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Assessment of Lipid Profile and HS-CRP level in Hypothyroid Patients

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Abstract | **Original Research Article**

The present study was conducted in the Department of Biochemistry in collaboration with Department of Medicine at Shri Aurobindo Institute of Medical Sciences and P.G. Institute, Indore, Madhya Pradesh, India. The study included 70 cases of hypothyroidism and 40 cases of normal healthy individuals (euthyroids) as controls. In the present study results showed the patients with hypothyroidism found lower mean value of T3 (mean SD=0.43±0.16 vs. 1.28±0.21) and T4 (mean SD=2.64±0.97 vs. 8.87±1.42) while increased mean of TSH (61.86±24.94 vs 2.71±0.84) on comparison with control group, which were all statistically highly significant (P<0.001). The fasting lipid profile (mg/dl) mean values were found higher including TC, TG, LDL-C and VLDL-C (252.41±18.52 vs 151.94±25.29, 220.76±18.36 vs 111.85±22.97, 180.02±14.81 vs 85.34±22.10 and 44.15±3.67 vs 30.38±5.06) while HDL-C (28.49±4.15 vs. 44.64±8.72) level was lower in patients with hypothyroidism than control group respectively, all were highly (p<0.001) statistically significant. The hypothyroid patients showed increased mean value of hs-CRP (4.09 ± 1.26 vs 0.97 ± 0.33) than compare to control group, which was highly (p<0.001) significant. It can be concluded that the hypothyroidism affects higher levels of serum lipids and CRP levels that can cause the inflammation in body or arteries directly or indirectly. The both the factors higher lipid levels and inflammation in hypothyroidism patients can exert an additive effect on the risk of atherosclerosis and cardiovascular disease in hypothyroidism patients. Hence, the patients should be screened for lipid profile and hs-CRP levels with thyroid disorders which can be help in diagnosis and prognosis of the cardiovascular diseases.

Keywords: Lipid Profile, high sensitive-C reactive protein (hs-CRP), Thyroid Profile & Hypothyroidism.
Study Design: Observational Study.

INTRODUCTION

Hypothyroidism is defined as a deficiency of thyroid activity. It results from reduced secretion of Total Thyroxine (T4) & Triiodothyronin (T3). Biochemical decrease in T4 and T3 lead to Hyper Secretion of Pituitary Thyroid Stimulating Hormone (TSH) and amplifies increase in serum TSH levels. Thyroid hormones have major effects on the synthesis, mobilization & metabolism of lipids. They affect serum cholesterol primarily by varying lipoprotein metabolism [1].

Hypothyroidism is a clinical syndrome resultant from a deficiency of thyroid hormones, which in turn results in a generalized slowing down of metabolic processes [2]. It is a familiar metabolic disorder universally. The thyroid dysfunction increases with age, particularly in females [3].

The present study aims to assess the abnormalities in serum lipids and inflammatory marker hs-CRP levels in patients of hypothyroidism.

MATERIALS AND METHODS

The present study was conducted in the Department of Biochemistry in collaboration with Department of Medicine at Shri Aurobindo Institute of Medical Sciences and P.G. Institute, Indore, Madhya Pradesh, India.

In the present study we were selected 70 clinically diagnosed hypothyroid patients in the age group of 20 – 60 years along with 40 cases of age and sex matched healthy individuals (euthyroids). Patients with TSH level above 5.50 µIU/ml (as the upper limit of normal range given by the kit manufacturer is 5.50 µIU/ml) were considered to be having hypothyroidism. hypothyroidism Patients who were already taking the

anti-thyroid drugs as eltroxin or thyronorm were included while patients on anti lipidemic drugs, type II diabetes mellitus, post myocardial infarction, congestive cardiac failure, any renal disease, pregnant women and women on oral contraceptive pills, were excluded from present the study.

5 ml of blood was taken from the patients of both groups after overnight fasting with dry disposable syringe and needle by venous puncture under all aseptic precautions. The serum was separated after 30 minutes of blood collection by centrifuged at 3000 rpm for 10 minutes. Separated serum was stored at -20℃ for the analysis of biochemical parameters. Various biochemical parameters were done by using the following standard methods:

Thyroid profile

Thyroid profile includes TSH, total T3 and total T4 estimation were done by ELISA method.

Lipid profile

- Serum total cholesterol was estimated by CHOD-PAP end point method [4].
- Serum triglycerides were estimated by Trinder's method [5].
- HDL-Cholesterol was estimated by Phosphotungstic acid method[6]
- LDL-Cholesterol & VLDL were calculated by Friedewald's formula :
- VLDL = TG/5 mg/dl

LDL-Cholesterol = total cholesterol – (HDL+TG/5) mg/dl (10)

Hs-CRP was estimated by solid phase sandwich ELISA by using commercially available kits from Calbiotec diagnostic (USA).

Patients with TSH level 5.50µIU/ml and above were considered are to be having hypothyroidism and grouped as follows:

Group I – Normal healthy individuals as controls.

Group II – TSH levels of > 5.50µIU/ml as cases.

Statistical analysis

The numerical data was presented as Mean ± SD. Data analysis was performed using by XLSTAT 2018, version program with a value of $p<0.001$, $p<0.01$ and $p<0.05$ considered highly significant and significant respectively. One-way ANOVA was applied to analyze the significance between 2 group.

RESULTS

The study included 70 cases of hypothyroidism and 40 cases of normal healthy individuals (euthyroids) as controls.

Table 1 shows the comparison of thyroid profile parameters between the cases and controls. Patients with hypothyroidism showed lower mean value of T3 (mean SD=0.43±0.16 vs. 1.28±0.21) and T4 (mean SD=2.64±0.97 vs. 8.87±1.42) while elevated mean of TSH (61.86±24.94 vs 2.71±0.84) when compared to control group, which is found highly significant (P<0.001).

Table 2 shows the comparison of levels of lipid profile parameters between the cases and controls. Fasting lipid profiles (mg/dl) showed that patients with hypothyroid group had elevated mean TC, TG, LDL-C and VLDL-C (252.41±18.52 vs 151.94±25.29, 220.76±18.36 vs 111.85±22.97, 180.02±14.81 vs 85.34±22.10 and 44.15±3.67 vs 30.38±5.06) while HDL-C (28.49±4.15 vs. 44.64±8.72) found lower than the control group respectively, all were highly (p<0.001) significant. In hypothyroid patients had elevated mean SD of TC/HDL-C and LDL/HDL-C (8.97 ± 1.44 vs 3.44 ± 0.67 and 6.42 ± 1.18 vs 1.95 ± 0.60) when compared with control group with the p'Value (<0.001).

The hypothyroid patients showed increased mean value of hs-CRP (4.09 ± 1.26 vs 0.97 ± 0.33) than compare to control group, which was highly (p<0.001) significant.

Table-1: Comparison of Case & Control among Thyroid Profile

Parameters	Group I (controls) n = 40	Group II (cases) n = 70	p'Value
T3 (ng/ml)	1.28 ± 0.21	0.43 ± 0.16	<0.001
T4 (µg/dl)	8.87 ± 1.42	2.64 ± 0.97	<0.001
TSH (µIU/ml)	2.71 ± 0.84	61.86 ± 24.94	<0.001

p' value shows the statistical difference between case and control groups among the tested variables (T3, T4 & TSH)

Table-2: Comparison of Case & Control among Lipid Profile

Parameters	Group – I (Controls) n = 40	Group – II (Cases) n = 70	p'value
T. Cholesterol (mg/dl)	151.94 ± 25.29	252.50 ± 18.52	<0.001
Triglycerides (mg/dl)	111.85 ± 22.97	220.76 ± 18.36	<0.001
LDL-Cholesterol (mg/dl)	85.34 ± 22.10	180.02 ± 14.81	<0.001
HDL-Cholesterol (mg/dl)	44.64 ± 8.72	28.49 ± 4.15	<0.001
VLDL (mg/dl)	30.38 ± 5.06	44.15 ± 3.67	<0.001
TC/HDL	3.44 ± 0.67	8.97 ± 1.44	<0.001
LDL/HDL	1.95 ± 0.60	6.42 ± 1.18	<0.001
Hs-CRP (mg/L)	0.97 ± 0.33	4.09 ± 1.26	<0.001

p' value shows the statistical difference between case and control groups among the tested variables (T. Chol, TG, LDL-C, HDL-C,VLDL-C, TC/HDL, LDL/HDL and hs-CRP)

DISCUSSION

Hypothyroidism is a common metabolic disorder. The prevalence of primary hypothyroidism is 1:100, but it may be 5:100 if patients with subclinical hypothyroidism (normal T4, raised TSH) are included. According to a study done by Sawin [7], hypothyroidism is a common disorder with a prevalence rate up to 20%. In another cross-sectional study on twelve hundred and twelve subjects of both sexes and age 20-60 years, the incidence of subclinical hypothyroidism was 19.7%15.

In our study, mean total cholesterol, LDL cholesterol and triglycerides were found significantly increased whereas HDL cholesterol was found significantly decreased in cases compared to controls. Jung [8] found mean plasma total cholesterol and LDL cholesterol levels elevated in hypothyroid cases than in normal controls. In another study, average serum total cholesterol level was found elevated in primary and secondary hypothyroidism.

Hypothyroidism is characterized by a decrease in both synthesis and catabolism of lipoproteins. In most patients with myxedema, the relative greater decrease in catabolism and the resulting preponderance of synthesis results in high cholesterol concentrations. The present study documented that serum total cholesterol; triglycerides and LDL were significantly increased, while activity of hepatic lipase and concentration of HDL was decreased in subjects with Clinical hypothyroidism in comparison to euthyroid controls. The presence of hypercholesterolemia and hypertriglyceridemia in clinical hypothyroidism is well established [1] and is reconfirmed by the results of our investigation, comparable data with regard to subclinical hypothyroidism remain contradictory, since normal[9,10] as well as increased [11,12] levels has been reported. Therefore, clinical hypothyroid patients may also present with elevated triglycerides levels associated with increased levels of VLDL and occasionally fasting chylomicronemia [13].

In present study we found the significantly higher hs-CRP levels in hypothyroid patients when compare with the healthy euthyroids. C-reactive protein (CRP) levels have not been routinely used to diagnose thyroid disease, although many thyroid conditions involve inflammation. Czarnywojtek *et al*. studied reported the higher serum CRP levels in hypothyroidism, which was similar to the present study. The lack of thyroid hormones causes a slower metabolic rate, which results in impaired biochemical processes. Consequently CRP clearance rate may result with elevated serum CRP levels. Similarly, slow CRP uptake in target cells might also added a reason to this phenomenon [14]. Similarly Tuzcu *et al*. showed that patients with hypothyroidism had higher serum hs-CRP levels than healthy euthyroids[15].

CONCLUSION

The present study results shows the hypothyroidism affects higher levels of serum lipids and CRP levels that can cause the inflammation in body or arteries directly or indirectly. The both the factors higher lipid levels and inflammation in hypothyroidism patients can exert an additive effect on the risk of atherosclerosis and cardiovascular disease in hypothyroidism patients. Hence, the patients should be screened for lipid profile and hs-CRP levels with thyroid disorders which can be help in diagnosis and prognosis of the cardiovascular diseases. Future studies analyzing the correlation between these parameters and the CVD risk in hypothyroidism would further validate the present findings.

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