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Original Research Article

Feto-maternal impact of altered lipid profile in pregnancy

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ABSTRACT

Background: This study was aimed to evaluate the association of lipid profile with development of feto-maternal complications.
Methods: This observational study was carried out in the Department of Obstetrics and Gynecology, Pt. J.N.M. Medical College Raipur during August 2015-November 2016. Total 200 study subjects were evaluated who were having normal lipid profile in 1st trimester.
Results: Out of 200 antenatal women recruited in our study, 129 had normal lipid profile throughout pregnancy and 71 women developed dyslipidemia.89 % of those women having normal lipid profile did not develop any maternal or perinatal complication, showing a high negative predictive value (88.72%) and high specificity of 91.47%. We observed that the onset of dyslipidemia occurred in 2nd trimester and it was progressive. About 83.58 % of them developed toxemia of pregnancy (GHTN, preeclampsia, eclampsia), positive predictive value of 83.58%. The levels of TC (total cholesterol), TG(triglyceride), VLDL (very low-density lipoprotein) and LDL (low density lipoprotein) were significantly ($p<0.0001$) higher in hypertensive women than normotensive women. Dyslipidemic women have developed significant ($p= 0.00001$) level of perinatal complications like preterm (18.05%), IUGR (15.28%) and IUD (13.89%). Sensitivity- 78.9, Specificity- 88.72, Positive likelihood ratio-9.25, Negative likelihood ratio- 0.23.
Conclusions: Early pregnancy dyslipidemia was significantly associated with an increased risk of preeclampsia and eclampsia. Thus, evaluating dyslipidemia in 1st and 2nd trimester may help in early prediction and management of maternal as well as fetal complication.

Keywords: Eclampsia, IUGR, IUD, Lipid profile, Preeclampsia

INTRODUCTION

Hypertensive disorders complicate approximately 10% of all pregnancies worldwide, with onset of symptoms in the late second or third trimester, most commonly after the 32nd week.[1] The national incidence is reported to be 8-10%.[2] Preeclampsia is one of the major cause of maternal mortality in developed and developing countries. It is also a leading cause of perinatal morbidity and mortality and it is very strongly related to fetal growth retardation. To avoid complications, it is very important to diagnose it early, but the available tools are unable to clinch the diagnosis of preeclampsia effective in majority. Pregnancy-induced hypertension(PIH) is one of the major risk factors in present day health care practice because it not only causes maternal mortality but also impaires fetal development during pregnancy.[3]

Pre-eclampsia is a multi-system disorder of pregnancy, which is characterised by new onset hypertension and proteinuria that develop after 20 weeks of gestation in previously normotensive women. Pregnancy-induced hypertension(PIH) is one of the major risk factors in present day health care practice because it not only causes

maternal mortality but also impaires fetal development during pregnancy.[4]

The mechanism of causation of preeclampsia is not well understood. The available tools for its diagnosis are effective only when the disease sets in, and in many cases at this stage; it becomes difficult to prevent complications. It is necessary to diagnose this condition in advance so that the complications of mother as well as fetus may be prevented.

It is seen that severity of preeclampsia is directly related to levels of TC, TG, VLDL and LDL levels.[5] In pregnancy, lipolysis of TG-rich lipoproteins is reduced because of decreased lipolytic activities of the mother. In Pre-eclampsia, the vascularization of the fetoplacental unit may be impaired, resulting in yet-undefined compensatory mechanisms that may further increase synthesis of maternal Triglyceride (TG) levels. In addition, the decreased catabolism of TG-rich lipoproteins by reduced placental uptake and the concomitant decrease of lipoprotein lipolysis results in the accumulation of TG-rich remnant lipoproteins in the maternal circulation. Remnant lipoproteins may induce platelet activation and endothelial dysfunction, thus leading to the serious complication of Pre eclampsia.

METHODS

This study was a prospective observational study which was conducted in the Department of Obstetrics and Gynaecology, Dr. B.R.A.M. Hospital, Raipur, in women attending antenatal clinic. All the women in first trimester were recruited for the study. Their lipid profile was done in each trimester. All the necessary medication was given to the patient. Any variation in BP, proteinurea and lipid profile were recorded. The fetal and maternal outcome and complications was recorded and analysed.

Serum lipid profile estimation was done by enzymatic method. LDL cholesterol (LDL-C) was calculated byFrederickson-Friedwald's formula according to which

LDL cholesterol = Total cholesterol - HDL cholesterol - Triglycerides (TG)/5.

VLDL cholesterol (VLDL-C) was calculated as 1/5 of Triglycerides (TG). Lipid profile concentration was measured in milligram per deciliter (mg/dl).

Exclusion criteria

Patients with diabetes mellitus, gestational diabetes, chronic hypertension (hypertension arising before 20 weeks gestation), coronary artery disease, chronic obstructive pulmonary disease (COPD).

Statistical analysis

The continuous data were summarized as mean and standard deviation while discrete (categorical) in numbers and percentage (%). The continuous variables (Lipid profile: TC, TG, HDL-C, VLDL-C, LDL-C; Blood pressure: SBP and DBP) were compared by independent student's t test. The categorical variables were compared by chi-square ($\chi 2$) test. The $p<0.05$ was considered statistically significant with confidence interval of 95%.

RESULTS

Out of 200 antenatal women recruited in our study, 129 had normal lipid profile throughout pregnancy and 71 women developed dyslipidemia. The age distribution among the two groups was not significant. Most of the women were primigravida among both dyslipidemic women and women with normal lipid profile, 59.69 and 56.34% respectively (Table 1).

Table 1: Demographic distribution of study participants (N=200).

		Normotensive		Hypertensive		P value
		N=133	%	N=67	%	
Age group	Mean	24.61		25.63		
Parity	0	77	59.69	40	56.34	0.804
	1	43	33.33	25	35.21	
	2	06	4.65	05	8.45	
	>2	03	2.33	01	00	
Diet	Vegetarian	68	55.74	38	48.72	0.3319
	Non-vegetarian	54	44.26	40	51.28	
BMI	Underweight	40	20.49	21	11.54	0.1002
	Normal	88	68.03	33	62.82	
	Obese	05	11.48	13	25.64	0.0093
BP	SBP (mean)	109.36		110.3		0.66
	DBP (mean)	74.19		76.32		0.33

Study participants when divided according to their BMI (Table 1). It was found that 59% of underweight women had normal lipid profile among which 91.7% remain normotensive while 41% women had dyslipidemia among which 72% women develop hypertension. 72% obese women had dyslipidemia and 77% among them develop GHTN. The distribution according to diet, religion and area of residency among both groups were not significant. 89 % of those women having normal lipid profile did not develop any maternal or perinatal complication, showing a high negative predictive value (88.72%) and high specificity of 91.47%. We observed that the onset of dyslipidemia occurred in 2nd trimester and it was progressive (Table 2).

Table 2: Distribution according to total cholesterol and triglyceride level.

Level		Number of patient					
		1st trimester		2nd trimester		3rd trimester	
		n=200	%	n=200	%	n=200	%
Cholesterol level	140-220 (N)	194	97	133	66.5	119	59.5
	220-300	06	03	69	34.5	70	35
	>300	00	00	08	04	11	5.5
Triglyceride level	30-200 (N)	181	90.5	121	65.5	115	57.5
	200-250	16	08	68	34	71	35.5
	>250	03	1.5	11	5.5	14	07

Table 3: Comparison of lipid profile among normotensive and hypertensive patients.

	Normotensive	Hypertensive	Difference	P value
Mean total cholesterol	171.97	237	63.44 (26.77%)	<0.0001
Mean TG	147.80	237.58	88.02 (37.05%)	<0.0001
Mean LDL	80.04	154.63	74.59 (48.24%)	<0.0001
Mean HDL	34.74	35.52	0.78 (0.02%)	0.38
Mean VLDL	29.85	47.53	17.68 (37.20%)	<0.0001

Table 4: Maternal outcome among participants.

	Participants with normal lipid profile		Participants with dyslipidemia		P value
	n=129	%	n=71	%	
No complication	99	76.82	20	27.55	<0.00001
GHTN	13	10.14	10	14.48	0.0105
Preeclampsia	15	11.59	33	46.38	0.00012
Eclampsia	02	1.45	8	11.59	0.00034

p-value<0.00001

Table 5: Fetal outcome among participants.

	Participants with normal lipid profile		Participants with dyslipidemia		P value
	n=129	%	n=71	%	
No complication	107	82.81	37	52.78	<0.00001
IUGR	12	09.38	11	15.28	0.209
IUD	04	03.16	10	13.89	0.0042
Preterm	06	04.69	13	18.05	0.00197

p-value 0.000032

About 83.58% of dyslipidemic women developed toxemia of pregnancy (GHTN, preeclampsia, eclampsia) (Table 3), positive predictive value of 83.58%.

The levels of TC (total cholesterol), TG (triglyceride), VLDL (very low-density lipoprotein) and LDL (low density lipoprotein) were significantly (p<0.0001) higher in hypertensive women than normotensive women. Dyslipidemic women have developed significant (p= 0.00001) level of perinatal complications like preterm (18.05%), IUGR (15.28%) and IUD (13.89%) (Table 5). Sensitivity of this investigation is 78.9 and Specificity is 88.72%. The Positive likelihood ratio-9.25and Negative likelihood ratio- 0.23.

DISCUSSION

In our community based study, it was found that a strong association of dyslipidemia (raised levels of TC, TG, LDL) and development of hypertensive disorders of pregnancy i.e. gestational hypertension, pre eclampsia, eclampsia as well as intra uterine growth restriction and inta uterine death of fetus.

Women in whom TG level were severely increased (>250mg/dl) in first and then into second trimester, the chances of developing preeclampsia were found to be significant. Other studies have also supported our finding.[4,5] Singh et al stated that the level of TG was found to be elevated in women with pre eclampsia compared to their normotensive counterpats.[4] Vrijkotte TG et al reported that with each unit increase in triglyceride was linearly associated with an increased risk of PIH.[5]

In present study the onset of dyslipidemia occured in insidious manner in 2nd trimester and was observed to be progressive which precedes culmination in complication.

There was very strong positive association of elevated levels of LDL, VLDL, TC and TG with development of hypertensive disorders. Many other studies also demonstrated this correlation.[6-11] Jin WY et al, Saha D et al, Saxena S et al, Vidyabati RK, Islam NAF and Aziz R they all agree on the fact that dyslipidemia was significantly associated with pre eclampdia and eclampsia.[6-11]

As hypertensive disorder developed, there was development of fetal complications. The women with severe dyslipidemia developed fetal complication of severe IUGR and IUD in their late second and early third trimester with very poor outcome.

The women who developed dyslipidemia consequently developed preeclampsia (46.38%) and eclampsia (11.59%). These women also had poor fetal outcome as for preeclamsia had to be induced resulting in preterm deliveries.

89% of those women having normal lipid profile did not develop any maternal or perinatal complication, showing a high negative predictive value (88.72%).

In present study, the difference in HDL levels of hypertensive and normotensive patient were found insignificant ($p>0.05$). While some previous studies have shown significant decrease in HDL level among hypertensive patients.[3,9,12,13]

In present study maternal dyslipidemia occurs with preeclampsia and eclampsia. There is accentuation of the normal pregnancy changes. Mean triglycerides and free fatty acid (FFA) concentration increases about 2-3 fold on average in women with preeclampsia relative to uncomplicated preganacy. Of particular significance was that dyslipidemia becomes evident during 1st and 2nd trimester of pregnancy far preceding the clinical manifestations of preeclampsia.

CONCLUSION

Thus, estimation of maternal lipid profile in early trimester may help in early recognition of patient at risk of developing hypertensive disorder of pregnancy before the onset of clinical symptoms and their complications for maternal and fetal benefit. The findings of this study support strong relation between dyslipidemia and development of preeclampsia and eclampsia.

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