PATTERN OF LIPID PARAMETERS IN HEALTHY WOMEN DURING PREGNANCY

Muhammad Asif[1], Imtiaz Ahmad[1], Sania Tanveer Khattak[2], Imran-U-Din Khattak[1]

ABSTRACT

BACKGROUND: During pregnancy lipid accumulation occurs due to change in energy metabolism. Pregnancy has being found to be associated with changes in lipid profile and this differs with each trimester.
OBJECTIVES: To study pattern of lipid parameters in healthy women during pregnancy.
MATERIAL & METHODS: In this cross sectional descriptive 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 apparently healthy non pregnant volunteers serving as control. All the lipid parameters were analyzed by enzymatic method by semiautoanalyzer. LDL and VLDL were calculated by Frederickson-Friedwald's formula.
RESULTS: TC, TG and HDL in the first, second and third trimesters when compared with that of the control subjects 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.
CONCLUSION: Variation in lipid metabolism in pregnancy is associated with complications in mother and fetus. Therefore, it is recommended to do lipid profile as a routine investigation in all the three trimesters of pregnancy to avoid maternal and fetal morbidity and mortality.

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INTRODUCTION

The mother becomes almost a new person during the period of pregnancy physiologically. Profound local and systemic variation in maternal physiology are initiated by conception and continued throughout pregnancy. During early pregnancy, maternal metabolic environment is modified by a rise in serum estrogen and progesterone level, pancreatic beta-cell hyperplasia and raised serum insulin level. This hyperinsulinemia causes peripheral glucose utilization, increased tissue storage of glycogen, increased storage of fats and decreased lipolysis[1,2].

Increase in maternal lipid profile during pregnancy differs with trimester. 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 age[3-5].

1. Department of Pathology, Saidu Medical College, Swat.
2. Department of Gynae & Obs, Saidu Group of Teaching Hospital, Swat.

Correspondence: Dr. Muhammad Asif
Assistant Professor Pathology
Saidu Medical College, Swat.
Email: drasif555@yahoo.com Mobile # 03339669042

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The four basic lipid indexes cholesterol (HDL and LDL), Triglyceride (VLDL) increase during pregnancy. Among the four analytes tri-glycerides show the largest increase and HDL-C the smallest. All analyte values are raised during the 40 weeks of pregnancy, except HDL-C which is stabilized during the second trimester. After delivery the values decrease, except LDL-C which remains steady (for some weeks) before starting to fall following the others[6-8].

With the development of more modern techniques various studies observed an increase in various lipid fractions, though the increase was neither consistent in time of appearance nor proportion of changes in various fractions. Most authors believe that the increase in blood lipids is related to the requirements of the fetus and to development of the mammary apparatus. Thus hyperlipidemia is a normal prenatal finding but many questions in this field remained unanswered, such as those pertaining to the exact relationship among the lipid changes during pregnancy. Thus in the present study an attempt has been made to define more precisely the changes in lipid fractions during different periods of gestation.

The objective of the study was to find out the affects on lipid profile (total cholesterol, triglyceride, LDL, VLDL and HDL) during the period of gestation.

MATERIALS AND METHODS

A total of one hundred and sixty (160) subjects between the ages of 20 and 45 years were taken. They are divided into two groups. Group 1(control) composed of forty (40) healthy non pregnant volunteers. Group 2 composed of one hundred and twenty (120) healthy pregnant women, each made of forty (40) subjects distributed into 1st, 2nd and 3rd trimester of pregnancy respectively. The subjects were selected among those attending antenatal clinic at Saidu Group of Teaching Hospital, swat between September 2014 to October 2015. The study was conducted in compliance with the Declaration on the Right of the Patient after approval by the Ethical Committee of the Health centre. Informed consent was also obtained from all the subjects enrolled for the study.

Inclusion criteria include; healthy non pregnant and pregnant women and are Consumers of normal mixed food.

Exclusion criteria include; pregnant women with gestational diabetes mellitus, anemia, hypertension, obesity, smoking, alcoholism, HIV and Women with other chronic diseases that may affect the lipid profile. Adolescents and women over age 45 were excluded because pregnancy in those age groups is considered to be high risk.

All subjects were made to fast overnight at least for a minimum of 8hrs. 5ml of fasting venous blood was collected from the vein under aseptic precaution from each subject into plain bottles. The blood was then centrifugated after clotted blood has retracted at 4000rpm for 5 minutes and the serum removed and stored at 4 °C pending assay for lipid profile. Serum Triglycerides (TG), Total cholesterol (TC) and HDL cholesterol (HDL) were analyzed by enzymatic methods with the help of Glaxo kits on ERBA Chem-5 semi auto analyzer. Serum LDL cholesterol (LDL) was calculated by Frederickson-Friedwald's formula according to which LDL cholesterol = Total cholesterol - (HDL cholesterol+ LDL cholesterol). VLDL was calculated as 1/5 of Triglycerides.

RESULTS

Results were presented in mean ± S.D and in suitable table. The paired sample t test was used to test the level of significance and $P < 0.05$ was considered significant. The result analysis of Table 1.1 shows a significant increase in the mean serum TGs, mean TC, and mean HDL cholesterol levels on comparison of 1st trimester of pregnancy with control subjects. On comparison of 2nd 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 1.1, the result shows a significant increase in the levels of serum TGs, TC, HDL cholesterol, and LDL cholesterol during the 3rd trimester of pregnancy when compared with the control subjects. In the table 1.2 and 1.3 first and 3rd trimmest and 2nd and 3rd trimester were compared respectively. There P values were <0.05 & 0.01 respectively which was statistically significant.

Table-1.1 Levels of lipid parameters in control and pregnant women

Parameter	Control	1st trimester	2nd trimester	3rd trimester
Total Cholesterol	169.1 ±32.6	182.9 ± 31.4	223.4±34.7	259.8±44.6
TG	106.6 ±15.9	180 ± 12.2	217.3±26.1	214.8±43.6
HDL-C	46.7±5.7	47.1±6.3	55.6±5.5	51.1±6.3
VLDL	16.2±3.1	16.8±5.8	28.2±8.3	45.3±9.7
LDL-C	103.2±19.2	114.1±20.2	132.6±21.6	154.3±25.2

P<0.05 (2nd trimester vs control group)
P<0.01 (3rd trimester vs control group)

Table-1.2 1st trimester vs 2nd trimester

Parameter	1st trimester	2nd trimester
Total Cholesterol	182.9 ± 31.4	223.4±34.7
TG	180 ± 12.2	217.3±26.1
HDL-C	47.1±6.3	55.6±5.5
VLDL	16.8±5.8	28.2±8.3
LDL-C	114.1±20.2	132.6±21.6

2nd trimester vs 1st trimester (P< 0.05)

Table-1.3 1st trimester vs 3rd trimester

Parameter	1st trimester	3rd trimester
Total Cholesterol	182.9 ± 31.4	223.4±34.7
TG	180 ± 12.2	217.3±26.1
HDL-C	47.1±6.3	55.6±5.5
VLDL	16.8±5.8	28.2±8.3
LDL-C	114.1±20.2	132.6±21.6

3rd trimester vs 1st trimester ($p<0.01$)

DISCUSSION

Some previous studies showed that the most dramatic damage in the lipid profile in normal pregnancy is serum hypertriglyceridemia, which may be as high as two to three folds in the third trimester over the levels in non pregnant women.[9, 10, 11]

In our study also this observation holds true. In this study, it was 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 age although HDL dropped a little in the 2nd trimester with the serum triglyceride concentration showing a very significant increase in the third trimester of normal pregnancy than in the non pregnant women, the mean value being raised almost two folds. Similar observations were reported in studies conducted by Fahraeus *etal* [12], Jimenez *et al*.[13] and Potter and Nestel .[14]

Furthermore, this study showed that total cholesterol, high density lipoprotein and triglyceride levels of the test subjects in the first trimester were higher than that of the control subjects. This is in agreement with those of Klovich and Hallman, [13] in which they observed that, in the first trimester of pregnancy there is formation of zygote in the uterine wall. This accounts for the elevated levels of cholesterol and triglyceride in the first trimester. Total cholesterol, triglyceride, this is in line with results of Russel and Copper, [14] in which they reported that there is development of fetal organ in the third trimester.

This is in line with the findings of Wald and Guckle, Adegke, Russell [15, 16, 17] who observed that the increase in the maternal lipid profile is in response to the maternal switch from carbohydrate to fat metabolism which is an alternative pathway for energy generation due to high energy demand. Total cholesterol, triglyceride, HDL and LDL levels of the test subjects in the third trimester were higher than those of the control subjects.

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 do lipid profile 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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