

Comparative Study of Lipid Profile in Normotensive and Hypertensive Pregnant Women

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Abstract

Introduction: Hypertension (HTN) during pregnancy is one of the leading causes of maternal and perinatal morbidity and mortality. Dyslipidemia is critical in the pathogenesis of endothelial dysfunction. There are a very few studies in this regard from South India. This study compared lipid levels in the hypertensive and normotensive pregnant women and correlated them with the maternal outcome.

Methods: This was a prospective, comparative study done at JSS hospital, a tertiary care teaching hospital in Mysore city between December 2012 and April 2014. About 70 patients with HTN in pregnancy, and 70 age-matched normotensive pregnant controls were taken up and lipid levels were analyzed statistically.

Results: The majority of the pregnant patients were in the age group of 21-25 years (47.1%) with a mean age of 22 years. The primigravida were 76 (54.3%), the second and third gravida 49 (35%) and 14 (10%), respectively. The mean values of total cholesterol in normotensives was 172 (Standard deviation [SD] \pm 40.8) mg/dl and in hypertensive 279.5 (SD \pm 73.2) P < 0.0001. Mean high density lipoprotein-cholesterol in the hypertensives was 43.3 mg/dl (SD \pm 15.4) and in normotensives 53 mg/dl (SD \pm 11.3) P < 0.0001. Low-density lipoprotein-cholesterol (LDL-C) was significantly increased in hypertensives - mean 162.4 mg/dl (42.8) and 88.4 (SD \pm 30.3) mg/dl in normotensives P < 0.0001. Very LDL-C was significantly increased in hypertensives with mean 68.3 mg/dl (SD \pm 27.9) mg/dl while in normotensives it was 28.7 mg/dl (SD \pm 11.3). Hypertensive patients had a mean triglycerides (TG) of 290.7 mg/dl (SD \pm 126.5) while in normotensive mean TGs was 152.8 mg/dl (SD \pm 48.4) P > 0.0001. 25 (35.7%) in the hypertensive group had full term normal delivery compared to 46(65.7%) normotensive patients P = 0.001. 45 (64.3%) in the hypertensive group had caesarean section compared to 24 (34.3%) in the normotensive group P = 0.001.

Conclusions: The lipid profile parameters were significantly abnormal in hypertensive pregnant patients. Significantly, the more hypertensive pregnancies with dyslipidemia underwent caesarean section Serum lipid levels should be monitored in pregnancy to prevent obstetric complications.

Key words: Cesarean, Endothelial dysfunction, Hypertension, Lipid profile, Preeclampsia

INTRODUCTION

Hypertension (HTN) during pregnancy is a major health problem. It is the one of the leading causes of maternal and perinatal morbidity and mortality.¹ Lipid values in normal pregnancies change with gestational age. HTN and dyslipidemia are major risk factors for cardiovascular

disease (CVD) and account for more than 80% of deaths and disability in low- and middle- income countries. It is widely accepted that CVD is associated with HTN and increased blood levels of low-density lipoprotein (LDL), total cholesterol (TC), and triglycerides (TGs).^{2,3} In contrast, a low level of high-density lipoprotein (HDL) is a risk factor for mortality from CVD.⁴ In a normotensive pregnancy serum TGs, TC and HDL increase during pregnancy but lipoprotein A level decreases. These changes are reported to be secondary to hormonal changes during pregnancy.

Preeclampsia (PE) is a leading cause of morbidity and mortality in pregnant women. It is characterized by HTN and an increased systemic inflammatory response

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potentially initiated by widespread endothelial damage dysfunction. Women with PE demonstrate marked dyslipidemia. It has been observed that the concentration of serum TC, serum TGs, HDL-cholesterol (HDL-C), and LDL-cholesterol (LDL-C) in normal pregnant women increased with increasing age.⁵ Most of the available literature is from Western sources carried out on Caucasian populations. Ethnic variations in lipid parameters are well recognized. There are very few studies in this regard from India more so the Southern region of India. Hence, there was a need to study the lipid profile changes in hypertensive pregnant women in comparison with normotensive pregnant women.

Objective of the Study

The primary objective was to compare the lipid profile in hypertensive and normotensive pregnant women, and the secondary objective was to note the maternal outcome with lipid profile changes.

MATERIALS AND METHODS

This was a prospective hospital-based comparative study of antenatal cases admitted in Obstetrics Department, JSS hospital, a tertiary care teaching hospital attached to JSS University carried out between December 2012 and April 2014. HTN in pregnancy was defined as blood pressure (BP) 140/90 mm of Hg. 70 Ante-natal hypertensive cases were and 70 normotensive pregnant were enrolled. The hypertensive pregnant group included gestational HTN, chronic HTN, PE, superimposed PE and eclampsia. Pregnant patients with gestational diabetes mellitus, obesity and those with family history of hyperlipidemia were excluded from the study.

A blood sample of 3 ml was collected from the subjects after 8-10 h of fasting in a vacutainer not coated with any anticoagulant. The blood was processed in biochemistry lab of JSS hospital to obtain the values of TC, HDL-C, TGs, LDL-C the test method used for TC, HDL-C, LDL-C was enzymatic method and that for TGs is glycerol-3-phosphate oxidase-PAP method. The samples were processed in "Automated Chemistry Analyzer" (Toshiba).

The normal values of lipid profile according to recent National Cholesterol Education Programme Guidelines were taken as follows:

TC: <200 mg/dl, LDL-C: <100 mg/dl, HDL-C: > 40 mg/dl

TGs: 35-<150 mg/dl, very LDL-C (VLDL-C): <30 mg/dl

The study was presented before and cleared by the Institutional Ethical Committee of JSS Medical College.

Statistical Analysis

The values obtained were compared between the hypertensive and normotensive groups. The Descriptives procedure was used to display univariate summary statistics for several variables in a single table. The Frequencies procedure was used for describing many types of variables. The Crosstabs procedure was used to measure of association for two-way tables. The Chi-square test procedure was used to tabulate variables into categories. $P < 0.005$ was assessed for statistical significance. All the statistical methods were carried out through the SPSS for Windows (version 16.0).

RESULTS

The majority of the pregnant patients were in the age group of 21-25 years (47.1%) with a mean age of 22 years. 45 (32.1%) were in 39 weeks of gestation. The primigravida were 76 (54.3%), second and third gravida 49 (35%) and 14 (10%), respectively, (Table 1). Mean values of TC in normotensives was 172. (Standard deviation [SD] \pm 40.8) mg/dl and in the hypertensive group it was 279.5 (SD \pm 73.2) $P < 0.0001$. Mean HDLC in hypertensives was 43.3 mg/dl (SD \pm 15.4) and in normotensives was 53 mg/dl (SD \pm 11.3) $P < 0.0001$. LDL-C was significantly increased in hypertensives with a mean of 162.4 mg/dl (42.8) while it was 88.4 (SD \pm 30.3) mg/dl in normotensives $P < 0.0001$. VLDLC showed a significant increase in hypertensive patients with mean of 68.3 mg/dl (SD \pm 27.9) mg/dl. In normotensives it was 28.7 mg/dl (SD \pm 11.3). Hypertensive patients had a mean TGs of 290.7 mg/dl (SD \pm 126.5) while in normotensive mean TGs was 152.8 mg/dl (SD \pm 48.4) $P < 0.001$ (Tables 2 and 3). 25 (35.7%) in the hypertensive group had full term normal delivery compared to 46 (65.7%) normotensive patients $P = 0.001$. 45 (64.3%) in the hypertensive group had lower segment caesarian section compared to 24 (34.3%) in the normotensive group $P = 0.001$ (Table 4).

Table 1: Distribution of patients according to their age, BMI, POG in both hypertensive and normotensive state

Patient parameter	n	Mean \pm SD	P value
Age (years)			
Normotensive	70	24.5942 \pm 3.46121	0.2
Hypertensive	70	25.4429 \pm 3.54939	
BMI (kg/m ²)			
Normotensive	70	21.6377 \pm 2.19606	0.7
Hypertensive	70	21.5286 \pm 1.51056	
POG_weeks			
Normotensive	70	39.17 \pm 1.014	0.09
Hypertensive	70	38.19 \pm 4.750	

BMI: Body mass index, POG: Periods of gestation, SD: Standard deviation

DISCUSSION

CVD in non-pregnant is directly associated with increased levels of TC, TGs, LDL and VLDL whereas, at the same time, the levels of HDL are decreased. TC, TGs, LDL, and VLDL are known as bad cholesterol as they play their destructive role in several diseases.

In early pregnancy, it has been shown that altered levels of serum lipids increase the risk of pregnancy-induced HTN (PIH).^{6,7} Pregnant women are having HTN usually have higher levels of TC, TGs, LDL, and VLDL whereas, the levels of HDL are decreased as compared to that in normal pregnant women.⁸ In the present study, we investigated the correlation of lipid levels with the systemic BP throughout the pregnancy period. Normotensive pregnant women were taken as a control group and hypertensive pregnant women as a study group. The mean age was 22 years in both the study group and control group.

In the hypertensive group, it was noted that TC, LDL, VLDL and TGs were statistically significantly higher in the hypertensive group whereas there was no significant statistical difference in the levels of HDL between the two groups. The results of our study are consistent with that of Wald *et al.*⁹

Table 2: Lipid profile values in hypertensive and normotensive state

Lipid parameter	n	Mean±SD	P
TC (mg/dl)			
Normotensive	70	172.9565±40.74398	<0.0001
Hypertensive	70	259.9143±76.61852	
HDL (mg/dl)			
Normotensive	70	53.0290±11.35130	<0.0001
Hypertensive	70	43.3286±14.72917	
LDL (mg/dl)			
Normotensive	70	88.4493±30.47107	<0.0001
Hypertensive	70	154.6857±47.98688	
VLDL (mg/dl)			
Normotensive	70	28.7681±11.38904	<0.0001
Hypertensive	70	65.0000±26.73488	
TGs (mg/dl)			
Normotensive	70	152.8406±48.63115	<0.0001
Hypertensive	70	275.3857±123.24858	

TC: Total cholesterol, HDL: High-density lipoprotein, LDL: Density lipoprotein-cholesterol, VLDL: Very density lipoprotein-cholesterol, TGs: Triglycerides, SD: Standard deviation

The results of our study are similar to the results of study done by Anjum *et al.*¹⁰ in Pakistan. This can be because of the similar ethnicity of the population studied. TC and LDL-C. VLDL TGs components of lipid profile were increased in the hypertensive group when compared with normotensive group, and HDL was significantly lower and their results were comparable to various other studies.¹¹⁻¹⁵

Normally, in early, pregnancy altered levels of serum lipid profile increase the risk of PIH. Pregnant women with HTN usually have high levels of TC, TGs, LDL, VLDL, whereas levels of HDL are decreased as compared to that in normotensive pregnant women. PIH may cause several critical problems in pregnancy such as preterm deliveries, intrauterine growth restriction, fetal death, maternal mortality, and morbidity. Several factors responsible for PIH have been identified but among them the most important are lipid components. It has been reported that metabolism of lipoprotein is directly associated with PIH. The association of abnormal lipid values in the promotion of HTN in pregnant women helps to investigate the underlying pathological process of HTN in pregnancy. PIH is characteristically associated with hypertriglyceridemia.¹⁶ The principle modulator of hypertriglyceridemia is estrogen which is also associated with hyperestrogenemia during pregnancy. Estrogen induces hepatic production of TGs that causes PIH and endothelial dysfunction through the generation of LDL and VLDL. Endothelial dysfunction is the most important event in the pathogenesis of HTN during pregnancy, and abnormal levels of lipid profile play their critical role in the induction of endothelial dysfunction. The limitation of this study could be the small sample size which might need to be increased in future large-scale similar studies for better results.

CONCLUSION

Dyslipidemia is more profound in hypertensive pregnant women than in those with normal BP. Lipids may have an important role in the etiopathogenesis of PE. Serum lipid profiles should be monitored during pregnancy.

Table 3: Mean lipid values in normotensive and various hypertensive state

Lipid parameter	Normotensives	PE	Gestational HTN	Eclampsia	Chronic HTN	Superimposed PE
TC (mg/dl)	172.3	279.5	228.4	237.0	178	180.5
HDL (mg/dl)	53.1	43.2	44.4	40.3	60	39
LDL (mg/dl)	88.4	162.4	145.8	147.3	100	103
VLDL (mg/dl)	28.7	68.3	57.1	74.3	48	34.5
TGs (mg/dl)	152.4	290.7	251.8	269.8	247	149.5

P<0.0001, HTN: Hypertension, TC: Total cholesterol, HDL: High-density lipoprotein, LDL: Density lipoprotein-cholesterol, VLDL: Very density lipoprotein-cholesterol, TGs: Triglycerides, PE: Preeclampsia

Table 4: Distribution according to mode-of-delivery in hypertensive state

Hypertension status	Mode-of-delivery (n (%))		Total
	FTND	LSCS	
Normotensive	46 (65.7)	24 (34.3)	70
PE	13 (28.9)	32 (71.1)	45
Gestational HTN	9 (56.3)	7 (43.8)	16
Eclampsia	1 (16.7)	5 (83.3)	6
Chronic HTN	0 (0.0)	1 (100.0)	1
Superimposed PE	2 (100.0)	0 (0.0)	2
Total	71 (50.7)	69 (49.3)	140

HTN: Hypertension, LSCS: Lower segment caesarian section, FTND: Full term normal delivery, PE: Preeclampsia

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