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# Relationship of Hypothyroidism with Lipid Levels, hs-CRP and BMI

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## ABSTRACT

**Introduction:** In India, the occurrence of overweight and obesity is increasingly rising in the younger and adult populations. It is a remedial problem that increases the risk of various lifestyle modifiable diseases. In hypothyroidism, there are also cardiovascular problems & hs-CRP is a marker of systemic inflammation and an interpreter of cardiovascular disease. Therefore a study was planned to find out the correlation of Hypothyroidism with Lipid Levels, hs-CRP and BMI in the study population.

**Objective:** Our objective of the study is to find out the relationship of hypothyroid patients with lipid profile, hs-CRP& BMI

**Material & Methods:** A Hospital-based observational study was carried out in 87 hypothyroid patients. They were divided into two groups obese & nonobese based on the BMI ranges(group 1 BMI <25 (nonobese)) and (group 2 BMI ≥25(obese)). Serum lipid levels, hs-CRP& BMI were estimated in obese & nonobese groups to find out their correlation. Estimation of hs-CRP was done on semi-auto analyzer&lipid profile by auto-analyzer. All the statistical analysis was done by using the Windows-based SPSS statistical Package (Version 21.0) and P- values <0.05 were taken as the level of significance.

**Results:** There was a significant rise in serum Lipids in the obese group. hs-CRP& BMI has significantly increased in obese people also. There was a statistically significant positive correlation found between lipid levels, hs-CRP and BMI in obese people.

**Conclusion:** Significant correlation was found between hs-CRP, lipid profile and BMI of obese people as compared to nonobese.

**Key Words:** hs-CRP, Obesity, BMI, Hypothyroidism, Cardiovascular and lipid profile

## INTRODUCTION

In the metabolism and mobilization of lipids thyroid hormones play a key role in the synthesis.[1] As a result, hypothyroidism is the most important origin of secondary dyslipidemia. Analysis of various studies reports prominent levels of total cholesterol (TC) and low-density lipoprotein (LDL-C) in patients with evident hypothyroidism. These patients possibly will also have elevated to normal levels of triglyceride (TG) and high-density lipoprotein (HDL-C).[2,3] In hypothyroidism, there is an elevation in thyroid-stimulating hormone (TSH) with normal levels of thyroxine (T4) and triiodothyronine (T3).[4] This condition in women and older populations is more common and may progress to overt hypothyroidism.[5,6] Thyroid disorders are a risk factor for cardiovascular diseases, is budding evidence mainly in middle-aged and elderly women. [7,8]

The Body Mass Index (BMI) is considered obese when a measurement is obtained by dividing a person's weight by the square of the person's height, exceeding 30 kg/m$^2$, with the range 25-30 kg/m$^2$ defined as overweight. [9]

The excess body fat has accumulated to the extent that it may hurt health, leading to reduced life expectancy and/or increased health problems is termed as Obesity [10,11], dyslipidemia associated with obesity leading to inflammatory changes in vessels which leads to atherosclerosis [12,13] CRP is a marker of a chronic inflammatory condition that can activate acute coronary syndrome. [14] A comparative study was planned to assess serum hs-CRP, lipid profile and BMI in hypothyroid individuals.

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## MATERIAL & METHODS

This was a Hospital-based comparative observational study carried out in the Department of Biochemistry & Dept of Medicine Subharti Medical College & its associated Hospital, Meerut (U.P). The duration of the study is from January 2015 to August 2016. The institutional ethics committee approved the study [letter no. SMC/EC/2015/026]. The study is conducted on a total of 87 hypothyroid patients who fall under the inclusion & exclusion criteria during the study period were chosen for the study, from the OPD of the Department of General Medicine. Body mass index was calculated as ($kg/m^2$). [9] They were categorized into two groups based on BMI (group 1 BMI <25) and (group 2 BMI ≥25) and hypothyroid subjects were diagnosed after laboratory investigations of T3, T4 and TSH.)

### Inclusion Criteria

(a) All patients attending Medicine OPD having signs and symptoms of hypothyroidism

(b) Hypothyroid participants (patients classified after having thyroid profile based on laboratory investigation of T3, T4 and TSH)

(c) Study participants between the age group of 20 and 60 years.

### Exclusion Criteria

(a) Female patients who are pregnant

(b) Patients on steroids and/ or on immunosuppressant drugs

(c) Patients with Chronic Diseases.

### Data Collection

Information about the subject's age, sex, monthly income, lifestyle, family history of diabetes mellitus and other chronic disorders were recorded. Anthropometric measurements like height, weight and waist circumferences were also measured. Body mass index (BMI) was calculated by dividing weight in kg by the square of height in meters. Blood pressure was measured with special precaution. The participants were asked to take fast for 12 hours before the blood sample was taken for lipid profile. [15] Blood sample (3ml) was collected from each subject. Serum was separated by centrifuging blood at 3000rpm for 10 min. Lipid profiles were estimated by Vitros 250 auto analyzer using ready-made dry chemistry kits from Ortho Clinical Diagnostics, Johnson & Johnson, USA.

Estimation of hs-CRP was done on semi auto-analyzer (Robonikreadwell touch) at a central clinical biochemistry laboratory. An Enzyme immunoassay for hs-CRP in which the principle of agglutination reaction is used Measuring Range is 0.15mg/L to 5mg/L. the American Heart Association and US Centers for Disease Control and Prevention have defined risk groups as-Low risk: 3.0 mg/L respectively. [16]

### Statistical Analysis

All the statistical analysis was done by using the Windows-based SPSS statistical Package (Version 21.0) Values were given as mean ± SD and P- values <0.05 were considered as significant, Unpaired student t-test was used for continuous variables normally distributed, Pearson correlation analysis was carried out to find the association between the groups.

## RESULT

Our study was carried out in 87 hypothyroid patients. They were divided into two groups obese and nonobese based on the BMI ranges(group 1 BMI <25 (nonobese)) and (group 2 BMI ≥25 (obese)). Serum lipid levels, hs-CRP and BMI were estimated in obese & nonobese groups to find out the correlation of hypothyroidism with hs-CRP, lipid profile and BMI.

Total cholesterol mean ±SD value of subjects having BMI less than 25 are (179.7±34.3) whereas it is (207.5±31.4) in patients having BMI more than or equal to 25, P-value comparison of group 1 and group 2 for total cholesterol gives statistically significant results, triglycerides Mean ±SD value of subjects having BMI less than 25 are (208±50.65) whereas it is (209.8±49.0) in patients having BMI more than or equal to 25, High-density lipoprotein (HDL) Mean ±SD value of subjects having BMI less than 25 are (31.5±4.8) whereas it is (28.3±5.4) in patients having BMI more than or equal to 25 respectively. Low-density lipoprotein (LDL) and very-low-density lipoprotein (VLDL) Mean ±SD values of subjects having BMI less than 25 are (106.1±28.6) and (41.5±10.0) whereas LDL and VLDL values of BMI more than or equal to 25 are (131.6±30.1) and (41.8±9.8) respectively when we compare LDL-C for group 1 and group 2, the P value is statistically significant, whereas mean±SDhs-CRP Values of patients having BMI less than 25 are (3.19±1.09) and in patients having BMI more than or equal to 25 is (3.95±0.9) and the P-value is statistically significant as we compare both the groups (group 1 & group 2) (Table 1).

(Table 2) shows a significant positive correlation between hs-CRP and triglycerides, VLDL-C & BMI in nonobese patients. In the obese group, there was a significant positive correlation between Serum hs-CRP and Total cholesterol, triglycerides, HDL-C, LDL-C, VLDL & BMI. There was a negative correlation between hs-CRP and Total cholesterol, HDL-C and LDL-C in nonobese patients found.

## DISCUSSION

The present study shows a positive correlation between BMI and hs-CRP and the mean hs-CRP levels were high in obese patients when compared with nonobese hypothyroid patients. This is following other studies also. [17-19]

In India, it has been reported in various studies 10% to 30% of adolescents are overweight. Decreased physical activity, consuming more junk foodstuffs and sedentary lifestyles are common in younger people. All of these factors are responsible for the growing prevalence of obesity. [20]

Obesity which is one of the characters of metabolic syndrome was correlated with chronic inflammation. [21] In the current study, there is a significant positive correlation of hs-CRP, lipid profile and BMI. This is supported by the study done by Ebrahimi M et al. [22] Serum HDL-C was not significantly correlated with hs-CRP in nonobese patients. Similar results were found in the study conducted by Gowdaiah PK et al.[23] where TG and HDL were not significant predictors of hs-CRP. Our study approved the relation between obesity and dyslipidemia. The obese group in our study had significantly raised serum hs-CRP compared to the non-obese group.

Aronson et al.[24]reported in their study that obesity is the major contributor of hs-CRP and researchers established BMI as the major determinant for hs-CRP variance.[12]This correlation of BMI and obesity with increased hs-CRP level is observed in our study also. A Positive correlation of hs-CRP and BMI are also the findings of Andre T et al. [25]our study also agree with this study.

Thus hs-CRP can be an early unique inflammatory indicator in obese hypothyroid patients. As the level of hs-CRP indicates the inflammatory changes occurring at a low level, if estimated early in the process, it would be beneficial. Simple measures like changes in lifestyle, modifications in diet and exercise may minimize or delay the atherosclerotic changes.

## CONCLUSION

There is a significant correlation found between hs-CRP and lipid profile, treatment for dyslipidemia may decrease hs-CRP levels. This treatment for dyslipidemia will include counselling for change in lifestyle i.e. weight reduction and/or use of hypolipidemic drugs. This would minimize the prevalence of atherosclerosis and hence decrease the risk for the development of coronary artery disease and therefore improving the quality of life in hypothyroid patients.

## RECOMMENDATION

Further, studies with a large sample size are needed to explain the role of hs-CRP, lipid profile &BMI in a disease condition like hypothyroidism and their correlation.

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Authors' contribution

Dr Shahid Iqbal- Statistical analysis & review of the literature.

Dr Mushir Ahmad - Technical assistance.

Contribution of each author: Dr Naved Ahmad, Dr Shahid Iqbal and Dr. Javed – Compilation of data & review of the literature,

Dr Sana- writing the final draft of the article and outcome assessment.

All authors equally contributed to the data analysis and drafting of the manuscript.

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**Table 1: Mean±SD values of lipid profile &hs-CRP of hypothyroid patients in groups categorized by BMI value.**

| Parameters | BMI | | P Value | t-Test |
|---|---|---|---|---|
| | <25 (n=11) | ≥25 (n=76) | | |
| Total cholesterol (mg/dl) | 179.7±34.3 | 207.5±31.4 | 0.02s | 2.53 |
| Triglyceride (mg/dl) | 208±50.65 | 209.8±49.0 | 0.91 | 0.11 |
| HDL-C (mg/dl) | 31.5±4.8 | 28.3±5.4 | 0.06 | 2.033 |
| LDL-C (mg/dl) | 106.1±28.6 | 131.6±30.1 | 0.01s | 2.74 |
| VLDL-C (mg/dl) | 41.5±10.0 | 41.8±9.8 | 0.92 | 0.09 |
| hsCRP(mg/L) | 3.19±1.09 | 3.95±0.9 | 0.04s | 2.20 |

(n = number of subjects) (s=significant)

(P- values <0.05 were consider as significant).

HDL: High-Density Lipoprotein, LDL: Low-Density Lipoprotein, VLDL: Very Low-Density Lipoprotein

**Table 2: Illustrating Pearson's Correlation coefficient (r) values of hs-CRP and lipid profile, BMI in obese & non-obese hypothyroid patients.**

| hsCRP v/s | (nonobese) (r) | (obese) (r) |
|---|---|---|
| Total cholesterol | -0.17 | 0.15 |
| Triglycerides | 0.10 | 0.09 |
| HDL-C | -0.00 | 0.08 |
| LDL-C | -0.23 | 0.12 |
| VLDL-C | 0.08 | 0.09 |
| BMI | 0.09 | 0.11 |