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Original article:

Elevated Lipid Profile in Second Trimester as predicator of Pregnancy-Induced Hypertension (PIH)

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Abstract

Introduction: A variety of biological, biochemical, and biophysical markers implicated in the pathophysiology of pre-eclampsia; during the last two decades have instigated the growing interest in this study to include lipid profile studies in the early second trimester as early predictors of pregnancy-induced hypertension. Early identification of at-risk women may help in taking timely preventive and curative management to prevent or delay complications associated with pregnancy-induced hypertension.

Method: A prospective study was performed on 100 patients attending the outpatient department of the Obstetrics and Gynaecology of the NRS Medical College, Kolkata. All the patients were screened for serum lipid profile in their early second trimester (14–20 weeks) and followed up till their delivery. Comparative studies serum lipid profile were performed between those who remain normotensive (group I) and those who developed pregnancy-induced hypertension (group II).

Results: BMI, total cholesterol, VLDL, LDL and HDL values for those women who developed PIH (group II) were significantly higher than those who remain normotensive (group I), with p value of <0.05 which is statistically significant.

Conclusion: Maternal lipid profile in second trimester is very good noninvasive test which can be used for prediction of pregnancy-induced hypertension before its clinical onset.

Keywords: Pregnancy-induced hypertension(PIH),TG, Total cholesterol, VLDL, LDL,HDL

Introduction

Pregnancy-induced hypertension(PIH) is one of the important medical problems that may arise during pregnancy. Cunningham et al. [1] describe hypertension in pregnancy as a major cause of maternal and perinatal morbidity, complicating 5–10 % of all pregnancies worldwide whereas pregnancy-induced hypertension has been identified in 3.9 % of all pregnancies. Early diagnosis, antenatal surveillance by competent medical professionals, and timely intervention are key to the management of pregnancy-induced hypertension in pregnancy. A variety of biological, biochemical, and biophysical markers are tested as predictors of pre-eclampsia . But unfortunately there are no completely reliable screening test that can reliably predict development of pregnancy-induced hypertension.

The most common pathophysiology of pregnancy-induced hypertension directs to early placental dysfunctions [2, 3]. In pathogenesis of pre-eclampsia, endothelial cell dysfunction is believed to be the main cause [4].

Association between serum lipid levels and pregnancy induced hypertension described by Van den Elzen et al. [5] and Sattar et al. [6] In pre-eclampsia main pathology is widespread vasospasm involving vascular beds of kidneys, uterus, placenta, and brain. Altered lipid synthesis causes reduction in PGI_2:TXA_2 ratio which play important role in the pathogenesis of pre-eclampsia [7].

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Methods

This was a prospective study, conducted on 100 patients. The study population included women with singleton pregnancy visiting antenatal outpatient department of the Department of Obstetrics and Gynaecology of NRS Medical College,Kolkata from January 2017 to December, 2017.

All pregnant women in this study were screened for serum lipid profile in their second trimester (14–20 weeks) by taking blood sample after 12 h of fasting. These values were recorded, and patients were followed up till their delivery. Comparative study of serum lipid profile were done between those who remain normotensive (group I) and those who developed pregnancy-induced hypertension (group II) in later half of pregnancy.

Exclusion criteria include the following:

Mothers with chronic hypertension,Kidney disease,hypertension diagnosed before 20 weeks of gestation,molar pregnancy,diabetes mellitus,multiple pregnancy,hypothyroidism

Informed consent was taken from the patient on their first visit . Patients were called on a predetermined date after 12 h of fasting, and blood sample was collected for serum lipid profile.

Statistical Analysis : Means ± SD of all parameters of interest were calculated for both groups, and the difference of means between the two groups was tested by t test. Chi square test was used to find out significant correlation .

Table no 1

Distribution of mean +/- SD of Lipid profile between two groups

Group Statistics					
	Group	N	Mean	Std. Deviation	P
CHOL	Case	19	210.58	16.557	0.018
	Control	81	199.56	18.363	
TGL	Case	19	194.05	22.387	0.088
	Control	81	185.95	17.463	
VLDL	Case	19	39.68	6.575	0.020
	Control	81	36.19	5.588	
LDL	Case	19	130.37	10.568	0.020
	Control	81	125.04	8.360	
HDL	Case	19	54.16	7.010	0.047
	Control	81	50.73	8.990	

Results

Out of these cases, 19 cases developed pregnancy-induced hypertension (group II), and 81 cases remained normotensive (group I).The prevalence of pregnancy-induced hypertension in our study was 19 %. Vidyabati et al. [8] found prevalence rate of pregnancy-induced hypertension as 17.68 %.

Table 1 shows that cholesterol , VLDL, and LDL values for those women who developed PIH were significantly higher than in the cases of those who remain normotensive, with *p* value <0.05 as shown in Table 1. We also observed statistical significance between HDL value and pregnancy-induced hypertension as shown in Table 1 as the *p* value is 0.047 that is inverse relationship between pre-eclampsia risk and HDL concentration

Discussion

In our study, 43.2 % of cases were in the age group of 25–29 years as shown in Table 2. There were only six cases aged more than 30 years, and they didn't develop PIH so the relation between age and PIH risk can't be established .

Table no 2

Distribution of cases according to age

	AGE GROUP					
	<19 yrs	19-24 yrs	25-29 yrs	>30 yrs	Total	*p* value
Gr.1 Cases-81	10	30	35	6	81	
% whole group	12.3%	37%	43.2%	7.5%	100%	0.082
Gr.2 Cases-19	8	6	5	0	19	
% whole group	42.1%	31.5%	26.4%	0	100%	
Total cases	18	36	40	6	100	
% whole gr.	18%	36%	40%	6%	100%	

Table 3

Distribution of cases according to parity

			Group		Total	P
			Control	Case		
PARITY	MULTI	Count	32	7	39	
		%	39.5%	36.8%	39.0%	
	PRIMI	Count	49	12	61	0.829
		%	60.5%	63.2%	61.0%	
Total		Count	81	19	100	
		%	100.0%	100.0%	100.0%	

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Out of the 100 cases of our study, 61 (61%) cases were primigravida and 39 (39 %) were multigravida. Twelve (63.2 %) cases out of the 19 with PIH were primigravida which suggests that PIH is more common in primigravida cases but this association between parity and PIH isn't statistically significant.

Table 4

Distribution of cases according to BMI

	Group	N	Mean	Std. Deviation	P
BMI	Case	19	24.95	4.490	0.018
	Control	81	22.43	4.003	

The association of BMI with development of PIH is significant.

In this study, we observed a statistically significant association between maternal early pregnancy dyslipidemia including higher total cholesterol, VLDL, HDL and LDL cholesterol levels and the risk of development of pre-eclampsia. In their study Lorentzen et al. [9] showed that serum-free fatty acids and triglyceride are increased before 20 weeks of gestation in pregnant women who develop PIH later. Clausen et al. [10] have shown that hypertriglyceridemic dyslipidemia before 20 weeks of gestation has association with the risk of developing PIH in later part of pregnancy. Cekmen et al. [11] concluded that serum triglyceride and LDL levels were significantly higher in mothers with PIH than in controls and serum HDL levels were significantly lower in PIH cases than in control group. Vidyabati et al. [8] concluded that total cholesterol; VLDL, and LDL were significantly higher in women who developed PIH than in normotensive patients.

Our results, when compared with those of other similar studies, indicate that dyslipidemia has association with PIH and thus may have role in the pathophysiology pregnancy-induced hypertension(PIH) .

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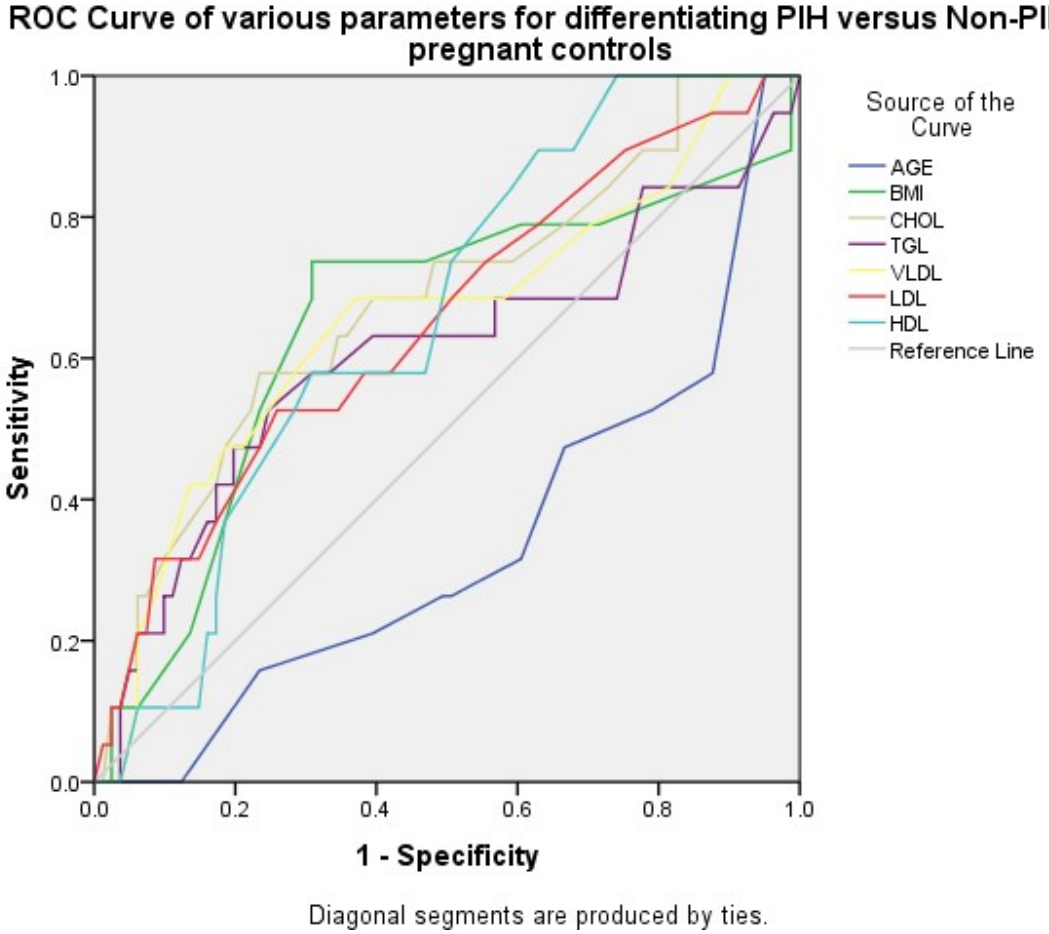
Figure ***1***


ROC Curve of various parameters for differentiating PIH versus Non-PIH pregnant controls
Sensitivity
1 - Specificity
0.0
0.2
0.4
0.6
0.8
1.0
Source of the Curve
AGE
BMI
CHOL
TGL
VLDL
LDL
HDL
Reference Line
Diagonal segments are produced by ties.

Area Under the Curve of different variable in ROC Curve					
Test Result Variable(s)	Area	Std. Error[a]	Asymptotic p.[b]	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
AGE	.335	.070	.026	.198	.473
BMI	.747	.078	.046	.615	.880
TOTAL CHOLESTEROL	.779	.071	.015	.640	.839
TGL	.605	.083	.157	.443	.767
VLDL-CHOLESTEROL	.754	.075	.037	.606	.882
LDL-CHOLESTEROL	.750	.072	.043	.609	.891
HDL-CHOLESTEROL	.656	.061	.035	.537	.676
The test result variable(s): AGE, BMI, CHOL, TGL, VLDL, LDL, HDL has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.					
a. Under the nonparametric assumption					
b. Null hypothesis: true area = 0.5					

A rough guide for classifying the accuracy of a test variable on the basis of AUC in the traditional academic point system is as follows:

.90-1 = excellent (A)

.80-.90 = good (B)

.70-.80 = fair (C)

.60-.70 = poor (D)

.50-.60 = fail (F)

Thus we can say that BMI, Total Cholesterol, VLDL-Cholesterol and LDL-Cholesterol are predictors of PIH .

There are three hypotheses for association between dyslipidemia and pre-eclampsia . First, elevated plasma lipids may be a cause of endothelial dysfunction via oxidative injury [12] by generating free radicals [13]. These free radicals with polyunsaturated fatty acids, produce lipid peroxides which in turn influence vascular bed via stimulation of the arachidonic acid pathways [14]. Free radicals damages cellular membranes; inhibits vasodilatators such as nitric oxide (NO)[4]. All these have roles in the etiopathogenesis of PIH. Dyslipidemia may stop trophoblast invasion which in turn help in the development of PIH. The second mechanism is the pathologic process of PIH via dysregulation of lipoprotein lipase resulting in dyslipidemic lipid profile [15,16]. A third possible mechanism may be via hyperinsulinemia and hyperuricaemia, are also present in PIH[17].

Estimation of maternal lipid profile in second trimester can predict PIH early thus will help managing women with pregnancy-induced hypertension(PIH), before complication sets in which is essential for better feto-maternal outcome.

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Conclusion

Maternal lipid profile in second trimester is an effective noninvasive test, which can be used as a reliable predictor of pregnancy-induced hypertension(PIH) before its clinical onset.

Conflict of interest

None declared.

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