

Original Article

Study on Association of Maternal Triglyceride and Preeclampsia

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Abstract:

Preeclampsia is one of the most important pregnancy disorder, diagnosed with hypertension and proteinuria. It is the leading cause of fetal and maternal morbidity and mortality. This cross-sectional study was conducted in 100 pregnant women, of them, 50 were diagnosed cases of preeclampsia and 50 were normal pregnant women attended in the Gynaecology and Obstetrics department of Dhaka Medical College Hospital, Dhaka, during July 2016 to June 2017. Five ml fasting blood sample was collected and was analysed for triglyceride using standard enzymatic method. Mean value of triglyceride was compared between two groups by student unpaired t-test and the triglyceride level was correlated with systolic, diastolic blood pressure and urine albumin in preeclamptic patient was correlated by Pearson's correlation coefficient test. A p-value was considered to be statistically significant at 0.05 at 95% confidence interval. Statistically significant difference of serum triglyceride level was found in preeclamptic women and normal pregnant women ($p < 0.05$). The level was 248.90 ± 31.36 mg/dl in preeclampsia and 197.00 ± 27.04 mg/dl in normal pregnant women respectively. Serum triglyceride was positively correlated with systolic, diastolic blood pressure and urine albumin in preeclamptic women.

Key words: Preeclampsia, Association, Maternal triglyceride.

Introduction:

Preeclampsia is a pregnancy specific, multisystem, hypertensive disorder characterized by new onset of hypertension and proteinuria after 20 weeks of gestation and remission of signs after delivery. Preeclampsia is the most frequently encountered medical complication during pregnancy and is the leading cause of maternal, fetal and neonatal mortality and morbidity, with estimates of >60,000 maternal deaths/year in developing countries. The overall worldwide incidence of Preeclampsia is 3-5%¹. But in India, the overall incidence is 5-15%. In a survey for assessment of emergency obstetric care in Bangladesh, it was seen that 5% of total obstetrical admissions in health facilities were due to preeclampsia and eclampsia.

Preeclampsia is associated with substantial risks for the fetus. These include intrauterine growth restriction, death and prematurity with attendant complications whereas the mother is at risk of renal failure, pulmonary edema, stroke and death.

Molar pregnancy, multifetal gestations, certain chromosomal alterations of the fetus, family history of hypertension, diabetes mellitus, chronic hypertension, increased oxidative stress and renal diseases have been associated with preeclampsia.

The association of alteration of serum lipid profile in preeclampsia is well documented. An abnormal lipid profile is known to be strongly associated with atherosclerotic cardiovascular diseases and has a direct effect on endothelial dysfunction. The most important feature in preeclampsia is hypertension which is supposed to be due to vasospastic phenomenon in kidney, uterus, placenta and brain. Altered lipid synthesis leading to decrease in $PGI_2:TXA_2$ ratio is also supposed to be an important way of pathogenesis in pregnancy induced hypertension². Thus, abnormal lipid metabolism seems important in the pathogenesis of preeclampsia. Preeclampsia and related disorders are known to affect function of various organs involved in lipid and lipoprotein metabolism. Several studies have shown that endothelial dysfunction is related to hyperlipidemia. Significantly elevated plasma concentration of TG, phospholipids and total lipids and decreased HDL-C concentrations were found in women with preeclampsia in comparison to normal pregnancy³.

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A study by Vrijkotte et al found that an increase in maternal blood triglyceride level was linearly associated with an increased risk of pre-eclampsia⁴. It is suggested that the rise in circulating triglycerides may be due to an increase in hepatic lipase activity and a decrease in lipoprotein lipase activity. Hepatic lipase is responsible for an increased synthesis of triglycerides at the hepatic level, whereas a decreased activity of lipoprotein lipase is responsible for reduced catabolism at the adipose tissue level, resulting in a net increase in circulating triglyceride.

Although it is still unclear whether hypertriglyceridemia becomes a risk factor for preeclampsia or whether there is any causal association between them, high triglyceride levels seem to increase the risk of placental vascular disorders, which trigger endothelial dysfunction, atherosclerosis and thrombosis⁵. The development of atherosclerosis in the placental spiral arteries of preeclamptic women indicates that elevated levels of triglycerides are involved in this disorder. The principal modulator of this hypertriglyceridemia is estrogen as pregnancy is associated with hyperoestrogenaemia. Estrogen induces hepatic biosynthesis of endogenous triglycerides, which is carried by VLDL⁶. Several other investigators have reported that hypertriglyceridemia could be involved in the pathogenesis of hypertensive disorders during pregnancy.

Materials and Methods:

This cross sectional observational study was carried out in the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital, Dhaka from July 2016 to June 2017. Hundred singleton pregnant women with 28-40 weeks of gestation were included in this study. They were classified as Group I (50 preeclamptic women) and Group II (50 normal pregnant women). Sampling technique was purposive consecutive sampling. Polyhydramnios or oligohydramnios, known or detected fetal abnormality, history of essential hypertension, diabetes mellitus, renal disease, hepatic disease, blood disease, epilepsy, dyslipidaemia, hypo or hyperthyroidism and other medical diseases, history of lipid-altering drug intake were excluded from the study. Data was collected using a structured questionnaire containing all the variables of interest and by interview, clinical examination and laboratory investigations and recorded on the pre-designed data collection sheet. Samples were collected from the inpatient were outpatient department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, Dhaka. Purpose and procedure of the study were discussed with the patients who fulfilled the selection criteria. Written consents were taken from those who agreed to be included in the study.

After an overnight fasting, with all aseptic precaution 5ml venous blood was drawn from the antecubital vein by a disposable syringe. Immediately after drawing, blood was transferred to a dry clean test tube to avoid hemolysis and allow clotting. Then sample was centrifuged and serum was collected in test tube. In case of delay in carrying out the analysis, serum was preserved in the refrigerator at temperature of -20°C. The samples for triglyceride were estimated in the Department of Biochemistry in Dhaka Medical College. Hypertriglyceridemia was considered when triglyceride level was ≥ 150 mg/dl (The American Heart Association).

Collected data were checked and compiled on a master chart then processed by the statistical analysis by using SPSS version 17.0. Results were expressed as mean \pm SD for continuous data. Mean values were compared by unpaired students t-test. For all analytical tests, the level of significance when $p < 0.05$ was considered significant at 95% confidence interval.

Results:

Among total number of 100 study subjects, 50 were selected as group I (preeclamptic patients) and 50 as group II (normal pregnant women). Table I depicts socio-demographic characteristics of study subjects. There was no significant difference of maternal age and socioeconomic status in both groups.

Table I: Distribution of the study subjects by socio-demographic variables (n=100)

Socio-demographic variables	Group I (n=50)		Group II (n=50)		p value
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Age (years)	27.84 \pm 3.10	26.84 \pm 4.00			0.061 ^a
Socioeconomic status	n	%	n	%	
Lower class	32	64	38	76	0.309 ^b
Middle class	18	36	12	24	

^ap value reached from unpaired t-test

^bp value reached from chi square test

Table II: Distribution of the study patients by height, weight and BMI (n=100)

	Group I (n=50)		Group II (n=50)		p value
	Mean \pm SD	Mean \pm SD	Mean \pm SD	Mean \pm SD	
Height (meter)	1.48 \pm 0.01	1.49 \pm 0.02			0.586
Weight (kg)	55.12 \pm 2.89	54.86 \pm 2.08			0.607
BMI (kg/m ²)	24.88 \pm 1.35	24.65 \pm 0.86			0.314

Unpaired student's t test was done, level of significance $p < 0.05$.

Table II depicts height, weight and BMI of study subjects. There was no significant difference of height, weight and BMI in both groups.

Table III: Distribution of the study patients by obstetrical variable (n=100)

	Group I (n=50)		Group II (n=50)		p-value
	n	%	n	%	
Gravida					
1 (Primi)	21	42	29	58	0.321
2 (Multi)	29	58	21	42	
Gestational age (weeks)	32.66 ± 2.08		33.38 ± 1.689		0.061

Unpaired student's t test was done, level of significance p<0.05.

Table III depicts obstetrical variables of study subjects.

There was no significant difference of parity, gravid status and gestational age in both groups. (Table III)

Serum triglyceride levels and its significances in two groups (Table IV).

Table IV: Serum triglyceride levels in study subjects and its significances (n=100)

Parameter (mg/dl)	Group I Mean± SD (n=50)	Group II Mean± SD (n=50)	p value
Serum triglyceride	248.90 ± 31.36	197.00 ± 27.04	.001

Unpaired student's t test was done, level of significance p<0.05.

Mean serum triglyceride level is significantly higher in group I than group II.

Discussion:

In this study no statistical significant differences (p>0.05) were found in age, gestational age, parity, gravid status, height, weight and BMI between both groups similar to findings by Bennal A in their study⁷.

The socio-demographic characteristics of the patients were similar which showed that the participants are within the same environment. The ages of the participants were within the reproductive age group when they are not likely to have an underlying vascular disease. Most of the women in the preeclamptic group were young and mostly primigravida which is keeping with the fact that preeclampsia is more frequent in first gestation young women.

Studies by Cekmen MB and others have shown that the most dramatic damage in the lipid profile of pregnancy is serum hypertriglyceridemia which is even higher in preeclampsia⁸. In this study, this observation holds true. This study showed mean (+SD) serum triglyceride level was 248.90 ± 31.36 mg/dl in group I and 197.00 ± 27.04 mg/dl in group II, which were more than normal reference. This study shows a significant and positive correlation between preeclampsia and hypertriglyceridemia. Preeclamptic women presented significantly higher concentration of serum triglyceride than normal pregnant women which corroborated with the findings of Cekmen MB, Enquobahrie DA, De Jet and others⁸⁻¹⁰.

Studies by Winny HT et al among the Caucasian women have suggested that maternal predisposition to preeclampsia may be explained by abnormal lipid metabolism¹¹. It is thought that increased triglyceride found in preeclampsia, is likely to be deposited in predisposed vessels, such as the uterine spiral arteries and consequently contributes to the endothelial dysfunction, atherosclerosis and thrombosis both directly and indirectly. Moreover, Lima VJ found that hypertriglyceridemia may be associated with pathogenesis of hypertensive disorders during pregnancy¹². Elevated triglycerides have twice the risk of preeclampsia, studies by Ray JG et al indicated that the risk was four times higher, and compared with women with normal triglycerides¹³. Winkler K and several other investigators have reported that hypertriglyceridemia could be involved in the pathogenesis of hypertensive disorders during pregnancy¹⁴.

Therefore, assaying for the level of triglyceride in high risk women could be used in detecting women who may likely develop preeclampsia and this could subsequently improve their outcome.

Conclusion:

This study showed that hypertriglyceridemia is more profound in preeclampsia and serum triglyceride level showed significant positive correlation with blood pressure and urine albumin which are diagnostic criteria of preeclampsia. Systolic, diastolic blood pressure and urine protein are positively correlated with increased serum triglyceride level. It is suggested that routine investigation of serum triglyceride may be advocated to prevent hypertriglyceridemia related complication in preeclampsia.

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