

Changes in Serum Lipid in First Trimester of Pregnancy

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Abstract

A cross-sectional study was conducted in the department of Obstetrics & Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka to determine the changes in serum lipid in 1st trimester of pregnancy over a period 1 year. A total of 91 subjects (60 women at first trimester of pregnancy assigned to case and 31 non-pregnant women with regular menstruation assigned to control) were included in the study. The mean age was significantly higher in control group than in case group (27.0 ± 4.3 vs 24.4 ± 3.6 years respectively, $p = 0.002$). Lower socioeconomic class was predominance in case group (58.3%) and middle class (53.7%) in control group. The mean systolic and diastolic blood pressure was significantly higher in case group compared to control group. About 12% of patients had low HDL compared to 4.9% of controls ($p=0.240$). Raised LDL and raised triglycerides were found in 3.3% and 5% of the cases respectively while none of the control group had raised LDL and triglyceride ($p = 0.350$ and $p = 0.25$ respectively). The systolic and diastolic blood pressure was positively correlated with total cholesterol and HDL. However, LDL and triglyceride exhibit negative linear relationship in the both systolic and diastolic blood pressure. From this study, it can be concluded that pregnant mothers in their trimester had slightly altered serum lipids compared to their non-pregnant counterpart.

Key words: Gestation, Lipoprotein, Cholesterol.

Introduction

Pregnancy is accompanied by significant variations in maternal lipid metabolism. In early pregnancy, there in

increased body fat accumulation associated with both hyperphagia and increased lipogenesis while in late pregnancy there is an accelerated breakdown of fat depots, which plays an important role in foetal development. It has been observed that the concentration of serum total cholesterol, serum triglyceride, high density lipoprotein cholesterol and low density lipoprotein cholesterol in normal pregnant women increased with increasing gestational age¹. The present study was undertaken to elucidate any significant variation in the lipid profile during normal pregnancy in the different trimesters, to establish if pregnancy affects the lipid profile and to evaluate the clinical significance of the lipid level in pregnancy.

In the course of normal gestation, serum lipid and lipoprotein levels undergo variations, and triglycerides (TG), cholesterol and phospholipids are elevated. These changes are considered a reflection of increased metabolic demands by the mother's organism². Serum low-density lipoprotein cholesterol (LDL) levels increase as gestation, peaking at 36 week gestation, probably due to the hepatic effects of estradiol and progesterone. High-density lipoprotein cholesterol (HDL) levels increase until reaching a peak at 25 weeks, decreasing thereafter until the 32nd week, after which values remain constant until birth. It is thought that estrogen is responsible for elevating HDL levels during the first half of gestation. Maternal progesterone-induced lipoprotein lipase activity leads to hypertriglyceridemia³. Pre-eclampsia (PE), a non-convulsive form of pregnancy-induced hypertension, occurs in 5 to 10% of gestations. It accounts for a significant proportion of maternal and fetal morbidity and mortality⁴. PE is more frequent in first-gestation young women and in older multiparous women⁵. Endothelial injury is a key event in the pathogenesis of PE, occurring due to multiple factors. The typical uteroplacental lesion in PE is necrotizing arteriopathy. It has been shown that lipids accumulate in arterial intima cells and in macrophages. The similarity between lesions in PE and in arteriosclerosis has raised speculation about a common pathophysiological pathway⁶. Although data are scarce and inconsistent, marked hyperlipidemia has been observed in PE patients compared to women with pregnancies. PE is thus characterized by profound lipid changes similar to those found in atherosclerosis, including hypertriglyceridemia and relatively increased LDL levels, both of which play a role in endothelial injury and dysfunction. Decreased HDL serum levels were also related to PE⁵. There are, however, few studies assessing lipid profile changes early in pregnancy and the progression to PE. The purpose of this study was to evaluate serum TC, TG, LDL and HDL levels in pregnant women aged over 35 years during the first trimesters of pregnancy.

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Materials and Methods

A total of 9 91 subjects (60 women at first trimester of pregnancy were assigned as case and 31 non-pregnant healthy women with regular menstruation were assigned as control) were included in this study. The serum lipid profile (Total cholesterol, HDL, LDL and Triglycerides) of pregnant women of first trimester were determined by enzymatic method during their first trimester and also serum lipid profile of non pregnant women were determined in the same method at the department of obstetrics and Gynecology in a tertiary hospital in Bangladesh. Estimation of total cholesterol: Serum total cholesterol was estimated by enzymatic method. Estimation of HDL cholesterol: Phosphotungstic acid in conjunction with magnesium chloride precipitates LDL and VLDL fraction of the sera, leaving HDL-C fraction in the solution. From the supernatant obtained after centrifugation, cholesterol concentration in the HDL fraction was measured by enzymatic method.

Results

The mean age was significantly higher in control group than in case group 27.0 ± 4.3 vs. 24.4 ± 3.6 years respectively ($p > 0.002$) (Table-I). Lower socioeconomic class was predominance in case group (58.3%) and middle class (53.7%) in control group (Fig-1). In terms of systolic and diastolic blood pressure, all of the patients were found normal. The mean systolic and diastolic blood pressure was significantly higher in case group compared to control group 114.5 ± 5.0 vs. 108.5 ± 7.9 respectively ($p < 0.001$) (Table-II). Table-III shows about 12% of patients had low HDL compared to 6.5% of controls ($p > 0.240$). raised LDL and raised triglycerides were found in 3.3% and 5% of the cases respectively while non of the control group had raised LDL and triglyceride ($p > 0.350$ and $p > 0.205$ respectively). Systolic blood pressure was positively correlated with total cholesterol and HDL ($p > 0.090$ and $p > 0.080$ respectively) (Table-IV) and negatively correlated with LDL and triglyceride ($p > 0.166$ and $p > 0.503$ respectively) the correlation of total cholesterol and HDL with diastolic blood pressure exhibit a linear relationship ($p > 0.102$ and $p > 0.108$ respectively) while correlation of LDL and triglyceride with diastolic blood pressure demonstrates that the two variables bear an inverse correlations ($p > 0.455$ and $p > 0.407$ respectively) (Table-V).

Table I: Comparison of age between two groups

Age (years)	Group		p-value
	Case (n = 60)	Control (n = 31)	
<25	28 (46.7)	8 (26.8)	
25-30	24(40.0)	12 (39.0)	
≥ 30	8 (13.3)	11(34.1)	
Mean \pm SD	24.4 ± 3.6	27.0 ± 4.3	0.002

Figures in the parenthesis denote corresponding percentage; Data were analysed using Student's Test.

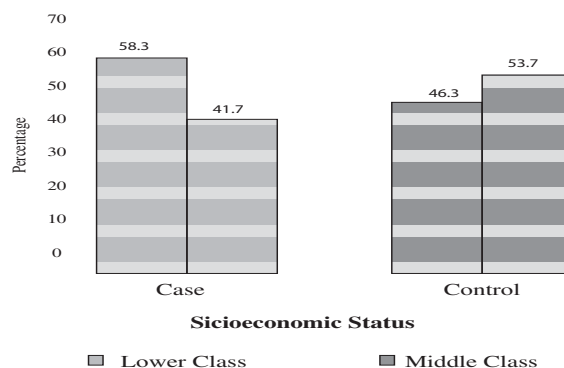


Fig. 1: Comparison of socioeconomic status between groups.

Table II.: Comparison of patients between groups by blood pressure

Clinical Variables	Group		p-value
	Case (n = 60)	Control (n = 31)	
Systolic BP Normal (≤ 140 mmHg)	60(100.0)	31 (100.0)	
Mean \pm SD	114.5 ± 5.0	108.5 ± 7.9	<0.001
Diastolic BP Normal (≤ 90 mmHg)	60(100.0)	31 (100.0)	
Mean \pm SD	27.3 ± 7.7	68.6 ± 7.8	0.002

Student Test was employed to analyse the Data and presented as Mean + SD

Table III.: Comparison of Lipid profile between groups

Lipid profile	Group		P-value
	Case (n = 60)	Control (n = 31)	
Total Cholesterol (mg/dl) ≤ 200	60(100.0)	31(100.0)	-----
HDL (mg/dl)#			
<40	7(11.7)	2(9.9)	
≥ 40	53(88.3)	29(95.1)	0.412
LDL (mg/dl)#			
≤ 130	58(96.7)	31(100.0)	
>130	2(3.3)	0(0.0)	0.350
Triglycerides (mg/dl)			
≤ 150	57(95.0)	31(100.0)	
>150	2(3.3)	0(0.0)	0.205

Chi-square (χ^2) Test was employed to analyse the Data;

* Fisher's Exact Test was done to analyse the Data.

Table IV.: Comparison between lipid profiles and systolic blood pressure

Correlated Variables	Correlation coefficient (r)	p-value
Total cholesterol Diastolic BP	0.164	0.102
HDL Diastolic BP	0.161	0.108
LDL Diastolic BP	-0.075	0.455
Triglyceride Diastolic BP	-0.083	0.407

Table V: Correlation between lipid profiles and diastolic blood pressure

Correlated Variables		Correlation coefficient (r)	p-value
Total cholesterol	Systolic BP	0.169	0.090
HDL	Systolic BP	0.175	0.080
LDL	Systolic BP	-0.060	0.551
Triglyceride	Systolic BP	-0.067	0.503

Discussion

Van den Elzen were conducted a study in the Department of Obstetrics and Gynaecology, Academic Hospital Rotterdam, Netherlands. They Showed that first trimester serum total cholesterol was significantly associated with the risk of pre-eclampsia with the adjusted relative risk exceeding for women with serum total cholesterol levels above 6.0 mmol/l when compared with women with a cholesterol level below 5.0mmol/L First trimester serum total cholesterol also showed a significant relationship with diastolic blood pressure³.

Festus et al conducted a study in the Department of Medical Laboratory Science, Ambrose Alli University, Nigeria. They stated that pregnancy has being found to be associated with changes in lipid profile and this differs with each trimester. In their study, serum total cholesterol (TC), triglyceride (TG) high density lipoprotein (HDL) and low density lipoprotein (LDL) were estimated in 120 pregnant women during normal gestation (40 in each trimester) and in 40 volunteers, apparently healthy non-pregnant women serving as control. TC, TG and HDL in the first, second and third trimesters when compared with that of the control subject were significantly high ($p < 0.05$). The change in low density lipoprotein was not significantly high ($p > 0.05$) in the first trimester but became significant ($p < 0.05$) in the second and third trimester when compared with the control. Comparison between first, second and third trimesters showed that TC, TG and LDL in the 2nd and 3rd trimesters were significantly higher than in the 1st trimester. Although, not significant in the 1st trimester HDL followed similar

trend. Conclusively, increase in susceptibility to the development of coronary heart disease, arteriosclerosis, hypertension and other foeta/maternal diseases associated with dyslipidaemia in the subjects studied may be unlikely since the increase in LDL is accompanied by corresponding increase in the scavenging lipid-HDL. They therefore recommend that lipid panel be part of routine investigation during pregnancy.

From this study, it can be concluded that pregnant mothers hi their first trimester had slightly altered serum lipids compared to their non-pregnant counterpart.

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