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Comparative Study of Serum Lipid Profile in Pre-Eclampsia and Normal Pregnancy

Jagannath Patar[1], Nilabh Acharjee[1*]

[1]Department of Obstetrics and Gynaecology, Tezpur Medical College and Hospital, Tezpur, Assam, India

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***Corresponding author:** Nilabh Acharjee
Department of Obstetrics and Gynaecology, Tezpur Medical College and Hospital, Tezpur, Assam, India

Abstract **Original Research Article**

Background: Pre-eclampsia is an important cause of fetal and maternal morbidity and mortality worldwide. It is therefore, important to study the lipid profile and risk factors for prevention, management and better prognosis of the disease. ***Method & 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) Pre-eclampsia 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 following a fast of 12-14 hours and collected in plain vials and were analysed at department of Biochemistry, Tezpur Medical College and Hospital, Tezpur. ***Results:*** The preeclampsia 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 results during pregnant women plays an important role in development of pre-eclampsia.

Keywords: Preeclampsia (PE); Lipid Profile; Triglycerides (TG), High Density Lipoproteins (HDL-C).

INTRODUCTION

Pre-eclampsia is a pregnancy specific condition that involves multiple systems [1]. Pre-eclampsia (PE) is one of the most common complications of pregnancy and a major cause of maternal and neonatal mortality and morbidity worldwide [2, 3]. It is diagnosed by elevated blood pressure and proteinuria after 20 weeks of gestation in a patient known to be previously normotensive. Incidence of Pre-eclampsia worldwide is 3-5% [4]. In India, the incidence of Pre- eclampsia in hospital practice varies widely from 5-15%; the incidence in primigravidae is about 10% and in multigravida is about 5% [5]. Adaptive changes occur in women's physiology during healthy pregnancies to meet the demands of the rapidly developing foetus. These normal adaptive metabolic responses are exaggerated in pregnancies complicated by pre-eclampsia. Pre-eclampsia manifests itself during the second and third trimesters of pregnancy [6].

Mild Preeclampsia

Blood Pressure (BP) ≥140/90 mmHg confirmed on two measures at least 6 (six) hours apart but not more than 7 days apart, and proteinuria ≥300 mg on a 24 hour urine collection or two random urine dipstick results of at least 30 mg/dl (" 1+").

Severe Preeclampsia

Blood Pressure during bed rest of ≥ 160 mmHg Systolic or ≥ 110 mmHg Diastolic, and proteinuria ≥ 5 gm on a 24 hour urine collection even if BP is in the mild range. The main symptom of PE is hypertension caused by vasospasm in the kidneys, uterus, placenta, and brain. Endothelial prostacyclin levels are 8-10 times higher in pregnant women than in non-pregnant women. This increase is only 1-2 times greater in Pre-eclampsia women. Thromboxane levels are also higher in Pre-eclampsia patients than in normal pregnant women [7]. Endothelial cell destruction ensures vasospasm because prostacyclin is a vasodilator and thromboxane is a vasoconstrictor [8]. Increased lipid synthesis raises the thromboxane prostacyclin rate, which contributes to the pathogenesis of pregnancy-induced hypertension [9]. Endothelial cell injury and dysfunction are important in the pathogenesis of PE. When compared to women with normal pregnancy, women with a history of PE have significant differences in lipid parameters and increased susceptibility to lipoprotein peroxidation-the most common factor associated with PE is placental vasculopathy. If PE is a

multifactorial disease, triglyceride-related vasculopathy could be one of the etiological factors [10]. Increased triglycerides in Pre-eclampsia patients 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 feto-placental insufficiency and proteinuria is seen. The present study was conducted to look into the differences in lipid profiles between normal and Pre-eclampsia 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 Pre-eclampsia 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 Pre-eclampsia.

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, 24 hour urine sample was taken from each patient. 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 following a fast of 12-14 hours, 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 in auto- analyzer-Hitachi 912. 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, Mann Whitney test, Student T test. Statistical package for social sciences (SPSS- 22) 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 Pre-eclampsia 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

There has recently been a lot of discussion about the role of lipid metabolism in the development of Pre- eclampsia (PE). Previous studies have found that plasma lipid levels in Pre-eclampsia women were higher than in healthy pregnant women [11, 12]. The lipid changes are thought to play a role in the endothelial cell damage that is characteristic of PE. All cells and tissues have low levels of lipid peroxidation. In good health, free radical oxidation and antioxidant neutralisation are balanced [13]. Antioxidant nutrients are used excessively in PE to counteract the cellular changes caused by free radicals such as lipid peroxides. Abnormal lipid metabolism is not just a symptom of PE; it is also involved in the pathogenesis of PE [14]. Endothelial hyper stimulation caused by lipid-mediated oxidative stress is likely to contribute to dysfunction and damage.

Based on these observations the present study was conducted to compare serum lipid in Pre-eclampsia and normal pregnancy. It was seen that in the Pre-eclampsia group Mean ± SD serum triglyceride level was 224.30 ± 38.41. Whereas in the control group the Mean ± SD of serum triglyceride level was 178.06 ± 21.02; the difference is statistically significant. Jayanta De *et al.*, [15] and Torun Clausen *et al.*, [16] also observed a significant increase in triglyceride levels in Pre-eclampsia women compared to normotensive women. In present study the mean serum concentration of total cholesterol in controls is 166.64 + 18.80 and in cases (Pre-eclampsia) is 206.82 + 29.89; the difference is statistically significant. Md. Zakir H *et al.*, [17], S. WareJauregui *et al.*, [18] and Shruthi Mohanty *et al.*, [19] also observed a significant increase in total cholesterol levels in Pre-eclampsia women compared to normotensive women. In present study the mean serum concentration of LDL cholesterol in controls is 90.22 + 15.41 and in cases (Pre-eclampsia) is 119.94 + 20.24; the difference is statistically significant. Carlos A. Negrato *et al.*, [20] and Torun Clausen *et al.*, [16] also observed a significant increase in LDL-cholesterol levels in Pre-eclampsia women compared to normotensive women. In present study the mean serum concentration of HDL cholesterol in controls is 45.64 + 4.69 and in cases (Pre- eclampsia) is 38.92 + 6.09; the difference is statistically significant. Carlos A. Negrato *et al.*, [20] and S. WareJauregui *et al.*, [18] also observed a significant decrease in HDL-Cholesterol

levels in Pre-eclampsia women compared to normal pregnant women.

CONCLUSION

Atherogenic lipid profile that is raised triglycerides, LDL-C and decreased HDL-C leads to the development of Pre-eclampsia by causing oxidative stress and endothelial dysfunction.

If Pre-eclampsia is diagnosed in present pregnancy the chance of recurrence in the next pregnancy is high. This study helps in understanding the role of altered lipid profile in the pathophysiology of Pre-eclampsia. By detecting the lipid profile changes in early pregnancy, it may be helpful in early diagnosis and to prevent and slow down the disease progression either by medication or life style modification.

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