2 (6.7%)
	20-30	27 (90%)	25 (83.3%)
	>30	3 (10%)	3 (10%)
Gravida	Primi-	16 (53.3%)	12 (40%)
	Multi-	14 (46.7%)	18 (60%)
Gestational weeks	28-33wks	7 (23.3%)	0 (0%)
	34-36wks	10 (33.3%)	3 (10%)
	37-40wks	13 (43.3%)	22 (73.3%)
	>40wks	0 (0%)	5 (16.7%)

The mean value of serum total cholesterol, triglycerides, low density lipoprotein and very low-density lipoprotein in the study group were significantly raised compared to

comparison group; high density lipoprotein levels were lower in study group. [Table-2]

It was observed that total cholesterol was increased to >200mg/dl in eclampsia group (100%) and severe preeclampsia group (83.3%). No significant difference was found between serum triglyceride levels, HDL and severity of preeclampsia (non-severe, severe preeclampsia and eclampsia). Values of LDL and VLDL were noted be significantly higher in severe preeclampsia and eclampsia in comparison to non-severe preeclampsia. [Table-3]

Table 2: Comparison of lipid parameters in two groups

Serum parameters	Study group	Comparison group	All participants	p-Value
TC	217.90±22.48	181.58±11.18	199.74±25.40	<0.001
TG	200.89±9.24	157.23±10.52	169.56±12.50	<0.001
HDL	28.26±3.11	51.79±2.46	50.03±3.30	<0.001
LDL	138.20±12.37	122.36±8.04	130.29±13.07	<0.001
VLDL	43.87±4.87	34.96±0.97	39.42±5.68	<0.001

TC-Total cholesterol, TG-Triglyceride, HDL-High-density lipoprotein, LDL-Low-density lipoprotein, VLDL-Very low-density lipoprotein

Table-3: Comparison of lipid profile and severity of preeclampsia

Lipid parameters	Lipid profile by Severity			Total	P Value
	Non-severe Pre-Eclampsia	Severe pre-Eclampsia	Eclampsia		
TC	208.24±18.24	227.34±15.37	252.02±4.78	217.90±22.48	<0.001
TGL	176.98±11.72	180.91±9.92	192.97±6.52	197.23±10.52	0.512
HDL	47.35±2.83	50.80±3.64	49.05±1.23	48.26±3.11	0.045
LDL	131.40±9.02	151.81±3.70	151.90±3.45	138.22±12.37	<0.001
VLDL	40.83±2.42	50.13±1.50	49.71±1.87	43.87±4.87	<0.001

DISCUSSION

Preeclampsia is one of the major obstetric problem in present-day healthcare practice affecting not only the maternal health but also poses the fetus at risk.

In present study, both the groups of women were between the age group of 20-30y and there was no statistically significant difference in the age distribution among the both study (90%) and comparison group (83%). The results were similar to the study conducted by Attah R et al study group (50%) and comparison group (47.14%) and Enaruna NO et al study group (45%) and comparison group (46.3%).[7,8] Pre-eclampsia is commonly seen in young and nulliparous women, whereas the older women are at risk for developing chronic hypertension with superimposed pre- eclampsia.

A statistical significance noted between the mean level of lipid components between the two groups. Levels of LDL (138.20±12.37 vs 122.36±8.04), VLDL (43.87±4.87 vs 34.96±0.97), S triglycerides (200.89±9.24 vs 157.23±10.52), total cholesterol (217.90±22.48 vs 181.58±11.18) were higher in study group except for HDL (28.26±3.11 vs 51.79±2.46) compared to comparison group. These results were in agreement with studies done by Attah R et al, Tanzeela Nazir et al, Khaliq F, Dhrubajyati Saha et al, Kaur B et al,Misra M K et al, Sangeeta N et al and Agbara J O et al .[7,9-14,18] However study done by Rubina Aziz et al, mean cholesterol, low density lipoproteins, cholesterol and total lipids levels were not statistically different between preeclamptic and normal pregnant women.[15] All the average values of lipid parameters of various studies are depicted in table 4.

Table 4: Comparison of lipid parameters of various studies

Studies	Total cholesterol		HDL		LDL		VLDL		Triglyceride	
	Study group	Comparison group	Study group	Comparison group	Study group	Comparison group	Study group	Comparison group	Study group	Comparison group
Tanzeela N et al	219.06 ± 35.05	214.51 ± 28.81	42.82 ± 8.70	60.44 ± 7.85	124.40 ± 14.0	120.8 ± 16.4	56.65 ± 7.20	41.17 ± 5.06	265.70 ± 35.9	212.90 ± 25.20
Khaliq F et al	220.95± 45.38	209± 13.6	77.17± 11.89	35.4± 2.7	124.61± 40.88	148.4± 13.6	52.10± 15.46	36.8± 4.8	260.83± 77.35	186.3± 20.9
Saha D et al	235.37± 4.125	135± 8.7	41.75± 3.41	61.1± 2.8	135.97± 3.659	83± 4.7	53.89± 1.15	26±5	273.12± 8.1	120± 20
Kaur et al	224.36± 43.68	180.77± 36.58	39.68±7 .50	43.72±7 .35	132.87± 23.74	112.14± 25.15	36.51±8 .10	31.10±6 .64	184.48± 35.63	157.09± 28.10
MisraM K et al	236.2 ± 5.9	213.5 ± 4.3	39.95 ± 1.3	58.90 ± 0.98	147.64 ± 4.2	122.34 ± 4.8	57.72 ± 0.82	44.85 ± 1.3	287.1 ± 3.7	228.6 ± 6.4
Sangeeta N et al	255.60± 70.65	207.26± 21.80	45.46±1 4.13	55.77±9. 68	132.24± 61.10	103.64± 17.18	55.55±2 5.91	36.92±7. 04	274.97± 127.66	189.41± 41.69
Agbara J O et al	255.2 ± 36.7	205.0 ± 22.0	54.1 ± 13.2	64.6 ± 9.7	174.0± 39.1	122.6 ± 15.5	24.4± 5.4	18.2± 2.7	278.1 ± 62.0	207.3 ± 31.9
Rubina A et al	177.5 + 57.19	183.5 + 12.88	39.75 + 11.99	51.18 + 06.09	117.93 + 12.56	108.43 + 06.60	–	–	232.18 + 106.41	113.12 + 21.3

As oestrogen levels are increased during pregnancy which induces hepatic biosynthesis of endogenous triglycerides, which is carried by VLDL. These combined effects of enhanced liver production of triglycerides, LDL, VLDL and decrease removal of these particles from the circulation due to low lipoprotein lipase activity finally results in deposition of these components in uterine spiral arteries and contribute to hyper coagulability and endothelial dysfunction finally resulting in preeclampsia.

The lipid profile values studied in the present study between the three groups- non-severe preeclampsia, severe preeclampsia and eclampsia. It was observed that the total cholesterol was increased in eclampsia group (100%) and severe preeclampsia group (83.3%). The levels of LDL and VLDL were noted to be significantly higher in severe preeclampsia and eclampsia in comparison to non-severe preeclampsia. No significant difference found between serum triglyceride levels and HDL levels and severity of preeclampsia. However, study done by

Rekha K et al,[16] Kondakasseril NR et al[17] and Abdel AA et al[18] showed that the total cholesterol, triglycerides and LDL levels were increased with increasing severity of preeclampsia whereas HDL levels were decreased with the increasing severity of preeclampsia whereas study done by Agbara J O et al showed raised levels of triglycerides, total cholesterol and low-density lipoprotein in severe pre-eclamptics compared non-severe pre-eclamptics and there was no difference in HDL with increasing severity.[19]

CONCLUSIONS

In the present study there was lipid profile abnormality noted which was marked with the severity of the disease. LDL and VLDL were significantly higher in severe preeclampsia and eclampsia; but no significant difference found between serum triglyceride levels and HDL levels. Many multicentric cross sectional studies are required to be conducted to determine the reference range of lipid profile in pregnancy and its role in preeclampsia and to assess its impact on severity of pre-eclampsia.

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