



HDL, LDL AND VLDL CHOLESTEROL LEVELS IN DIFFERENT TRIMESTERS OF PREGNANT WOMEN

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ABSTRACT **Background:** The present study was conducted to study any significant variation in the High density lipoprotein-cholesterol (HDL-C), Low density lipoprotein-cholesterol (LDL-C) and Very Low density lipoprotein-cholesterol (VLDL-C) level during normal pregnancy in the different trimesters and its clinical significance in pregnancy. **Methods:** The study was conducted on pregnant women from rural areas attending antenatal clinic of NIMS Hospital. HDL-C, VLDL, LDL-C, TG, TC and random blood glucose were measured in serum in all three trimester of pregnancy. **Results:** The serum LDL-C & VLDL-C level increased significantly ($P < 0.001$) in all the trimesters of pregnancy & serum HDL-C level was elevated in first trimester, decrease in the second trimester and again it increased in the third trimester of pregnancy. **Conclusions:** High cholesterol level in the plasma leads to abnormal lipid metabolism with increased serum lipid profile during pregnancy.

KEYWORDS : Pregnancy, HDL-C, VLDL-C, LDL-C

INTRODUCTION

Pregnancy is associated with increase in cellular proliferation as a result of uterine enlargement expansion of blood volume, placental development, and fetal growth.⁽¹⁾

Cholesterol is used by the placenta for steroid synthesis and fatty acids are used for placental oxidation and membrane formation. Changes in total cholesterol concentration reflect changes in the various lipoprotein fractions. HDL cholesterol increases by 12 week of gestation in response to estrogen and remains elevated throughout pregnancy.⁽²⁾ Total and LDL cholesterol concentrations decrease initially, but then increase in the second and third trimesters. VLDL and triacylglycerols decrease in the first 8 wk of gestation and then continuously increase until term. In the second half of pregnancy, VLDL clearance is altered because of the decreased activity of lipoprotein lipase (LPL) in the adipose and liver and because of the increased activity in the placenta. In the fed state, hepatic LPL is low, but increases with fasting, which increases fatty acid and ketone production for the fetus while the supply of glucose is low. Changes in lipid metabolism promote the accumulation of maternal fat stores in early and mid pregnancy and enhance fat mobilization in late pregnancy. In early pregnancy, increased estrogen, progesterone, and insulin favor lipid deposition and inhibit lipolysis. LPL activity in the adipose tissue from the femoral region, but not from the abdominal region, is elevated at 8–11 wk of gestation.⁽²⁾

Results from a systematic literature review conducted in 2011 revealed an average increase of 46% in TC and 60% in LDL-C from the first to the third pregnancy trimester, whereas high density-lipoprotein cholesterol (HDL-C) levels followed a different pattern, increasing 18% from the first to the second trimester, when they peaked. LDL-C levels increased, on average, 19% from second to third trimester and 35% from first to second trimester. Average LDL-C levels in the last five to ten weeks of pregnancy are usually greater than 160 mg/dL.⁽³⁾

HDL-C peaks in the second trimester. HDL-C levels begin to return to pre-pregnancy values during the final weeks of the second trimester. An 18% increase is observed, on average, from first to second trimester and an overall first to third trimester increase of 10% in 15 studies.⁽⁴⁾

Lipid metabolism undergoes major adjustment during pregnancy, although there is no change in either basal carbohydrate oxidation or non-oxidizable carbohydrate metabolism, there is a significant 50–80% increase in basal fat oxidation during pregnancy and also in response to glucose.⁽⁵⁾

The present study was undertaken to elucidate any significant variation in the HDL, LDL & VLDL cholesterol during normal pregnancy in the different trimesters and to evaluate the clinical significance of cholesterol level in pregnancy.

METHODS

Study Population: we selected normal rural pregnant women in different trimesters of pregnancy and compared them with 20 age-matched healthy non-pregnant women selected from rural population as control. The mean of age in control group was (28.15±5.16) years and in different trimesters respectively 60 pregnant women were divided into three groups of 20 each 1st, 2nd and 3rd trimester of pregnancy. The pregnant women were selected for the study after proper examination and after excluding hypertension, obesity, diabetes, anemia, smoking, alcoholism and women with other chronic diseases and any other pathology that may affect the cholesterol level. The personal and clinical history of the subject was recorded with the help of a questionnaire at the time of examination.

Sample collection

All subjects were made to fast overnight at least for a minimum of 8 hrs. 5 ml of fasting venous blood was collected from the antecubital vein under aseptic precautions from each subject into plain vials. The blood was centrifugated after coagulation at 4000 rpm for 5 minutes and the serum was removed and stored at 4°C.

Biochemical evaluation:

Blood samples of all the subjects were taken. Blood glucose (GOD-POD)⁽⁶⁾, TC (CHOD-POD⁽⁷⁾), TG (GPO/PAP)⁽⁸⁾ and HDL-C (CHOD-PAP)⁽⁹⁾ were measured enzymatically by using ready to use kit at the analyzer. VLDL-C & LDL-C both are determined by Friedewald equation.

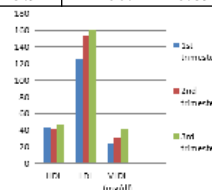
STATISTICAL ANALYSIS

The paired sample t test was used to test the level of significance and $P < 0.05$ was considered significant.

RESULTS

Table 1: Level of HDL, VLDL and LDL level in control and 3 trimester of pregnancy

Groups	HDL (mg/dl) Mean±SD	LDL (mg/dl) Mean±SD	VLDL (mg/dl) Mean±SD
Control	45.8 ± 6.47	90.97±19.25	15.51±3.43
1 st trimester	43.42±8.64	126.13±21.89*	23.75±6.08*
2 nd trimester	40.72±6.46	153.88±32.90*	30.10±8.15*
3 rd trimester	46.69±5.92	160.11±46.89*	41.36±11.92*



Graph 1: Chart showing comparison of HDL, VLDL and LDL level of control and study group

DISCUSSION

In our study non- significant change was observed in the HDL cholesterol level in all three trimesters of pregnancy when compare to healthy non-pregnant women (Table-1). We also observed that although non-significant there were slightly lower value of HDL cholesterol in the second trimester compare with first trimester and third trimester of pregnancy (Graph-1) Which is in line with study, in which they observed that there was a decrease after 22 to 24 weeks in HDL cholesterol which coincides with the onset of increasing resistance to insulin and the increase in concentration of plasma insulin.⁽¹⁰⁾ In some studies reported HDL-C levels to be highest in the first trimester and continually decrease throughout the duration of pregnancy for an overall decrease of 10%.⁽¹¹⁾ In our study significant increase was observed in the LDL & VLDL cholesterol level in all three trimesters of pregnancy when compare to healthy non-pregnant women (Table-1 & Graph-1). The level of LDL cholesterol reached its peak at 3rd trimester probably as a consequence of the hepatic effect of estrogen and progesterone.⁽¹²⁾

The level of VLDL increased in the three trimester as compare to non-pregnant women which may be attributed to the increase rate of synthesis of cholesterol due to estrogens,⁽¹³⁾ principle modulator of hypertriglyceridemia is estrogen which induce hepatic biosynthesis of endogenous triglyceride, which is carried by VLDL.⁽¹⁴⁾

Sattar *et al* proposed that women destined to develop intrauterine growth retardation (IUGR) had lower starting cholesterol level during early pregnancy. They also observed that apart from decrease in LDL-Cholesterol, there was also decrease in level of VLDL and intermediate density lipoprotein (IDL) in IUGR pregnancy which is a precursor of LDL.⁽¹⁵⁾

In our study, no variation was found in random blood glucose (84.29±10.33) which was in normal range in all three trimesters. So according to our study, in pregnancy blood sugar level in different trimester's remains within normal range.

It was also observed that the concentration of serum cholesterol, serum TG, LDL-Cholesterol and VLDL-Cholesterol in pregnancy associated with normal birth weight increase with increasing gestational age at sampling. While HDL-Cholesterol level did not change significantly.⁽¹⁶⁾

CONCLUSION

Increase in circulating concentrations of HDL, LDL and VLDL cholesterol in the plasma leads to abnormal lipid metabolism with increased serum lipid profile which is a risk factor for coronary artery disease during pregnancy.

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