

A study of Thyroid Function test and Lipid Profile in Pregnancy

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Abstract

Pregnancy is known to create profound changes in the body. It causes hormonal changes in the body which may lead to changes in lipid profile. TSH levels are usually suppressed due to very high levels of Human chorionic gonadotropin (hCG) during the first half of the pregnancy. Thyroid dysfunction may result in various changes in triglycerides, phospholipids, cholesterol and other lipoproteins. Dyslipidemia, a consequence of thyroid dysfunction, generally increases the risk for cardiovascular disease.

The study was conducted in the Department of Biochemistry, MMC&RI, Mysore. 100 women with a singleton pregnancy irrespective of parity and gravida were enrolled and cases like chronic hypertension, Diabetes mellitus, Renal Disorders and Thyroid Disorders, Obstetric and Foetal Complications (Hydrops foetalis, congenital foetal anomalies) were excluded from the study. Blood was analysed for thyroid and lipid profile.

Conclusion: T3, T4 and TSH levels are within normal range during pregnancy. There is a positive correlation between TSH levels and cholesterol. This suggest that regular TSH and cholesterol estimation is very important during pregnancy to reduce the maternal and fetal complications.

Key words: cholesterol, dyslipidemia, HDL, LDL, lipid profile, VLDL and thyroid function test.

Introduction

Pregnancy is known to create profound changes in the body. It not only increases demand for metabolic fuels for the foetal growth and development but also causes hormonal changes in the body which may lead to changes in lipid profile¹.

During early pregnancy, there is rise in serum estrogen and progesterone levels. And also, 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 breakdown².

The thyroid gland is an important endocrine gland in the human body because of its ability to produce the hormone triiodothyronine (T3) and tetraiodothyromine (T4). These hormones are important in regulating functions like growth, differentiation, cellular metabolism and general hormonal balance of the body, maintenance of metabolic activity and the development of skeletal and organ system. Over 99% thyroxine in the blood is bound to proteins like thyroxine binding globulin (TBG), albumin and prealbumin. Approximately 0.3% T4 is in the free unbound state in the blood. This free fraction is physiologically active due to its ability to enter target cells and influence calorogenesis and protein, lipid and carbohydrate metabolism. T4 also functions in the peripheral tissues as a prohormone by being further metabolized to another most active thyroid hormone, tri-iodothyromine (T3) and other inactive metabolites reverse T3³.

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During pregnancy controlled hyper-stimulation of the ovaries results in a rise of serum TBG, T4 and T3 concentrations while there was a fall in serum free T4 concentration and a small rise in serum TSH concentrations (usually within the normal range). Also, TSH levels are usually suppressed due to very high levels of Human chorionic gonadotropin (hCG) during the first half of the pregnancy, especially the first trimester. Thyroid dysfunction without any primary thyroid disease may result in various qualitative or quantitative changes of triglycerides, phospholipids, cholesterol and other lipoproteins. Dyslipidemia, a consequence of thyroid dysfunction, generally increases the risk for cardiovascular disease⁴.

Aim: The present study was undertaken to find out whether there is any significant variation in the thyroid function test and lipid profile during pregnancy and to establish a relation between TSH & lipid profile.

Materials & Method

The study was conducted in the Department of Biochemistry, MMC&RI, Mysore. This study was undertaken after obtaining the Institutional ethical clearance. The study was conducted for a period of 5months. A total of 100 pregnant women were enrolled in the study after informed consent.

Inclusion criteria: All pregnant women with a singleton pregnancy who came to our hospital

irrespective of parity and gravida.

Exclusion criteria: Pregnant women with diseases or complications like chronic hypertension, Diabetes mellitus, Renal Disorders and Thyroid Disorders, Obstetric and Foetal Complications (Hydrops foetalis, congenital foetal anomalies).

Collection of Blood Sample: 3ml of fasting blood was collected under aseptic precautions from the cubital vein. Serum was separated after centrifugation and analysed. T3, T4 and TSH were analysed by ECLIA method. The serum total cholesterol by enzymatic CHOD-PAP method, serum triglycerides by enzymatic GPO-PAP method, serum high density lipoprotein (HDL) cholesterol by Direct enzymatic method, very low density lipoprotein (VLDL) by calculation method (triglycerides/5) and low density lipoprotein (LDL) cholesterol was calculated by Fredrickson-Friedwald formula {total cholesterol - HDL cholesterol - (triglycerides/5)}.

Statistical Method: The data was entered in excel format and analysed using epi-info software. Descriptive statistics like frequency and percentage were calculated. Association between qualitative variables was tested by chi-square test. P value less than or equal to 0.05 was considered as significant. Correlation was used for quantitative variables. The values between 0 to +1 was considered as positive correlation and 0 to -1 as negative correlation.

Results & Discussion

Table 1: Thyroid function test of study subjects

	Mean	SD
T3	171.72 ng/dl	4.04 ng/dl
T4	10.73 µg/dl	48.07 µg/dl
TSH	2.18 µIU/ml	2.16 µIU/ml

Table 2: Thyroid status of study subjects

	Frequency	%
Euthyroid	90	90
Hypothyroid	8	8
Hyperthyroid	2	2

Table 3: Lipid profile of study subjects

	Mean	SD
Total cholesterol	223.32mg/dl	58.87mg/dl
Triglycerides	198.38 mg/dl	76.46 mg/dl
HDL	60.9 mg/dl	11.89 mg/dl
LDL	106.8 mg/dl	26.47 mg/dl
VLDL	39.67 mg/dl	15.29 mg/dl

Table 4: Lipid status of study subjects

	Frequency	%
Normal	30	30
Hypercholesterolemia	70	70

Table 5: Association between TFT profile and lipid profile of study subjects

	Normal lipid profile	Hypercholesterolemia	Total	P value
Euthyroid (Normal TSH)	30	60	90	0.092
Hypothyroid (high TSH)	0	2	8	
Hyperthyroid (low TSH)	0	8	2	
Total	30	70	100	

Table 6: Correlation between TSH and cholesterol

Mean TSH	Mean	r value
2.18 μ IU/ml	223.32mg/dl (Total cholesterol)	+0.019
	60.9 mg/dl (HDL)	+0.35
	106.8 mg/dl (LDL)	-0.07

Pregnancy is a stress condition to the maternal thyroid gland, due to increase in thyroxin binding globulin, increased demand for iodine and thyroid stimulation by HCG⁵. Thyroxin is an important hormone for fetal brain development, growth and lung maturation. Thus if maternal levels are not well maintained in pregnancy,

fetus is at risk⁶. Hence regular measurement of thyroid profile is important.

Table 1 & 2 shows Thyroid function test of study subjects. Out of 100 subjects, 90% were euthyroid, and 8% & 2% were hypothyroid & hyperthyroid

respectively. The mean T3 level was $171.72 + 48.07$ ng/dl, mean T4 was $10.73 + 2.16$ μ g/dl and mean TSH was $2.18 + 1.37$ μ IU/ml. Patwari M et al also showed similar results. According to Patwari M et al, the mean T3, T4 & TSH was 71-175 ng/dl, 3.6-9.0 μ g/dl & 0.1-4.40 μ IU/ml; 84-195 ng/dl, 4.0-8.9 μ g/dl & 0.4-5.0 μ IU/ml; 97-182 ng/dl, 3.5-8.6 μ g/dl & 0.23-4.4 μ IU/ml in 1st, 2nd and 3rd trimester respectively⁷. When average values of all the 3 trimesters were considered the results were in agreement with present study.

Thyroid hormones play an important role in synthesis, mobilization and metabolism of lipids. Therefore, hypothyroidism is a major cause of secondary dyslipidemia⁸. The risk of developing atherosclerosis is directly related to the plasma cholesterol. Increased level of cholesterol for prolonged period will favor deposits in subintimal regions of arteries. The oxidized LDL (ox-LDL) gets deposited in the walls of arteries, which are degraded by nonspecific uptake by macrophage. There is also smooth muscle cell proliferation and fibrosis. So, this adversely affects the pregnancy. In the present study we have carried out the lipid profile and found dyslipidemic features.

Table 3 & 4 shows lipid profile of subjects. Out of 100 subjects, 70% were Hypercholesterolemia. The mean total cholesterol was $223.32 + 58.87$ mg/dl, triglycerides was $198.38 + 76.46$ mg/dl, HDL $60.9 + 11.89$ mg/dl, LDL was $106.8 + 26.47$ mg/dl and VLDL was $39.67 + 15.29$ mg/dl. There is a consensus regarding elevated levels of total cholesterol, triglycerides, LDL and VLDL between the present study and the study done by Pusukuru, R et al., on 200 pregnant women. Pusukuru, R et al. learnt that the average values of total cholesterol, triglycerides, high density lipoprotein, low density lipoprotein and very low density lipoprotein in 2nd and 3rd trimester was 228.61 mg/dl, 202.73 mg/dl, 46.09 mg/dl, 115.11 mg/dl & 32.24 mg/dl respectively¹.

Table 5 shows association between TFT and Lipid profile. Out of 90 euthyroid subjects 60 were in Hypercholesterolemic status but it was statistically not significant ($p > 0.05$).

Table 6 shows correlation between TSH and cholesterol levels and we observed a positive correlation between total cholesterol and HDL. This indicates that the TSH and Cholesterol & HDL are positively

associated. When TSH level increases, cholesterol levels also increases. Garduno-Garcia JJ et al. concluded that TSH is significantly associated with lipid profile in the euthyroid population and they showed TSH is positively correlated with TC, TG & LDL and negatively correlated with HDL⁹.

Pregnancy is a phase of life, where the emotions are high not only to the pregnant lady but to the other family members. If there is any untoward incidence during pregnancy, then allegations of medical negligence are often cited as the reason. Hence, the study which establishes association between TFT and lipid profile to maternal and fetal complications are need of the hour. It is recommended that forensic experts consider regularly examining the thyroid gland histologically, particularly a cause of death there is no apparent anatomic cause of death in pregnant women¹⁰.

Conclusion

T3, T4 and TSH levels are within normal range during pregnancy. There is a positive correlation between TSH levels and cholesterol. This suggest that regular TSH and cholesterol estimation is very important during pregnancy to reduce the maternal and fetal complications. The documentation in the form of tests of Thyroid function tests and Lipid profile will serve as a arsenal to the doctors in cases of alleged Medical Negligence. Lack of documentation can be an achille's heel even though doctor would have taken all precautions.

Limitations: The sample size is less to establish proper correlation between thyroid status and dyslipidemia and its related complications. Hence, the study should be conducted on large sample size and these parameters should be considered in all trimesters and postpartum period as well.

Conflict of Interest: Nil

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Ethical Clearance: Taken from Mysore Medical College and Research Institute Ethical Committee

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