



## A STUDY OF ALTERATION IN LIPID PROFILE IN HYPOTHYROIDISM

**Rosy Lekharu\***Department of Biochemistry, GCS Medical College, Ahmedabad, Gujarat, India.  
\*Corresponding Author**Nikita Hasani**

Department of Biochemistry, Gujarat University, Ahmedabad, Gujarat, India.

**Jayshree Tolani**

Statistician cum Tutor, Department of Community Medicine, GCS Medical College, Ahmedabad

**Ramesh Pradhan**

Department of Biochemistry, GCS Medical College, Ahmedabad, Gujarat, India.

**ABSTRACT**

Hypothyroidism is associated with an increase in serum concentrations of intermediate-density lipoprotein and low-density lipoprotein (LDL) cholesterol due to a change in metabolic clearance. Hyperlipidaemia may contribute to the higher risk for developing coronary artery disease associated with hypothyroidism. Serum levels of total cholesterol and LDL are often increased in hypothyroid individuals. The LDL particles of hypothyroid patients appear to be more susceptible to oxidation, which potentially makes them more atherogenic. Thyroid hormone replacement therapy may slow the progression of coronary artery disease, because of its beneficial effects on lipids.

For this study, we have selected diagnosed cases of Hypothyroidism undergoing consultation with physician and endocrinologist at the "Gujarat Cancer Society Medical College Hospital and Research Centre, Ahmedabad" belonging to the age group 25-80 years. We have estimated lipid profile in hypothyroid patients, compared the degree alteration in lipid levels as compared to alteration in thyroid hormone levels and tried to assess the risk for cardiovascular disease.

The present study concludes that thyroid dysfunction leads to derangement in the lipid profile. Recognition and treatment of hypothyroidism, can lead to prevention in alteration of lipid profile parameters and thereby prevent the development of atherosclerosis. As TSH is a sensitive parameter for screening thyroid dysfunction, early detection of hypothyroidism and treatment can significantly reduce the incidence of ischaemic heart disease.

**KEYWORDS** : Hypothyroidism, LDL Cholesterol, Dyslipidemia, Ischaemic heart disease**INTRODUCTION:-**

Thyroid abnormalities affect a considerable portion of the population. The prevalence pattern depends on ethnic and geographical factors as iodine sufficiency in male to female sex ratio was 1:5.4 as studied previously in Indians.

TSH levels is the main stay for labelling the diagnosis as hypothyroidism, along with T3 and T4 estimation for the kind of hypothyroidism to be classified. The serum TSH prevalence of was 11.3% (male to female ratio 1:3.7) and 74% belonged to 35 – 54 years (Dorland's ,2012). World health organization (WHO) recommends use of sensitive TSH assay as the first line of assessment of thyroid as well as free T3 and freeT4 and anti TPO antibodies for differential diagnosis of thyroid disorders (Vanderpump MPJ et al, American Journal of Cardiovascular Disease Research, 2015).

In hypothyroid patients, despite the reduced activity of HMG-CoA Reductase, there is often an increase in the serum total cholesterol concentration, mainly due to raised levels of serum LDL cholesterol and intermediate density lipoprotein (IDL) cholesterol. In addition, incompletely degraded VLDL particles enriched in cholesterol and apo- E accumulate in thyroid subjects. A defective receptor-mediated LDL catabolism and changes in intravascular metabolism as defined by decreased activities of lipoprotein lipase & hepatic lipase, seem to contribute to alterations. Estimates of the prevalence of Sub Clinical Hypothyroidism among patients with dyslipidemia ranges from 1.4% to 11.2% (Surks MI, 2004)

In this study in support of this hypothesis, it was observed that serum cholesterol levels were significantly elevated only in severely hypothyroid patients when compared with controls.

**MATERIALS AND METHODS:-**

The present study was carried out in the Central Clinical laboratory of GCS Hospital, Naroda Road, Ahmedabad. It was a Case-Control study.

120 patients were randomly selected from the OPD and indoor patient of GCS hospital. They had a mean age of 49.04 years. Detailed information was taken from each subject regarding symptoms, treatment, family history other diseases as well as complications. 60 apparently healthy people were chosen as controls. Their mean age was 50.11 years old. On the other hand, 60 patients which are suffering from hypothyroidism having high TSH were taken as cases. Their mean age was 47.96 years.

Serum TSH level, T3 level, T4 level, total cholesterol, triglyceride, LDL cholesterol, HDL cholesterol, VLDL cholesterol were measured for each sample in all healthy and hypothyroidism subjects. Sample from patients and controls were taken under supervision of consultant physician and endocrinologist.

Venous blood samples were collected after 12 hours of overnight fasting for estimation of T3, T4, TSH and along with the lipid parameters - total cholesterol, triglycerides, LDL and HDL cholesterol and VLDL. All the parameters were estimated using Radio-immunoassay kits on Cobas e 411 – Biochemilluminescence and fully auto chemistry analyser – Erba XL-640.

**RESULTS:-** In the present study, 60 patients of Hypothyroidism and 60 apparently healthy individuals of same age group were included. In Data analysis comparison of parameters was done between normal and abnormal group by using unpaired t-test.

**1. Age incidence in case group :-**

Age in years	No. of case	%
21-30	2	3.3
31-40	14	23.3
41-50	21	35
51-60	16	26.6
61-70	6	10
71-80	1	1.6
Total	60	100

**2. Gender distribution of case group:-**

Gender distribution	No.	%
Male	15	25
Female	45	75
Total	60	100

**3. Comparison of parameters between cases (Group 1) and controls (Group 2) using unpaired t-test.**

Unpaired t-test	Group 1		Group 2		P-value
	Mean	S.D.	Mean	S.D.	
<b>TSH</b>	2.251	0.818	16.839	23.69	<0.0001
<b>Cholesterol</b>	156.93	29.236	219.83	39.822	<0.0001
<b>Triglyceride</b>	107.73	45.88	156.36	89.64	<0.004
<b>HDL</b>	48.91	10.99	54.37	8.46	<0.003
<b>LDL</b>	97.552	24.576	139.56	28.61	<0.0001
<b>VLDL</b>	21.48	9.2	31.27	17.77	<0.0002
<b>CHL/HDL</b>	3.273	0.79	4.25	1.53	<0.0001
<b>LDL/HDL</b>	2.0916	0.7485	2.615	0.646	<0.0001

Data was tabulated in Microsoft Excel and analysed using IBM SPSS 20.0 and Microsoft Excel 2007. Unpaired Sample T-test was used to test the significance between apparently healthy individuals and the patients suffering from Hypothyroidism for TSH, Cholesterol, Triglyceride, HDL, LDL, VLDL, CHL/HDL, LDL/HDL. P value less than 0.05 were considered significant.

As seen in the above table,

Mean differences in TSH, Cholesterol, Triglyceride, HDL, LDL, VLDL, CHL/HDL, LDL/HDL between apparently healthy individuals and the patients suffering from Hypothyroidism were statistically significant ( $p < 0.001$ ).

**4. Correlations between thyroid & lipid profile parameters :-**

Correlation between	r-value
TSH & Cholesterol	0.229887
TSH & Triglyceride	0.106922
TSH & HDL	0.008185
TSH & LDL	0.246681
TSH & VLDL	0.104199
TSH & CHL/HDL	0.062895
TSH & LDL/HDL	-0.05881

Statistical Analysis of Correlation between the serum TSH and Lipid profile was done using Pearson correlation coefficient

**DISCUSSION :-**

In this study, a significant increase was seen in mean levels of TG and LDL-C in the study group as compared with controls. Similar observations were made in previous studies of hypothyroid patients showing significant increase in TC and LDL-C with decrease in HDL-C levels.

In a study done in 2011 by DR. D.V. Krishnaveni in the Bhaskar Medical College, Andhra Pradesh, India observations were made on changes in lipid profile in age and sex matched healthy controls and hypothyroid patients. The mean levels of serum cholesterol were significantly higher in hypothyroid patients than that of healthy controls in the study. This finding is consistent with other studies also in our present study.

The decrease in lipid degradation rate may reflect the decrease in post-heparin lipolytic activity as well as reduced LDL receptors. Hypothyroid patients usually exhibit elevated levels of HDL-C mainly due to increased concentration of HDL particles. Decreased activity of cholesterol ester transfer protein (CETP) results in reduced transfer of cholesterol esters from HDL to VLDL, thus increasing HDL levels. In addition, decreased activity of the hepatic lipase (HL) also leads to decreased catabolism of HDL particles.

In this study, a significant increase in mean levels of TG and LDL-C

was observed in study group as compared with controls. Similar observations were made in previous studies of hypothyroid patients showing significant increase in TC and LDL-C with decrease in HDL-C levels as in hypothyroidism both synthesis and the degradation of lipids are decreased, the net effect being one of the lipid accumulation, especially of LDL & triglycerides.

Conversely, there was no significant change in HDL-C levels between cases and controls in our study and similar observations were made in a study of 60 hypothyroid patients where the serum TC, TG, LDL were increased and HDL-C was slightly increased. Interestingly, in the present study, the VLDL-C values between controls and patients (study group) were within the normal range or slightly increased with values of study group being significantly higher compared to controls.

Comparing results of our study with above mentioned studies we can conclude that hypothyroidism is associated with major alterations in lipid profile i.e. significant increase in total cholesterol, triglycerides & LDL-C levels (John D. Brunzell, 2007)

Dyslipidemia was observed in the patient group. Levels of total and LDL cholesterol tend to increase as the thyroid function declines. Therefore, hypothyroidism constitutes a significant cause of secondary dyslipidemia (M Sushma et al., 2014)

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