

# A Study of Thyroid Profile Status and its Correlation with Lipid Profile in a Tertiary Care Centre

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## ABSTRACT

**Introduction:** The thyroid hormone, which has varying effects on cell metabolism in various organs, is a crucial component of healthy homeostasis. It was discovered that thyroid hormones, which are classified as catabolic hormones, control several metabolic processes, such as lipid synthesis, mobilization, and breakdown. Aim: To study thyroid profile status and its correlation with lipid profile in a tertiary care centre

**Material and methods:** It is a Cross-sectional study. All the above samples were taken from the outpatient department (OPD). 5 ml of venous blood was collected in yellow topped vacutainer. Analysis of all the analytes Total Cholesterol, Triglycerides and HDL Cholesterol was made using a fully automated Biochemistry analyzer (Siemens Dimension EXL 200) LDL Cholesterol was calculated based on the Friedewald formula. Serum T3, T4, and TSH were analyzed using VIDAS. Two sets were tabulated, in one set when TSH value was less than 5uIU/mL, and in the second set the value of TSH was more than 5uIU/mL. Correlation of TSH value at both the set were done.

**Results:** Spearman test is used. Compare the TSH value at both levels, 0-5 and 5.1-10.5uIU/mL, to serum total cholesterol and serum triglyceride, we found that there was no significant correlation between the two.

**Conclusion:** It is not necessary that alteration in the thyroid hormones will affect the levels of serum total cholesterol and serum triglyceride in the body.

**Keywords:** Thyroid Profile, Lipid Profile

## INTRODUCTION

Thyroid diseases are among the most prevalent endocrine conditions worldwide, second only to diabetes. India is not an exception. The thyroid hormone, which has varying effects on cell metabolism in various organs, is a crucial component of healthy homeostasis. It was discovered that thyroid hormones, which are classified as catabolic hormones, controlled a number of metabolic processes, such as lipid synthesis, mobilization, and breakdown. There have been reports linking hypothyroidism to a higher risk of atherosclerotic cardiovascular disease and dyslipidemia.<sup>1,2</sup> In addition to controlling thermogenesis, thyroid hormones are crucial for the metabolism of fat, glucose, and lipids as well as for food intake.<sup>3</sup> Decreased activity of thyroid where serum TSH level is high and T3 & T4 levels are within normal range.<sup>4</sup> Study shows that the subclinical hypothyroid patients are at risk for developing cardiovascular diseases.<sup>5</sup> According to a number of studies, thyroid hormone influences lipid profile status and there are increasing evidence of

higher TSH level and increasing total cholesterol level and triglyceride level.<sup>6</sup> Thyroid hormones regulate many metabolism and metabolism of lipids are one amongst them. Dyslipidemias are common findings among hypothyroid patients. Subclinical hypothyroidism is also associated with increasing total cholesterol level with increasing LDL-Cholesterol level along with increasing serum triglycerides level. Altering the lipid profile status predisposes to increasing risk for cardiovascular disease in these sets of patients. Present study is being done to assess the thyroid profile and correlate the TSH with the lipid profile values in tertiary care centre.

Aim of the present study is to assess the pattern of thyroid profile and its correlation with lipid profile at different TSH levels in a tertiary care center.

## MATERIAL & METHODS

**Study protocol:** It was a cross sectional study, samples were taken from the outpatient department (OPD) who reported to the hospital for different clinical conditions. In the study males were 58, and females were 192. Study was conducted from December 2022 to July 2023. All guidelines as per declaration of Helsinki and good clinical practice guidelines were followed. Ethical clearance was obtained from institutional ethical committee.

### Inclusion and exclusion criteria

58 males and 192 females who reported to hospital for different clinical conditions were recruited in the study after taking written informed consent from each of them.

### Sample Collection and Analysis

5 ml of venous blood was collected in yellow topped vacutainer and serum was separated by centrifuging the sample at 3000 rpm for 3 minutes. Analysis of all the analytes Total Cholesterol, Triglycerides and HDL Cholesterol were made within 1 hour of serum separation using fully automated Biochemistry analyzer (Siemens Dimension EXL 200) LDL Cholesterol were calculated based on Friedewald formula. Serum T3, T4 and TSH were analyzed using VIDAS. Values of lipid profile were tabulated in two sets, in one set when

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TSH value was less than 5uIU/mL and in second set the value of TSH was more than 5uIU/mL. Correlation of TSH value at both the set were done.

All the analytes were analyzed after the 2 levels of quality control values were within ±2SD at fully automated biochemistry analyzer (Siemens). Controls were run for VITEK immunodiagnostic assay system (VIDAS) too and were in accepted range.

Reference ranges for different analytes analyzed for the study are: T3: 0.92-2.33 nmol/L

T4= 60-112 nmol/L, TSH= 0.25-5 uIU/ml, Total Cholesterol: <200=desirable, 200-239= borderline high, ≥ 240= high. Triglycerides= < 150= Normal, 150-199= borderline high, 200-499= high, ≥500= very high

Reference range for lipid profile were as per NCEP guidelines ATP III. Reference range for T3, T4 and TSH were as per value given by VIDAS kit insert.

**STATISTICAL ANALYSIS**

Data was analyzed in R 4.2.0 software. Shapiro-Wilk normality test is used for the data set of total cholesterol, TG and TSH. For total cholesterol, the p-value is 0.001561, for TG is 0.2259 and for TSH is 0.0000007722 respectively. For the correlation of TSH with total cholesterol and TG, Spearman's rank correlation rho is used. For total cholesterol and TSH correlation, the p-value is = 0.774, for TG with TSH, the p-value is 0.2372.

**RESULTS**

Total of two hundred fifty patients were enrolled in which 23 % were males and 76 % were females. Out of total 250 patients, most of the patients around 40% was from ANC clinic, followed by 12% hypothyroidism, 8% infertility and 4% hyperthyroidism diagnosed patients (fig1). When we tabulated the data and in second set when the value of TSH > 5uIU/mL, 45% of patients falls into the category of total hypothyroidism cases followed by 23% infertility cases and 14 % ANC cases (fig2). When we compared the TSH value at both levels, 0-5 and 5.1-10.5uIU/mL, to serum total cholesterol and serum triglyceride, we found that there was no significant correlation between the two (fig3,4,5&6). Spearman test is used for analysis of thyroid profile data and lipid profile data. Pie charts were used to evaluate the patient's profile who reported to the hospital.

Mean and Standard deviation (SD) of serum cholesterol. Triglycerides and TSH at different TSH levels is depicted in table1.

**DISCUSSION**

Dyslipidemia is thought to confer risk of cardiovascular

disease development. Overt hypothyroidism is associated with dyslipidemia. However, the relationship between subclinical hypothyroidism (SCH) and abnormal lipid profile is still unclear. Among 8586 adults from the National Health and Nutrition Examination Survey III database, SCH was not associated with alterations in TC, LDL-C, TG, or

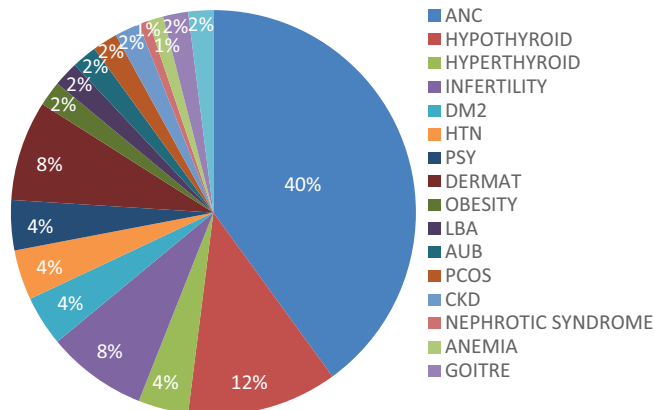


Figure-1: Overall patient profile status

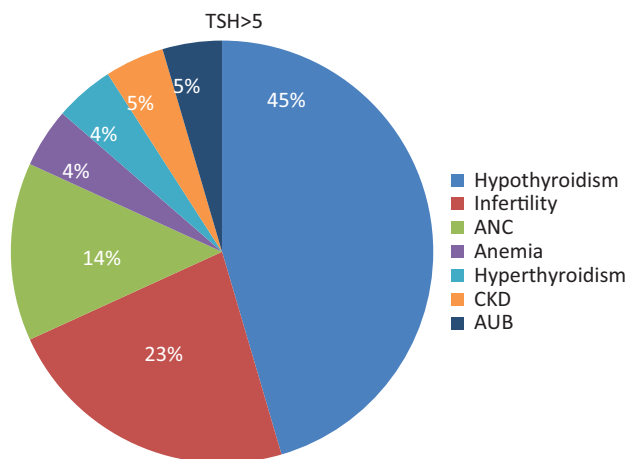


Figure-2: Patient profile status for TSH>5

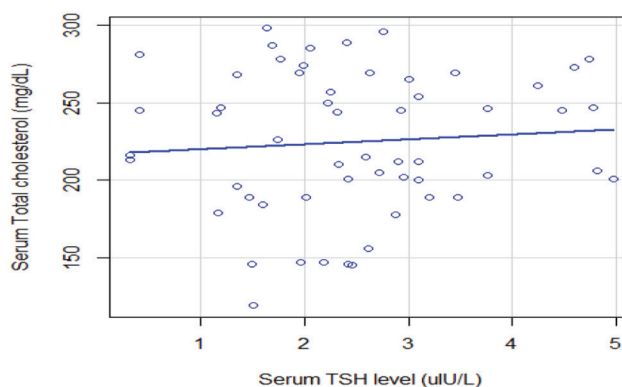
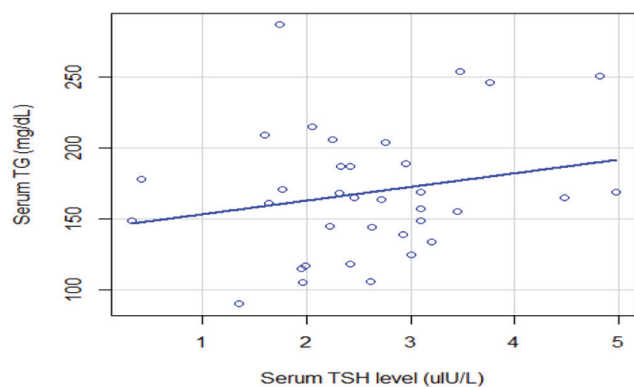


Figure-3: Serum TSH (<5uIU/mL) and total cholesterol level

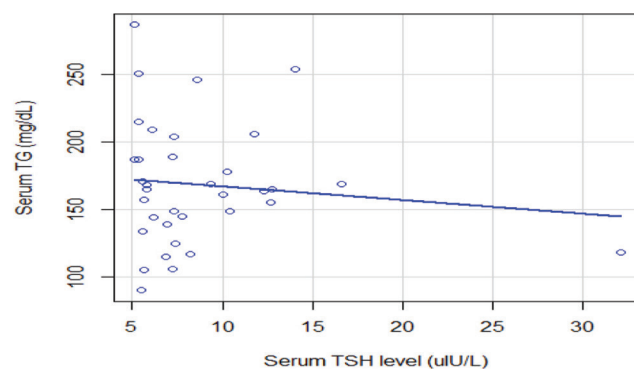
	TSH (<5 uIU/mL)			TSH (5.1-10 uIU/mL)		
	TSH	Chol	TG	TSH	Chol	TG
Mean	2.4	224.8	154.5	8.7	242.7	168.3
SD	1.1	45	36.4	5.0	50.61	45.4

SD=Standard deviation, TSH=Thyroid stimulating hormone, Chol=Cholesterol, TG=Triglyceride

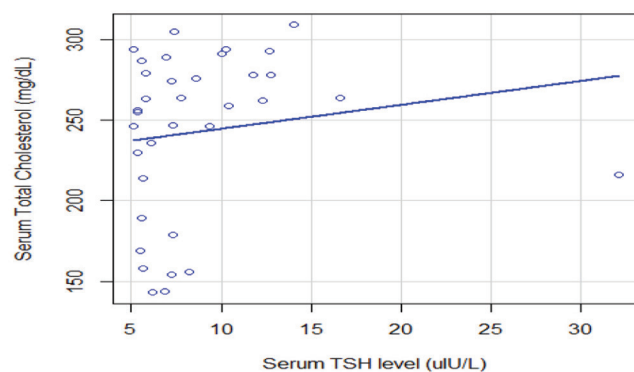
**Table1:** Mean & SD of TSH, Chol (mg/dL) & TG (mg/dL) level at different TSH levels



**Figure-4:** Serum TSH (<5uIU/mL) and triglyceride level



**Figure-5:** Serum TSH (5.1-10uIU/mL) and total cholesterol level



**Figure-6:** Serum TSH (5.1-10uIU/mL) and total cholesterol level

HDL-C after adjustment for age, race, sex, and using lipid-lowering drugs. Vierhapper et al reported that there were no significant differences in serum TC, LDL-C, HDL-C, or TG between patients with SCH and the euthyroid control group.<sup>7</sup> Role of thyroid hormone in regulation of lipid metabolism at various level is well known. Thyroid hormones influence cholesterol synthesis by inducing the rate limiting enzyme HMG-CoA reductase as well as T3 regulates the LDL receptors and hence controls the lipid profile status. In addition, thyroid hormones also involve cholesterol ester transfer protein (CETP) metabolism along with lipoprotein lipase activity and affects lipid profile status. There are controversies and different thoughts as per the available literatures regarding the dyslipidemias in subclinical hypothyroid patients compared to euthyroid patients. Many studies contradict the findings of other studies in evaluating dyslipidemia in subclinical hypothyroid patients. We will be

discussing the salient findings in some studies as per below mentioned paragraphs.

Present study is done keeping in mind the comparison of lipid profile status in euthyroid as well as in subclinical hypothyroid (SH) patients. Our study did not show any significant increase in total cholesterol and triglyceride value in SH patients as well as if we compare these value with euthyroid patients again it did not show any significant alteration. There are many studies which shows that the SH is associated with increased levels of total cholesterol and LDL-Cholesterol and SH is also associated with increased level of triglycerides which contradicts our findings.<sup>8-11</sup> There are study which shown that the levels of total cholesterol were significantly raised in SH patients compared to euthyroid patients however the level of triglyceride did not differ significantly in SH patients compared to euthyroid patients and hence the finding of total cholesterol in SH patients in this study contradicts our findings however the finding of triglyceride in this study is as per our study.<sup>12</sup>

There are studies which shows no significant differences in lipid profile values in subclinical hypothyroid patients compared to euthyroid patients.<sup>13-15</sup>

However, when we compared the TSH value at both levels, 0-5 and 5.1-105uIU/mL, to serum total cholesterol and serum triglyceride, we found that there was no significant correlation between the two. Our study suggested that it is not necessary that alteration in the thyroid hormones will affect the levels of serum total cholesterol and serum triglyceride in the body.

## CONCLUSION

In our study we have found that alteration in the thyroid hormones may not affect the levels of serum total cholesterol and serum triglyceride in Indian population..

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