A Comparative Study of Serum Lipid Profile in Normal Pregnancy and Pregnancy Induced Hypertension

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Abstract

Background: Pregnancy induced hypertension is a significant contributor to maternal and foetal morbidity and mortality worldwide. Studying the lipid profile and risk variables is crucial for illness prevention, management, and a better prognosis.

Method and Materials: This study was a case control study conducted in the Department of Obstetrics and Gynaecology, Tezpur Medical College and Hospital, Tezpur. A total of 100 (one hundred) were selected, out of which 50 (fifty) normotensive pregnant women served as a control and 50 (fifty) hypertensive women constituted the study group. Besides baseline routine investigations, estimation of Serum lipid profile was done by collecting blood samples from antecubital vein of every case and control and were analysed at department of Biochemistry, Tezpur Medical College and Hospital, Tezpur.

Results: The hypertensive group had a significant rise in Triglyceride (TG), total cholesterol, LDL-C levels and decreased HDL-C levels as compared to the control group.

Conclusion: Abnormal lipid profile during pregnancy plays an important role in development of pre-eclampsia.

Keywords: Pregnancy Induced Hypertension (PIH); Lipid Profile; Pre-eclampsia (PE); Triglycerides (TG), High Density Lipoproteins (HDL-C).

Introduction

Pregnancy Induced Hypertension is defined as a blood pressure greater than 140/90 mm Hg on two separate occasions at least 6 hours apart. Pre-eclampsia is a pregnancy-related condition that affects multiple systems [(1)]. Pre-eclampsia (PE) is one of the most common pregnancy complications and a major cause of maternal and neonatal mortality and morbidity worldwide[(2,3)]. It is identified by elevated blood pressure and proteinuria after 20 weeks of gestation in a previously normotensive patient. Pre-eclampsia affects 3-5% of women worldwide [(4)]. As per the report of India's third National Family Health Survey (NFHS-3, 2005-06), which was based on self-reported symptoms suggestive of preeclampsia and eclampsia by women who had a live birth in the five years preceding the survey, the incidence of preeclampsia and eclampsia in India might be higher (~28% and 7.4–11.3% respectively) as compared to its incidence worldwide[(5)].

Pre-eclampsia appears in the second and third trimesters of pregnancy [(6)]. Hypertension is the most common symptom of PE, which is caused by vasospasm in the kidneys, uterus, placenta, and

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brain. Endothelial prostacyclin levels in pregnant women are typically 8-10 times higher than in non-pregnant women. However, this increase is only 1-2 times greater in women with pre-eclampsia. Pre-eclampsia patients have higher thromboxane levels than normal pregnant women [7]. Vasospasm is ensured by endothelial cell destruction because prostacyclin is a vasodilator and thromboxane is a vasoconstrictor[8]. Increased lipid synthesis increases the rate of thromboxane prostacyclin, which aids in the pathogenesis of pregnancy-induced hypertension [9]. Injury and dysfunction of endothelial cells are important in the pathogenesis of PE. Women with a history of PIH have significantly different lipid parameters and increased susceptibility to lipoprotein peroxidation when compared to women with normal pregnancy-the most common factor associated with PE is placental vasculopathy. If PE is caused by a combination of factors, triglyceride-related vasculopathy could be one of them[10]. Triglycerides are likely to be deposited in predisposed vessels such as the uterine spiral arteries and contribute to endothelial dysfunction both directly and indirectly through the generation of small dense LDL cholesterol, resulting in endothelial dysfunction and thus fetoplacental insufficiency and proteinuria in pre-eclampsia patients. The present study was conducted to look into the differences in lipid profiles between normal and hypertensive women.

Material and Methods

Study Design: Case control study.

Study Site: Department of Obstetrics and Gynaecology, Tezpur Medical College and Hospital, Tezpur, Assam which is a tertiary care hospital.

Study Duration: July 2021- June 2022.

Sample Size: The sample size calculated via online sample calculator came out to be 50 in each group. A total of 100 study participants were recruited among which 50 were women with Pregnancy Induced Hypertension who were taken as cases while 50 women who were normotensive were taken as controls.

Inclusion Criteria: Women with singleton pregnancy, age between 18-37 years, gestational age between 20-42 weeks and who were known cases of Pregnancy Induced Hypertension.

Exclusion Criteria: Women with eclampsia, multiple pregnancies, severe anaemia, and history of smoking or any chronic medical illness were excluded.

Consent: An informed written consent was obtained before recruiting any participants for the study and participants were explained about the objectives of the study.

Procedure: A thorough general physical examination was done along with ultrasonography for confirmation of gestation age. Routine laboratory investigation was done viz., CBC, KFT, LFT, HIV, HBsAg, VDRL. Blood pressure was measured by the sphygmomanometer from the right arm while the patient was in semi recumbent position with the arm roughly at the level of heart.

Estimation of serum lipid profile: Peripheral blood sample (5ml) was collected from antecubital vein of every case and control and collected in vacutainer and sent to the Department of Biochemistry for analysis. The sample were analysed for serum triglyceride, total cholesterol and HDL-Cholesterol by enzymatic methods with the help of ROCHE diagnostic kit. Serum LDL-C was calculated by using Friedewald equation : LDL-C = TC – (TG/5+HDL-C)

Statistical Analysis: Data was expressed as mean and percentage. Statistical analysis was done using Chi-square, Student T test. Statistical package for social sciences (SPSS- 23) and Microsoft Excel software were used for analysis. P <0.05 was considered as significant at 95% CI.

Ethical Issues: The study was conducted as per already established guidelines and protocols and had no ethical issue related to animal or human experimentation.

Results

Table 1: 50 Pregnancy Induced Hypertension cases are taken in this study. It is seen most commonly the patients belong to the age group of 20-24 years 26 (52%), followed by 25-29 years 15 (30%). 4 cases are found in the age group of >30 years. The youngest patient is 18 years old, while the oldest is 34 years old in the study.

Table 2: Out of 50 cases selected for the study, 25 (50%) cases present with SBP between 141-160 mmHg. 13 (26%) of them have SBP between 161-180 mmHg, 9 (18%) have SBP of 181-200 mmHg and 3 (6%) cases present with SBP of >200 mmHg at the time of admission.

Table 3: Out of 50 cases selected for the study, 10 (20%) are in 91-100 mmHg group, 15 (30%) in 101-110 mmHg group, 20 (40%) in 111-120 mmHg group and 5(10%) cases have DBP >120 mmHg.

Table 4: It was found that Mean ± SD of triglycerides, total cholesterol, and LDL cholesterol among the women in the study group was higher than the Mean ± SD of triglycerides, total cholesterol, and LDL cholesterol among women in the control group. Further, Mean ± SD of HDL-cholesterol among the study group was lower than the Mean ± SD of HDL-Cholesterol among the control group. Statistically, there is a significant difference in case of triglycerides, total cholesterol, HDL- cholesterol and LDL-cholesterol.

Table 1: Table with Age Wise Distribution of Patients

AGE (YEARS)	NO. OF PATIENTS	PERCENTAGE
< 20 YEARS	5	10%
20-24 YEARS	26	52%
25-29 YEARS	15	30%
>30 YEARS	4	8%
TOTAL	50	100%
MEAN AGE	23.5	
SD	± 4.24	

Table 2: Table Showing Distribution of Cases According to Systolic Blood Pressure

SBP ON ADMISSION	NO. OF CASES	PERCENTAGE
141-160 mm Hg	25	50%
161-180 mm Hg	13	26%
181-200 mm Hg	9	18%
>200 mm Hg	3	6%
TOTAL	50	100%

Table 3: Table Showing Distribution of Cases According to Diastolic Blood Pressure

DBP ON ADMISSION	NO. OF CASES	PERCENTAGE
91-100 mm Hg	10	20%
101-110 mm Hg	15	30%
111-120 mm Hg	20	40%
>120 mm Hg	5	10%
TOTAL	50	100%

Table 4: Table with Serum Lipid Profile of Controls And Cases

PARAMETERS	STUDY GROUP (MEAN ± SD)	CONTROL GROUP (MEAN ± SD)	P- VALUE
Triglyceride	224.30 ± 38.41	178.06 ± 21.02	< 0.001
Total Cholesterol	206.82 ± 29.89	166.64 ± 18.80	< 0.001
HDL-Cholesterol	38.92 ± 6.09	45.64 ± 4.69	< 0.001
LDL-Cholesterol	119.94 ± 20.24	90.22 ± 15.41	<0.001

Discussion

Recently, there has been much debate about the role of lipid metabolism in the development of Pregnancy Induced Hypertension and Pre-eclampsia. Previous research found that plasma lipid levels in women with pre-eclampsia were higher than in healthy pregnant women [11,12]. The lipid changes are thought to contribute to the endothelial cell damage associated with PE. Lipid peroxidation is low in all cells and tissues. Free radical oxidation and antioxidant neutralisation are balanced in good health [13]. Antioxidant nutrients are abundantly used in PE to combat the cellular changes caused by free radicals such as lipid peroxides. Abnormal lipid metabolism is not only a symptom of PE; it also plays a role in its pathogenesis [14].

Based on these findings, the current study was designed to compare serum lipid levels in pregnancy-induced hypertension and normal pregnancy. The mean SD serum triglyceride level in the hypertensive group was 224.30 38.41. The mean SD of serum triglyceride level in the control group was 178.06 21.02; the difference is statistically significant. Jayanta De et al[15] and Torun Clausen et al[16] found that hypertensive women had higher triglyceride levels than normotensive women. The mean serum concentration of total cholesterol in the current study is 166.64 + 18.80 in controls and 206.82 + 29.89 in cases; the difference is statistically significant. Md. Zakir H et al. [17], S. WareJauregui et al. [18], and Shruthi Mohanty et al. [19] found a significant increase in total cholesterol levels in hypertensive women compared to normotensive women. The mean serum concentration of LDL cholesterol in the current study is 90.22 + 15.41 in controls and 119.94 + 20.24 in cases; the difference is statistically significant. Torun Clausen et al[16] and Carlos A. Negrato et al[20] also found a significant increase in LDL-cholesterol levels in hypertensive women compared to normotensive women. In the current study, the mean serum concentration of HDL cholesterol in controls is 45.64 + 4.69 and in cases is 38.92 + 6.09, a statistically significant difference.. Carlos A. Negrato et al[20] and S. WareJauregui et al[18] also observed a significant decrease in HDL-Cholesterol levels in hypertensive women compared to normal pregnant women.

Conclusion

An atherogenic lipid profile with elevated triglycerides, LDL-C, and decreased HDL-C contributes to the development of Pre-eclampsia by causing oxidative stress and endothelial dysfunction, and it plays a significant role in the development of Pre-eclampsia. This research contributes to a better understanding of the role of a changed lipid profile in the pathophysiology of Pregnancy Induced Hypertension and Pre-eclampsia. Detecting lipid profile changes in early pregnancy may aid in early diagnosis and the prevention and slowing of disease progression through medication or lifestyle changes.

Conflict of Interest: None Declared

Source of Funding: None

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