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Original Research Article

A cross sectional study to assess serum lipid profile among pregnant women suffering with pregnancy induced hypertension

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Abstract: Association of serum lipid profile with gestational proteinuric hypertension is highly suggested to reflect some new diagnostic tools. Simple measurement of serum lipid parameters may be of good predictive value in toxaemia of pregnancy, avoiding the costly endocrinal investigations. The objectives of present study is to study serum lipids in pregnancy induced hypertension and to determine if there is any change in lipid profiles in subject of preeclampsia as compared to normal antenatal female. The study was carried out on pregnant women and non-pregnant women attending or admitted in obstetrics and gynaecology department of NSCB Medical college and hospital, Jabalpur between 1stjune 2012 to 31st October 2013. Each serum sample from two groups was evaluated for total cholesterol, Triglyceride, HDL-Cholestrol, LDL –Cholesterol and VLDL-Cholesterol. Comparison is drawn and analysed using chi-square or fisher's exact statistic as appropriate.Dyslipidemia is found in the form of significantly increased total cholesterol, LDL, VLDL & Triglyceride concentration in patients of preeclampsia as compare to normotensive pregnant women.Dyslipidemia play an important role in pathophysiology of preeclampsia. The prevention and correction of various causative factors for dyslipidemia may significantly prevent development of preeclamsia.
Keywords: Preeclampsia; Lipid Profile

INTRODUCTION

Human pregnancy is associated with pronounced physiological hyperlipidemia. Serum triglycerides and cholesterol level increases steadily as pregnancy progress. These changes are mediated by gestational hormones PIH affect the functions of various organs involved in lipid and lipoprotein metabolism, particularly the liver and kidney.

PIH associated with a typical serum lipoprotein pattern, characterized by higher concentration of Triglyceride, VLDL, LDL, TC [1]. The most important feature of PIH is hypertension via vasospasm in kidney, uterus, placenta and brain. Primary source of prostacyclin and thromboxane are endothelial cells and thrombocyte respectively [2]. In normal pregnant woman endothelial prostacyclin's reaches 8-10 times more than a non-pregnant woman, but in preeclamptic woman this rising is only 1-2 times more. Oxidized LDL inhibits endothelial prostacyclin synthesis and inactivates endothelial derived relaxing factor and also stimulate synthesis and release of endothelin hormone which has vascular smooth muscle contracting effect. The most important feature in toxaemia of pregnancy is hypertension which is supposed to be due to vasospastic phenomenon in kidney, uterus, placenta and brain. Altered lipid synthesis leading to decrease in PGI2: TXA2 ratio is also supposed to be an important way of pathogenesis in pregnancy induced hypertension.

Women with prior preeclamptic pregnancies are increased risk for cardiovascular diseases [3]. Preeclamptic women are insulin resistant during and after pregnancy and higher Triglyceride levels. Metabolic changes seen in preeclampsia, such as insulin resistant, hypertriglyceridemia and hypertension similar to metabolic syndrome, consequently a predisposition to metabolic syndrome may induce women to develop preeclampsia.Women with a history of pre-eclampsia have significant differences in lipid parameters and an increased susceptibility to lipoprotein oxidation when

compared with women who had normal pregnancy. Disorders of lipoprotein metabolism are reported to be a major cause of hypertension and proteinuria in Pre-eclampsia[4].

Obviously the association of serum lipid profile with gestational proteinuric hypertension is highly suggested to reflect some new diagnostic tools. The hormonal imbalance is a prime factor for the etiopathogenesis of PIH and this endocrinal imbalance is well reflected in alteration of serum lipid profile. There-fore simple measurement of serum lipid parameters may be of good predictive value in toxaemia of pregnancy, avoiding the costly endocrinal investigations[5].

MATERIAL AND METHODS

Study design: Cross sectional study

Study period: 1st June 2012 to 31 st October 2013.

Study location: Department of Obstetrics and Gynecology N.S.C.B Medical College Jabalpur.

Study Groups: All pregnant women: Group A- Normotensive women. Group B- Hypertensive women.

Inclusion Criteria-All pregnant women age group 20-30yrswith similar socio demographic characters, parity, gravid, BMI- admitted in the department of Obst. &Gyne, NSCB Medical College, Jabalpur.

Exclusion criteria-Patients with history of hypertension, known case of Diabetes, renal disease thyroid disease.

Sample Size calculation-Sample size was determined using simple random sampling formulae-
$N=z2pq/d^2$

Where, z=1.96 at 5% alpha,95%of confidence and 80 power(beta),p is estimated prevalence of gestational hypertension which was assumed at 12%,q is 1-p and d is marginal error(absolute precision)which was considered 5%. This yielded 113 numbers required. Further multiplied by 1.5 as design effect to adjust clustering of samples and finally found total required sample size was 169 or 170 in each group.

After taking Blood Sample from all patients, on each sample from different groups following Investigations done-

Lipid Profile –
Serum cholesterol
HDL cholesterol
Direct LDL cholesterol
Serum triglyceride
VLDL Cholesterol
Cholesterol/HDL ratio

Statistical Analysis:

Data analysis and statistical methods selection-All case report forms were checked for completeness and inappropriateor illogical responses. The forms were entered using Microsoft 2007Excel worksheet. The databases were validated and all inconsistenciesand differences were resolved. Statistical analyses were performedusing STATA 12 for Windows (Stata Corp LP, Texas, and USA). Categoricaldata are presented as frequency counts (percent) and compared usingthe chi-square or Fisher's exact statistic as appropriate. Continuousdata are presented as means (standard deviation) and compared usingthe t-test.

OBSERVATIONS AND RESULTS:

This cross sectional study was carried out in department of Obstetrics and Gynecology during a period 1st June 2012 to 31st October 2013.168 normal pregnant women and 172 cases of PIH were studied. In PIH patients, the relevant finding were correlated with cardinal features of PIH namely hypertension, albuminuria and edema. These findings were compared with those obtained in group of patient with normal pregnancy.

Table 1: Distribution of Cases and Control in Different Age Groups

Age Groups	Case		Control	
	No.	%	No.	%
<=20yrs	30	17.44	29	17.26
21 - 25 yrs	119	69.19	109	64.88
26 - 30 yrs	18	10.47	20	11.90
31 - 35 yrs	4	2.33	7	4.17
=>36yrs	1	0.58	3	1.79
Total	172		168	

Pearson chi square = 2.3323 P = 0.675

The above table shows 69.19% of cases studied belonged to the age group 21-25yrs whereas 1% of cases above 36yrs and 17.44% were below 20 yrs. Means PIH women were mostly between the age group of 21-25 yrs.Only17.44% of them were comparatively younger and below 20yrs of age.

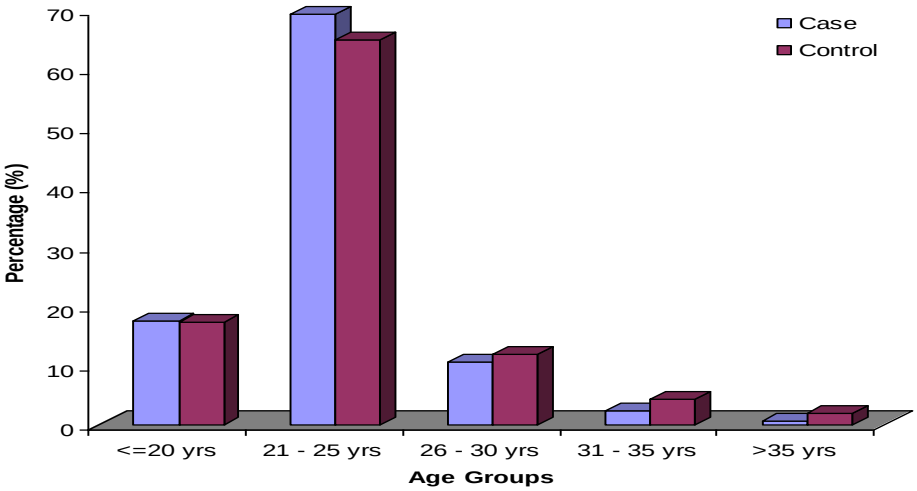

Fig-1: Chart showing distribution of cases in Study and Control groups by different age categories.

Table 2: Distribution of Cases and Control Based On Period of Gestation at Time of Test

Period of gestation at time of test	Case		Control	
	No.	%	No.	%
32	143	83.14	18	10.71
33	16	9.30	132	78.57
34	12	6.98	10	5.95
35	1	0.58	8	4.76
Total	172		168	

Chi Sq.: 193.6, P = < 0.01

In this 83.14% of cases were at 32 weeks and in control 78.57% were at 34 weeks of gestation. Difference in the two groups based on weeks of gestation was found to be highly significant. (P< 0.05)

Table 3: Distribution of Cases and Control According To Their Gravidity

Gravida		Case		Control	
		N	%	N	%
Primi		125	72.67	89	52.98
Multi		47	27.33	79	47.02
	2	31	18.02	61	36.31
	3	12	6.98	16	9.52
	4	3	1.74	2	1.19
	7	1	0.58	0	0.00
Total		172		168	

Pearson chi square= 14.1380 P< 0.0001

It shows that 72.67% of cases were primigravida 18.02% cases were 2nd and 12%cases were 3rdgravida.Means most of cases of PIH more frequently in primigravida. (p< 0.01)

Table 4: Comparison of SBP and DBP in Cases and Control

	Value	Mean	SD	[95% Conf. Interval]		t - test	p-value
Case	Systolic Blood Pressure (mm of Hg)	154.50	18.24	151.74	157.27	22.98	<0.0001
Control		117.99	9.63	116.52	119.45		
Case	Diastolic Blood Pressure(mm of Hg)	101.34	13.29	99.34	103.34	20.34	<0.0001
Control		77.98	6.79	76.94	79.01		

Blood pressure measurement was observed 154.50/101.34 (Systolic/Diastolic) mm of Hg in study subjects and 117.99/77.98 (Systolic/Diastolic) mm of Hg among control. The difference in systolic and diastolic blood pressure between study and control groups was found highly significant (P<0.0001). Study subjects were reported comparatively higher blood pressure than control groups.

Table 5: Lipid Profile in Cases and Control

	Variable	Mean	SD	95% Conf. interval		t -test	P-value
Case	TC(mg/dl)	189.50	70.05	178.87	200.14	0.72	>0.05
Control	TC(mg/dl)	184.78	47.25	177.58	191.98		
Case	HDL(mg/dl)	51.34	39.33	45.36	57.31	0.60	>0.05
Control	HDL(mg/dl)	49.39	14.65	47.16	51.63		
Case	LDL(mg/dl)	125.69	56.24	117.15	134.23	2.37	<0.025
Control	LDL(mg/dl)	113.73	33.61	108.61	118.85		
Case	VLDL(mg/dl)	44.59	24.10	40.90	48.27	5.25	<0.0001
Control	VLDL(mg/dl)	33.17	14.58	30.95	35.39		
Case	TRI Gl (mg/dl).	222.12	116.44	204.44	239.80	8.48	<0.0001
Control	TRI G(mg/dl)l.	137.00	58.09	128.15	145.85		
Case	Cholesterol HDL Ratio	4.46	2.07	4.15	4.78	3.27	<0.0015
Control	Cholesterol HDL Ratio	3.89	0.96	3.74	4.03		

- Total cholesterol of cases was 189.50+_70.05 mg/dl and 184.78+_47.25 mg/dl in control. Difference in this is not statistically significant (P>.05).
- HDL of cases was 51.34+_39.33 mg/dl and 49.39+_14.65 mg/dl in control. Difference in this is not statistically significant (P>.05).
- LDL of cases was 125.69+_56.24 mg/dl and 113.73+_33.61 mg/dl in control. Difference in this is statistically significant (P<.025).
- VLDL of cases was 44.59+_24.10 mg/dl and 33.17+_14.58 mg/dl in control. Difference in this is statistically significant (P<.0001).
- Triglyceride of cases were 222.12+_116.44 mg/dl and 137.00+_58.09 mg/dl in control .Difference in this is statistically significant (P<.0001).
- Cholesterol HDL ratio of cases were 4.46+_2.07 and 3.89+-.96 in control .Difference in this is statistically significant (P<.0015).
- LDL, VLDL, Triglycerides were higher among women with PIH as compared to normotensive pregnant women.
- Cholesterol HDL ratio was significantly higher among women with PIH (P<.0015).

DISCUSSION & CONCLUSION

Pregnancy induced hypertension (PIH) is a syndrome of hypertension in pregnancy, with or without edema and proteinuria. In a number of patients, the clinical appearance is mild, presenting only with small increase in blood pressure or protein in the urine. Though, in other patients severe maternal and fetal complications[6], such as the eclampsia, HELLP syndrome, preterm delivery, abruptio placenta, intra-

uterine fetal growth restriction or fetal death may take place.

Different lines of evidence indicate that abnormal lipid metabolism is not a mere manifestation but is also involved in the pathogenesis of disease. The concentration of total cholesterol, LDL, VLDL & triglycerides was found to be significantly increased in preeclamptic female as compare to normal pragnent female. Elevated triglyceride values may compromise vascular function in several ways. For example triglyceride rich lipoprotein has a prothrombotic activity. Elevated triglyceride might shift the pattern of LDL subclass towards disproportionate increase in smaller denser more allergenic LDL particle. It also stated that early pregnancy dyslidemia is associated with increased risk of preeclampsia[7].

The danger of pregnancy induced hypertension is higher when the age of pregnant women is less than 25 years. In our study, 69.19% of the patients were less than 25 years of age. A study from Andhra Pradesh done by Mohanty S *et al*.; in 2006, India reported that primiparous patients with PIH below 20 years of age were 26% while only 15% of the controls were less than 20 years, signifying that younger age of pregnant women was a causative feature to pregnancy induced hypertension[8]. Therefore, it can be assumed from the results of this study that younger age of pregnant women is commonly associated with PIH.

In our study group of PIH patients 72.67% of cases were primiparous. According to three cohort studies [9, 10, 11], Primiparity almost triples the risk for pregnancy induced hypertension (OR 2.91, CI 1.28 - 6.61); this is supported by adjusted odds ratios for Primiparity from two other cohort studies [12, 13]. Different case-control studies [9,13-16], propose that women with pregnancy induced hypertension are two times expected to be primiparous as women without PIH (OR 2.35, CI 1.80 - 3.06). A study from Canada reported, that women with hypertensive disorders were more expected to be nulliparous (range 42.2% -78,2%) when matched with normotensive (4 1.9%) pregnant women. In our study group of PIH patients 72.67% of cases were primiparous.

Increase of serum lipids through pregnancy in general and during pregnancy induced hypertension in particular is described in a number of studies. Worldwide diverse studies have reported elevated[17, 18] lipid levels in pregnancy induced hypertension patients.

Inthe present study, cholesterol concentration increased in the patients of pregnancy induced hypertension, but no significant changes in total cholesterol could be observed. These results are consistent with the findings reported in studies conducted in other populations[19, 20]. However some researchers Franz H *et al*.; [1] Mohanty*et al*.; [8] have found considerable rise in serum cholesterol in toxemia of pregnancy.

Triglyceride level was significantly raise in patients than control (p<.0001). In the Finnish and Peruvian population KaajaRel*et al*.; [20] and Ware js*et al*.; [21] that patients with pregnancy induced hypertension had higher mean triglyceride and lower mean serum HDL-C concentrations than the control group [21,22].

Low level of HDL-C in PIH is however not only because of hypoestrogenemia but also due to insulin resistance. In our study, the mean value HDLwas about 51.34+_39.33mg/dlin the pregnancy induced hypertensive patients over the pregnant women with normal pregnancy (49.39+_14.65mg/dl.).Mean value of HDL-C level were higher in cases than control, but that was not statistically significant (p>.05). It means in our population HDL level not significantly changed in PIH patient. May be because of this they had less complication as compared to population of other geographic area. PIH is multifactorial disorder so racial and genetic differences in population of different geographic area also affect the lipid profile, which require further study.Belo *et al* in their study concluded that preeclamptic women exhibited, in third trimester higher mean serum triglyceride concentration and lower high density lipoprotein cholesterol. They emphasized that this atherogenic lipid profile Inpreeclemptic females may be a potential contributor endothelial cell dysfunction [23].

In present study VLDL-C level rose significantly (p<.0001) in patients, which may be due to hypertriglyceridemia leading to increased entry of VLDL-C that carries endogenous triglyceride into circulation. According, to the reports of some Teichman AT *et al*.; [24], Kokia E *et al*.; [25], and Satter N *et al*.; [19].The VLDL-C level might raise up to 2.5 folds at term over the pre-pregnancy level. VLDL-C level further elevates in pregnancy induced hypertension as found in the present study in validation with those of other researchers[19, 26] perhaps due to increased VLDL-C which accumulate over the maternal vascular endothelium, mainly those of uterine and renal vessels.

The change in LDL –C was significant between the groups of patients and controls. LDL-C was significantly raise in cases than control (p<.025). A study conducted on Ghanaian women by Ahenkorahl*et al*.; [27] with pregnancy induced hypertension reported that there was a significant increase in triglycerides and LDL-C in the patient groups compared to the control. The lipid peroxidation marker Malondialdehyde (MDA), among the pregnancy induced hypertension subjects was significantly increased as compared to the normotensive pregnant women. A significant positive correlation between MDA and systolic and diastolic

blood pressure was also observed. The study obviously indicated that Ghanaian women presenting with pregnancy induced hypertension are very prone to dyslipidemia as well as lipid peroxidation.

We currently rely on secondary prevention of PIH. But derangement of lipid profile would have been started from earlier gestation. So by measuring lipid profile in first trimester we can predict chances of Preeclampsia and by taking precautions prevent this. We concluded that derangement of lipid profile significantly happen in preeclampsia and its play an important pathological role. It should be used as a diagnostic and prognostic indicator of preeclampsia. These can studies further be extrapolated to not just prediction but also primary prevention of PIH by administration of **a**ppropriate antioxidants like vit c, Vit.E and vit D.

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