

A Study of Comparison of Serum Lipid Profile of Women with Pregnancy Induced Hypertension and Normal Pregnancy

Sandhya Kumari¹, Sushma Sinha², Lata Shukla Dwivedy³

^{1,2}Assistant Professor, Department of Obstetrics & Gynaecology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar

³Professor and Head of Department, Department of Obstetrics & Gynaecology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar

Received: 24-05-2023 / Revised: 22-06-2023 / Accepted: 25-07-2023

Corresponding author: Dr. Sushma Sinha

Conflict of interest: Nil

Abstract:

Background: One of the main causes of fetomaternal morbidity is pregnancy-induced hypertension. Studies have indicated that early-stage PIH patients have altered serum lipid metabolism, which may aid in predicting PIH. The study's objective was to examine the levels of serum lipids in women with naturally occurring pregnancy and hypertension.

Methods: From August 2021 to July 2022, the study was carried out at the Department of Obstetrics and Gynecology, ANNMCH, Gaya, Bihar. In each group, 40 women were chosen after exclusion and inclusion criteria were applied. A thorough history and clinical examination were followed by a routine investigation, lipid profile assessment, and data analysis.

Results: Serum lipid level in the PIH group was significantly higher compared to normal group. Women with PIH had significantly higher values of total cholesterol (348mg/dl, SD±45), Triglycerides (368 mg/dl, SD ±39), LDL (201 mg/dl, SD±17)and VLDL (107 mg/dl, SD±11) as compared to normotensive pregnant women, total cholesterol (135mg/dl, SD±8.7), Triglycerides (120mg/dl, SD ±20), LDL(83 mg/dl, SD ±4.7)and VLDL(26mg/dl, SD±5) with p value of 0.0001. However HDL level is found to be significantly higher (p value<0.05) in normal group (61 mg/dl, SD 2.81) as compared to PIH group (34.3 mg/dl, SD ±4.3).

Conclusion: In conclusion, compared to pregnant women with normotensive blood pressure, women with PIH have greater levels of total cholesterol, triglycerides, LDL, VLDL, and low HDL. Early identification of PIH may benefit from prenatal testing for serum lipid levels.

Keywords: Pregnancy, Hypertension, Lipid levels.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

The main cause of fetomaternal morbidity and mortality is pregnancy-induced hypertension, which is defined as hypertension after 20 weeks of pregnancy in a woman with edema and proteinuria but no prior history of hypertension. 10% of primiparous women, 20% to 25% of women with a history of chronic hypertension, and 5% of all pregnancies are complete with elevated blood pressure [1]. The chance of acquiring PIH rises with advancing age [2]. Overweight and dyslipidemia are more likely to develop in PIH-affected women[3]. Endothelial dysfunction and insulin resistance are separate risk factors for cardiovascular disease [4]. The hepatic production of endogenous triglycerides increases during pregnancy due to the increased level of estrogen. This process is regulated by hyperinsulinism, which begins during pregnancy and may cause endothelial cell damage [5]. A two to three times greater increase in blood triglyceride concentration

is seen in PIH[6], and these triglycerides are likely to collect in channels like uterine spiral arteries where they cause endothelial injury by producing small, dense LDL particles.

Material and Methods

From August 2021 to July 2022, the study was carried out at the Department of Obstetrics and Gynecology, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar. A total of 40 women were recruited, 40 of whom had normal blood pressure and 40 of whom had gestational ages > 20 weeks and hypertension (measured as greater than 140/90 mm Hg). This study did not include women who had known renal disease, diabetes, hepatic dysfunction, dyslipidemia, or pre-existing hypertension prior to becoming pregnant. Samples of peripheral fasting blood were taken in order to estimate the serum lipid profile. Statistics were used to analyze the data. The results were

presented as mean \pm SD for both normotensive and hypertensive pregnant women. The Student t-test was used to determine the level of significance between pregnant women with hypertension and pregnant women with normal blood pressure. Statistical significance was defined as a P value <0.05.

Results

The difference in mean ages between the normal blood pressure group and the PIH group's 26.95

years against 29.67 years was statistically significant (p value 0.0001). With a p value of 0.0001, the average parity for the PIH group was 3.65 and 2.25 for the normal group.

The PIH and control groups' respective average weights were 64.5 and 58.35 kilos. With a p value of 0.0327, the weight difference was statistically significant. In comparison to the control group, the urban to rural ratio for PIH was 75:25 (p value 0.0294). In the PIH group, there were more females who were urban, heavier, and older (Table 1).

Table 1: Demographic comparison (PIH and pregnant women with normal BP)

Parameters	Group 1 (PIH) Mean	Group 2 (PNBP) Mean	P-value
Mean Age (years)	29.67	26.95	0.0001
Mean Weight (kg)	64.5	58.35	0.327
Urban	30(75%)	14(35%)	0.0294

Total cholesterol (348 mg/dl, SD \pm 45), triglycerides (368 mg/dl, SD \pm 39), LDL (201 mg/dl, SD \pm 17), and VLDL (107 mg/dl, SD \pm 11) were all significantly higher in women with PIH when compared to normotensive pregnant women. The p value for this comparison was 0.0001. However, group 2 HDL level (61 mg/dl, SD \pm 2.81) is shown to be substantially higher (p value 0.05) than group 1 (34.3 mg/dl, SD \pm 4.3) (Table 2).

Table 2: Blood Lipids in PIH and pregnant women with normal BP

Parameters	Group 1 (PIH) Mean (SD)	Group 2 (PNBP) Mean (SD)	95% CI	P-value
Total Cholesterol	348.0(45.0)	135.0(8.7)	198.5-227.43	0.0001
HDL (mg/dl)	34.3(4.3)	61.1(2.8)	-28.41-25.19	0.0001
LDL (mg/dl)	201.0(17.000)	83.000(4.700)	112.5-123.6	0.0001
VLDL (mg/dl)	107.0(11.00)	26.00(5.00)	77.2-84.80	0.0001
Triglyceride (mg/dl)	368.0(39.0)	120.0(20.0)	234.2-261.8	0.0001

Discussion

In the current study, we looked into how lipid profiles may contribute to pregnancy-induced hypertension. Pregnant women with normotension served as the control group while pregnant women with hypertension served as the test group.

Gradually rising lipid levels are anticipated as age increases. In the current study, hypertensive pregnant women had considerably higher serum levels of TC, TGs, LDL, and VLDL but significantly lower levels of HDL. It is well established that PIH and hypertriglyceridemia are related. Estrogen is the primary cause of hypertriglyceridemia. There is an increase in estrogen levels during pregnancy. Through the formation of LDL and VLDL, estrogen stimulates the hepatic production of TGs, which leads to PIH and endothelial dysfunction. The most significant factor in the etiology of hypertension during pregnancy is endothelial dysfunction, and aberrant lipid profile levels are crucial in its production. Our study results for TGs, LDL, and VLDL are at odds with previously published studies that found elevated levels of these lipid profiles in pregnant hypertensive women. In Gurgaon, India, Kaloti et al.[7] carried out a cross-sectional investigation. The findings were released in March 2013. There

were 804 pregnant women in the research. 624 of them were expecting mothers with PIH. With the exception of alterations in LDL (p>0.05) and total cholesterol, the study found statistically significant (p<0.001) differences in the majority of maternal serum lipid and lipoprotein concentrations in the patient group with PIH.

The TC:HDL, LDL:HDL, TG:HDL, and HDL:VLDL ratios among the various lipoprotein ratios were shown to be very significant (p <0.001) in the PIH patient group. After 20 weeks of pregnancy, women who developed hypertension had levels of total cholesterol, LDL, VLDL, and triglycerides that were 5.45%, 3.5%, 39%, and 38.6% higher than those of control individuals. At Jinnah Hospital in Lahore, Pakistan, from September 2012 to March 2013, Anjum et al.[8] conducted a comparison trial on analysis of blood lipid profiles between normotensive and hypertensive pregnant women.

Pregnant women with hypertension had considerably higher mean blood pressure (SBP/DBP) than pregnant women with normotension. When directly compared to normotensive pregnant women, the serum levels of TC, TGs, LDL, and VLDL were significantly higher in hypertensive pregnant women (p <0.05),

whereas the serum level of HDL was significantly lower ($p < 0.05$). In comparison to normotensive pregnant women, the values of the ratios (TC/HDL, TGs/HDL, and LDL/HDL) were significantly greater in hypertensive pregnant women.

Between July 2010 and December 2010, Theresa et al. [9] carried out a cross-sectional investigation at the University College Hospital Ibadan. Only HDL was found to be considerably greater in the gestational hypertension group, according to the results. The other lipid fractions, however, showed no association. Therefore, it demonstrates that hyperlipidemia and gestational hypertension are not related. This study's findings regarding LDL, VLDL, total cholesterol, and triglyceride levels were different from those of our study.

The serum lipid profile is also known to be impacted by other chronic inflammatory disorders including diabetes and malignant conditions like leukemia. Because HDL controls blood pressure toward normal ranges, it is excellent cholesterol for our health. In the current investigation, pregnant women with normal blood pressure did not have substantially different serum HDL levels ($p < 0.05$). The serum levels of HDL were considerably lower in pregnant hypertensive women. In line with previously reported findings, the third-trimester HDL levels of hypertensive pregnant women in our study were lower. Investigational studies that assess the therapeutic effects of various therapeutic methods are crucial for various disorders. Therefore, it is crucial to carry out research in which various therapy approaches for PIH management are assessed.

Conclusion

In comparison to normotensive pregnant women, women with PIH had lower levels of HDL and higher levels of total cholesterol, triglycerides, LDL, and VLDL. Early identification of PIH may benefit from prenatal testing for serum lipid levels. Since this would aid in the early detection of any obstetric-associated complications during PIH and/or at the time of delivery, it is essential that blood lipid profiles be constantly monitored during the whole pregnancy period.

References

1. Ghosh MK; Maternal mortality: a global perspective. *J Reprod Med.*, 2001; 46(5): 427-433.
2. Zhang J; Partner change, birth interval and risk of pre-eclampsia: a paradoxical triangle. *Paediatr Perinat Epidemiol.*, 2007; 21 (Suppl 1): 31-35.
3. Belo L, Caslake M, Gaffney D, Santos-Silva A, Pereira-Leite L, Quintanilha A *et al.*; Changes in LDL size and HDL concentration in normal and preeclamptic pregnancies. *Atherosclerosis*, 2002; 162(2): 425-432.
4. Seely EW, Solomon CG; Insulin resistance and its potential role in pregnancy-induced hypertension. *J Clin Endocrinol Metab.*, 2003; 88(6): 2393-2398.
5. Isomaa B, Almgren P, Tuomi T, Forsen B, Lahti K, Nissen M *et al.*; Cardiovascular morbidity and mortality associated with the metabolic syndrome. *Diabetes Care*, 2001; 24(4): 683-689.
6. Girman CJ, Rhodes T, Mercuri M, Pyorala K, Kjekshus J, Pedersen TR *et al.*; The metabolic syndrome and risk of major coronary events in the scandinavian simvastatin survival study (4S) and the Air Force/Texas Coronary Atherosclerosis Prevention Study (AFCAPS/TexCAPS). *Am J Cardiol.*, 2004; 93(2):136-141.
7. Kaloti AS, Kaur C, Goel RK, Jha S; Study of lipid profile trends in women of pregnancy-induced hypertension cases in a rural setup. *JEMDS*, 2013; 2(13): 20124-2031.
8. Anjum R, Zahra N, Rehman K, Alam R, Parveen A, et al.; Comparative analysis of serum lipid profile between normotensive and hypertensive Pakistani pregnant women. *J Mol Genet Med.*, 2013; 7: 64.
9. Theresa AI, Olumuyiwa AR, Ayo A; Serum lipid levels in pregnant normotensive and gestational hypertensive women in Ibadan, Nigeria. *Annals of Biological Research*, 2013; 4(4): 204-208.