

# Study of variations in lipid profile in different trimesters of pregnancy

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## ABSTRACT

**Background:** This study has been conducted to show a correlation of rise in lipid profile in all three trimesters when compared with nonpregnant controls. **Objectives:** As previous studies showed that increased lipid profile during pregnancy may lead to serious complications in both mother and fetus. Hence, the aim of our study is to monitor the lipid profile values during all the three trimesters of pregnancy and prevent the complications in both mother and fetus. **Materials and Methods:** A total 180 pregnant patients were taken with 60 in each trimester. 60 healthy nonpregnant women were taken as control subjects. In both study and control groups, we estimated lipid profile which includes total cholesterol (TC), serum triglycerides (TGs), high-density lipoprotein (HDL), and low-density lipoprotein (LDL). **Results:** In comparison between study and control groups, the levels of TC, serum TGs, and HDL were significantly high in all the three trimesters, but the levels of LDL were significantly high in the second and third trimesters only. **Conclusion:** Deranged lipid metabolism in pregnancy is associated with complications in mother and fetus. Therefore, it is recommended to get lipid profile done as a routine investigation in all the three trimesters of pregnancy to avoid maternal and fetal morbidity and mortality.

**KEY WORDS:** Lipid Profile; Trimesters; Pregnancy; Feto-maternal


## INTRODUCTION

During pregnancy, there is increased demand of energy to mother for the normal development of growing fetus and adaptations of the maternal body. This extra energy is provided by the extra demand of carbohydrates and lipids by the mother to maintain the normal development during pregnancy. In early pregnancy, there is increase in diet of mother and increased synthesis of lipids, i.e., lipogenesis which leads to accumulation of extra fat in body. In later stage of pregnancy, there is increase in fat breakdown which helps

in fetal development. The energy provided by lipid is used in cellular proliferation of uterus, blood volume expansion of mother, implantation of fetus in uterus, uteroplacental, and fetal development. During pregnancy, the altered metabolic and hormonal changes of mother's body are responsible for changes in lipid profile. During early pregnancy, there is rise in serum estrogen and progesterone levels. Furthermore, there is hyperinsulinemia leading to increased peripheral utilization of glucose, increased glycogen accumulation in the liver as well as increased storage of lipids and decreased lipid breakdown.

It has been observed that in normal pregnant woman with the advancement of gestational age there is increase in concentration of serum total cholesterol (TC), serum triglyceride (TG), high-density lipoprotein (HDL), and low-density lipoprotein (LDL).

This study is undertaken to understand the lipid profile pattern in different trimesters of pregnancy.

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## MATERIALS AND METHODS

This study was conducted at Mayo Institute of Medical Sciences, Barabanki. A total of 240 subjects between the age group of 22 and 45 were included in this study. Out of these 60 healthy nonpregnant subjects were included in control group. Rest 180 subjects were included in the study group, subdivided into three groups each made up of 60 subjects distributed into 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> trimesters of pregnancy.

Inclusion criteria include healthy nonpregnant women in control group and healthy pregnant women in the study group. All are consumers of normal mixed food.

Exclusion criteria include pregnant women with anemia, gestational diabetes mellitus, obesity, hypertension, smoking, alcoholism, HIV and women with other diseases that may affect the lipid levels in body. Adolescents and women over 45 years of age were excluded because these may lead to high-risk pregnancy.

### Sample Collection and Analysis

Samples from all subjects were collected after minimum 8 h of overnight fasting. Under aseptic precaution 5 ml of fasting venous blood was collected in plain bottles from antecubital vein. After the clot has retracted the sample was centrifuged at 4000 rpm for 5 min the serum separated and stored at 4°C pending assay for lipid profile.

Serum TGs, TC, and HDL cholesterol were analyzed by enzymatic methods with the help of Glaxo kits on ERBA Chem-5 semi-auto analyzer.

Serum LDL cholesterol was calculated by Frederickson-Friedwald's formula according to which:

$$\text{LDL cholesterol} = \text{TC} - (\text{HDL cholesterol} + \text{Very LDL [VLDL] cholesterol})$$

VLDL cholesterol was calculated as 1/5 of TGs.

### Statistical Analysis

The results were summarized as mean  $\pm$  standard deviation in different tables. The Z-test (mean difference test between two groups) was applied to test the level of significance and  $P < 0.05$  was considered significant.

## RESULTS

The result analysis of Table 1 shows a significant increase in the mean serum TGs, mean TC, and mean HDL cholesterol levels on comparison of 1<sup>st</sup> trimester of pregnancy with control subjects. On comparison of 2<sup>nd</sup> trimester of pregnancy with control subjects, it was observed that there was a significant increase in the levels of serum TGs, TC, HDL cholesterol, and LDL cholesterol. Also from Table 1,

**Table 1:** Comparison of lipid profile in control group and study group of different trimesters

Lipid profile (mg/dl)	Pregnant women 1 <sup>st</sup> trimester (N=60)	Pregnant women 2 <sup>nd</sup> trimester (N=60)	Pregnant women 3 <sup>rd</sup> trimester (N=60)	Control (N=60)
TC	151.2 $\pm$ 11.1*	185.4 $\pm$ 12.5*	225.7 $\pm$ 8.9*	147.3 $\pm$ 10.2
TG	185.2 $\pm$ 19.3*	221.1 $\pm$ 20.7*	213.6 $\pm$ 20.2*	121.1 $\pm$ 15.4
HDL	49.5 $\pm$ 9.1*	49.1 $\pm$ 7.9*	52.8 $\pm$ 8.4*	46.1 $\pm$ 8.5
LDL	84.4 $\pm$ 11.2	109 $\pm$ 12.3*	138 $\pm$ 12.7*	88.3 $\pm$ 11.1

\*Means significant difference. TC: Total cholesterol, TGs: Triglycerides, HDL: High density lipoprotein, LDL: Low density lipoprotein

**Table 2:** Comparison of lipid profile in 1<sup>st</sup> and 2<sup>nd</sup> trimester of pregnancy in study group

Lipid profile (mg/dl)	Pregnant women 1 <sup>st</sup> trimester (N=60)	Pregnant women 2 <sup>nd</sup> trimester (N=60)	P value
TC	151.2 $\pm$ 11.1	185.4 $\pm$ 12.5	$P < 0.01$
TG	185.2 $\pm$ 19.3	221.1 $\pm$ 20.7	$P < 0.01$
HDL	49.5 $\pm$ 9.1	49.1 $\pm$ 7.9	$P > 0.05$
LDL	84.4 $\pm$ 11.2	109 $\pm$ 12.3	$P < 0.01$

TC: Total cholesterol, TGs: Triglycerides, HDL: High density lipoprotein, LDL: Low density lipoprotein

**Table 3:** Comparison of lipid profile in 1<sup>st</sup> and 3<sup>rd</sup> trimester of pregnancy in study group

Lipid profile (mg/dl)	Pregnant women 1 <sup>st</sup> trimester (N=60)	Pregnant women 3 <sup>rd</sup> trimester (N=60)	P value
TC	151.2 $\pm$ 11.1	225.7 $\pm$ 8.9	$P < 0.01$
TG	185.2 $\pm$ 19.3	218 $\pm$ 20.2	$P < 0.01$
HDL	49.5 $\pm$ 9.1	52.8 $\pm$ 8.4	$P < 0.05$
LDL	84.4 $\pm$ 11.2	138 $\pm$ 12.7	$P < 0.01$

TC: Total cholesterol, TGs: Triglycerides, HDL: High density lipoprotein, LDL: Low density lipoprotein

**Table 4:** Comparison of lipid profile in 2<sup>nd</sup> and 3<sup>rd</sup> trimester of pregnancy in study group

Lipid profile (mg/dl)	Pregnant women 2 <sup>nd</sup> trimester (N=60)	Pregnant women 3 <sup>rd</sup> trimester (N=60)	P value
TC	185.4±12.5	225.7±8.9	P<0.01
TG	221.1±20.7	213.6±20.2	P<0.05
HDL	49.1±7.9	52.8±8.4	P<0.05
LDL	109±12.3	138±12.7	P<0.01

TC: Total cholesterol, TGs: Triglycerides, HDL: High density lipoprotein, LDL: Low density lipoprotein

the result shows a significant increase in the levels of serum TGs, TC, HDL cholesterol, and LDL cholesterol during the 3<sup>rd</sup> trimester of pregnancy when compared with the control subjects.

## DISCUSSION

In this study, serum TGs, TC, HDL cholesterol and LDL cholesterol levels between nonpregnant and pregnant women for each trimester of pregnancy. We also compared the lipid values between the three trimesters. The value of these lipid parameters increases during pregnancy at different rates. Some previous studies showed that there is 2-3 fold increases in serum TG levels in normal pregnant women as compared to non-pregnant women. In our study, the serum TG levels follow the same trend. In our study, it was observed that the concentration of serum TGs, TC, HDL cholesterol, and LDL cholesterol levels in normal pregnant women increased with increasing gestational age. These values were high in the 1<sup>st</sup> trimester in the pregnant women than that of control. This is attributed to formation of zygote in the wall of the uterus. The concentration of serum TGs, TC, and LDL cholesterol of pregnant women were high in the 2<sup>nd</sup> trimester as compared with the normal subjects. This is due to the maternal switch from carbohydrate to lipid metabolism which is an alternative pathway for production of energy due to high energy demand. The values of HDL cholesterol dropped slightly in the second trimester as compared with the values of nonpregnant women. The concentration of serum TGs, TC, HDL cholesterol, and LDL cholesterol of pregnant women were high in the 3<sup>rd</sup> trimester as compared with the normal subjects due to the development of fetal organ.

The cause of increased serum TG levels is estrogen as in normal pregnancy there is increased estrogen levels, i.e. hyperoestrogenemia. This estrogen induces biosynthesis of endogenous TGs in the liver. This process is associated with increased insulin levels (hyperinsulinemia) in pregnancy. Increased serum levels of insulin in pregnancy lead to an increase in peripheral glucose utilization causing decrease in plasma glucose levels and increased storage of glycogen in tissues. There is also increased deposition of lipids and decreased lipolysis. In late pregnancy, there is sparing of glucose for the fetus and an increased concentration of fatty acids in serum.

Studies in recent past have explained that abnormal lipid metabolism during pregnancy is related with pathogenesis of atherosclerosis, ischemic heart disease, intrauterine growth disease, intrauterine growth retardation, and hypertension. Hence, estimation of lipid profile is strongly recommended as part of the laboratory investigations during pregnancy so as to implement prompt management strategies to prevent deleterious effect of hyperlipidemia associated with pregnancy.

## CONCLUSION

The previous studies showed that deranged lipid profile during pregnancy is associated with atherosclerosis, coronary artery disease, intrauterine growth restriction, and pregnancy induced hypertension. These complications during pregnancy are likely to increase maternal morbidity and mortality, fetal outcome is also affected hence it is advised to get lipid profile done in each trimester of pregnancy to avoid harmful effects due to high serum lipid levels and start treatment as early as possible.

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