Assessment of Changes in Lipid Profile of Pregnant Women during Periods of Gestation and Post Partum in Chotanagpur – A Descriptive Study

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ABSTRACT

Introduction: There is a change in energy usage along with accumulation of fat during different trimesters of pregnancy. Altered hormonal status of the body in pregnancy leads to changes in lipid profile which is accompanied by changes in maternal lipoprotein required for the growth and development of the foetus. High lipid profile has adverse effects leading to atherosclerosis which is found to be due to raised cholesterol, triglyceride level. Current study aimed to analyze the levels of total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides (TGs) during pregnancy and their changes during post partum period.

Material and Methods: The study was performed on 110 pregnant women after taking an informed consent from patients to get enrolled in the study. Lipid profiles were assessed using standard procedures.

Results: Among the four analytes triglycerides shows the largest increase and HDL-C the smallest. All the values are raised during pregnancy except HDL-C which is stabilized during the second trimester.

Conclusion: The clinically non-significant elevated lipid profile in the pregnancy period and decline in the postpartum period are physiological.

Keywords: Postpartum, HDL, Triglycerides, Trimesters, Pregnancy

INTRODUCTION

Physiologically, the knowledge of giving birth lies deep within each woman. Successful childbirth depends on the acquiring the process. Pregnancy comprises of a variety of hormonal, immunologic and metabolic changes that exert significant effects on a woman's body which may lead to changes in lipid profile during gestation and postpartum period of the pregnancy. Changes in carbohydrate and lipid metabolism occur to ensure a continuous supply of nutrients to the growing foetus despite intermittent maternal food intake.[1]

During early pregnancy, maternal metabolic environment is modified by a rise in serum levels of estrogen and progesterone, pancreatic beta-cell hyperplasia occurs and there is an increase in the secretion of insulin. Hyperinsulinemia is a condition which leads to increase in peripheral glucose utilization, a reduction in fasting plasma glucose levels, increased tissue storage of glycogen, increased storage of fats and decreased lipolysis.[2] Freinkel was the first to describe the maternal metabolic changes of late pregnancy as "accelerated starvation", when food is unavailable and "facilitated anabolism" when food is ingested.[3]

Maternal fuel adjustments during late pregnancy include a sparing of glucose and an increased concentration of fatty acids in plasma. The four basic lipid indexes (Cholesterol, Triglycerides, HDL-C and LDL-C) increases during pregnancy. The changes in serum lipid indexes are associated with the gestational age. This was due to increase in the lipid and lipoprotein metabolism which reaches the level of cardiovascular risk during second trimester. It is most commonly observed in the second and third trimester of human pregnancy and is characterized by elevation in total cholesterol, HDL-C and LDL-C.[4]

Additionally in early pregnancy, there is an increase in body fat accumulation, associated with both hyperphagia and increased lipogenesis. This increased lipid production during pregnancy is necessary as an energy store to fulfill maternal and fetal metabolic needs especially towards late gestation, has an important role as a source of triglycerides for milk formation just before parturition.[5]

During late pregnancy there is an accelerated breakdown of fat deports, that plays a key role in fetal development. Maternal cholesterol is a rich source of cholesterol for the foetus development during early gestation and minimal during late pregnancy which is due to the higher capacity of fetal tissues to synthesize cholesterol. Maternal hypertriglyceridemia is a characteristic feature during pregnancy and corresponds to the accumulation of triglycerides in low (LDL-C) and high density lipoprotein (HDL-C).[6] The maternal lipid profile values during pregnancy differ 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 pregnant women increased with increased gestational age.[7,8] The present study was undertaken with the aim to elucidate any significant

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Parameters	Population N=102	1st Trimester	2nd Trimester	3rd Trimester	Six Weeks post partum	Percentage
Cholesterol	4.66±0.54	4.55±0.78	6.19±1.35	7.25±1.27	5.44±0.46	38%-65%
Triglycerides	1.01±0.35	0.88±0.36	1.67±0.59	2.40±0.84	1.23±0.34	115%-208%

Table-1- lipid profile values of Cholesterol and Triglycerides in various trimester and six weeks postpartum

Parameters	Population N=102	1st Trimester	2nd Trimester	3rd Trimester	Six weeks Post partum	Percentage
HDL-C	1.42±0.30	0.88±0.36	1.67±0.59	2.40±0.84	0.89±0.34	115%-208%
LDL-C	2.75±0.57	2.65±0.68	3.53±1.01	4.26±1.09	3.50±1.04	33%-64%

Table-2 lipid profile values of HDL-C and LDL-C in various trimester and six weeks postpartum

variation in the lipid profile during gestation and postpartum period in woman of chotanagpur.

MATERIAL AND METHODS

The study was conducted in the department of physiology, Patliputra Medical College Dhanbad, Jharkhand and the study period was from October 2015 to June 2016. Sample size was calculated with a power of 80% and 95% confidence interval and was found to be 100 with the help of G power. A total of 110 women were enrolled in the study. On the basis of eligibility criteria and informed written consent only 102 women participated in the study. A detailed history about present pregnancy, history of diabetes, renal disorders, thyroid disorders, family history regarding preeclampsia was taken before enrolling patients for the study. Subject's body mass index was calculated on enrolment and those who were obese were excluded from the study.

The women were in the reproductive age of 20-45 years old. The women over age 45 were excluded because pregnancy in that age groups is considered to be high risk. All the information about complex diseases in the study subjects was provided by their physicians. Women with other systemic diseases that may affect the lipid level were excluded from the study. Furthermore, all the prescriptions that the study subjects used during the period were evaluated. Women with a history of medication of dyslipidemia that could disturb the lipid profile were also eliminated from the study.

The blood was drawn into plain tubes and subjected to estimation of lipid profile (Serum Cholesterol by modified Roeschlau's method, Serum triglyceride by McGrowan method,[9,10]

HDL – C by Bursteim et al method,[11] VLDL and LDL – C was calculated by Friedewald's formula).[12] The estimation of lipid profile was also carried out in study group six weeks post partum.

STATISTICAL ANALYSIS

The statistical analysis was performed with the help of microsoft office 2007. Results are presented as mean + S.D.

RESULTS

Table 1 and 2 depicts the difference in mean values of lipid profile respectively, important findings were: No significant difference were observed in the values of serum total cholesterol, serum triglycerides, serum HDL-C, and LDL-C during early pregnancy. A progressive rise was observed in serum total cholesterol, serum triglyceride and LDL-C with the increased gestational period.

The four basic lipid indexes increase during pregnancy, following different rates of decrease. Among the four analytes triglycerides shows the largest increase and HDL-C the smallest. All the values were raised during pregnancy except HDL-C which is stabilized during the second trimester. After delivery the value decreases, except LDL-C which remains steady (for some weeks) before starting to fall following the others. Table-1 shows lipid profile values of Cholesterol and Triglycerides in various trimester and six weeks postpartum. The difference in percentage of increase has been calculated from first to third trimester. Table-2 shows lipid profile values of HDL-C and LDL-C in various trimester and six weeks postpartum. The difference in percentage of increase has been calculated from first to third trimester.

DISCUSSION

The present study showed that the values of the four analytes increased during pregnancy. The percentages of increase between the first and second trimester were: Cholesterol -38%, Triglycerides- 115%, HDL-C -30%, LDL-C-33%. The increase between second and third trimester was even higher. Triglycerides were proved to show the highest increase during pregnancy. It was observed that fat appears to be the main form of stored energy in pregnancy because as fat deposition increases during the first half of pregnancy and slowly diminishes in late gestation. The interpretation for this is that the hypothalamic centre gets "triggered" to the degree of maternal adiposity. Although the exact mechanism for the more sensitive regulation of appetite in pregnancy is still not known fully, a more important is that the increases in the adipose tissue store anticipates the late gestation foetal growth spurt by beginning in early gestation and reaching a maximum in mid gestation.[13,14]

The importance attached to need for routine examination of serum lipid profile in human subjects especially during pregnancy is well known. The maternal lipid metabolism is specifically altered in pregnancy, with raised lipoprotein and cholesterol levels during different trimesters of pregnancy.[15] It has been found that normal pregnancy is associated with high concentrations of oestrogens which may contribute to the rise in plasma lipids especially in last half of pregnancy. Total cholesterol, LDL-C, HDL-C, and triglyceride levels

rise throughout the different trimesters, peaking just before term at approximately 36 weeks of gestational age.[16]

The increase in lipid profile in third trimester of pregnancy was also seen in this study. The pattern of increase of total cholesterol in third trimester was the same as the pattern of decrease from the third trimester to the end of puerperium. This same mirror image pattern was observed for the high density lipoprotein and low density lipoprotein. However, for the triglyceride there was a steep rise from the control to the third trimester value with a non-mirror image decrease at the postpartum period.[17]

Overall, the physiological mechanism in the postpartum period for return of the elevated lipid profile to pre-pregnant value is optimum. Some studies have also revealed that the mean values of serum TC, TG, and LDL are significantly higher among the hypertensive patients in comparison to normotensive.[18]

Variations in the plasma lipids during pregnancy have been recognised and thought to be mostly due to alterations in the hormonal level which in the form of rise in various types of hormones such as insulin, progesterone, and human placental lactogen. This study revealed that a reduction in the triglyceride, LDL-C and total cholesterol at the end of the puerperium. But these lipids at the end of the puerperium were found to be significantly increased. The reduction observed in triglyceride levels is in concordance with the study done by Ola et al, and their observation was also at the 4th week postpartum. However, the high-density lipoprotein cholesterol reduced to the pre-pregnancy value at the end of puerperium, as there was no statistical difference between the gestational period and the 4th week postpartum value.[19,20]

Some previous studies showed that the changes in the lipid profile in normal pregnancy was found to be highest among triglycerides especially in the third trimester which is in consistent with the studies done by festus et al.[21] In this study, it was observed that the concentrations of serum total cholesterol, serum triglyceride, high density lipoprotein increased with increasing gestational age although HDL decreased in the 2nd trimester and then again showing a significant increase in the third trimester of pregnancy which is in concordance with the studies conducted by Jimenez et al and Potter and Nestel.[22,23]

National Cholesterol Education Program describes serum concentration of lipids as; desirable, within normal range, optimal, high, near optimal, normal and borderline. The triglyceride value in the early pregnancy was normal when compared to third trimester which is in concordance with the studies done by Bassi et al.[24,25] The initial increase HDL-C is estrogen dependent, while decreasing HDL-C in the latter half of pregnancy, along with LDL-C changes, correlate with rising levels of human placental lactogen, insulin and insulin resistance. Further studies are required to delineate the role of lipid profile in pregnant women during different trimesters.

CONCLUSION

The elevated lipid profile in pregnancy is physiological and declines to the pre-pregnant values to restore the non-gravid maternal homeostasis.

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