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Original Research Article

Lipid Profile and Renal Function Test Variations in Hypothyroidism in and Around Karikal District

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Abstract: Hypothyroidism, also called underactive thyroid or low thyroid, is a common disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormone. It can cause a number of symptoms, such as poor ability to tolerate cold, a feeling of tiredness, constipation, depression, and weight gain. The association between thyroid autoimmunity and lipoprotein (a) levels is controversial. Hyperthyroidism may be the underlying cause for acquired hypocholesterolemia or unexpected improvement of the lipid profile of a previously hyperlipidemic patient. Using a cross sectional analytical study design, a total of 50 subjects attending Out Patient Department, of, vinayaka mission Medical College, karikal 25 newly diagnosed hypothyroid patients (Group I) and 25 healthy adults (Group II) were enrolled in this study. Serum thyroid stimulating hormone and serum free thyroxine were assayed by radioimmunoassay. Serum fasting lipid profile, serum creatinine and serum uric acid were estimated by enzymatic colorimetric method. The mean Serum total-cholesterol, LDL- cholesterol and triglycerides in Group I were significantly higher than that in Group II. Serum HDL cholesterol in Group I was significantly lower than that in Group II The mean serum creatinine, urea and uric acid was significantly higher in Group I than Group II. Hypothyroidism is associated with dyslipidemia hyperuricemia and impaired renal function. Therefore, patients presenting with these biochemical abnormalities are recommended to be investigated for hypothyroidism and vice versa.
Keywords: Hypothyroidism, Lipid profile, renal function test.

INTRODUCTION

Thyroid hormones (TH) are necessary for growth and development of the kidney and for the maintenance of water and electrolyte homeostasis. On the other hand, kidney is involved in the metabolism and elimination of TH [1]. From a clinical practice viewpoint, it should be mentioned that both hypothyroidism and hyperthyroidism are accompanied by remarkable alterations in the metabolism of lipid profile, water and electrolyte, as well as in cardiovascular function [2]. All these effects generate changes in water and electrolyte kidney management Moreover, the decline of kidney function is accompanied by changes in the synthesis, secretion, metabolism, and elimination of TH. The association between thyroid dysfunction and dyslipidemia was first reported in 1930 since then there were studies on the relationships between thyroid function, lipid status, and cardiovascular outcomes. However the relationship still remains incompletely understood [3]. A review of the relationship between hypothyroidism and dyslipidemia describes the prevalence of thyroid dysfunction and the lipid effects of overt hypothyroidism. It is well known that alterations in thyroid function result in changes in the composition and transport of lipoproteins1-3. In general, overt and subclinical hypothyroidism is associated with hypercholesterolemia mainly due to elevation of low density lipoprotein (LDL) cholesterol levels, whereas high density lipoprotein (HDL) cholesterol concentration is usually normal or even elevated3-5. On the other hand, hyperthyroidism (both overt and subclinical) is accompanied by a decrease in serum levels of total, LDL and HDL cholesterol [4]. These changes in the lipid profile are explained by the regulatory effect of thyroid. Hypothyroidism is a common metabolic disorder in the general population, especially in older women9.5% of the participants of the Colorado prevalence study had elevated levels of thyroid stimulating hormone3. Levels of total and LDL cholesterol tend to increase as the thyroid function

declines Therefore; hypothyroidism constitutes a significant cause of secondary dyslipidemia. Thyroid dysfunction causes significant changes in kidney function. Both hypothyroidism and hyperthyroidism affect renal blood flow, GFR, tubular function, electrolytes homeostasis, electrolyte pump functions [5]. the most common kidney derangements associated to hypothyroidism are: elevation of serum creatinine levels, reduction in GFR and renal plasma flow (RPF), disruption of the capacity to excrete free water and hyponatremia. These alterations may be absent in patients with central hypothyroidism due to the fact that this kind of thyroid hypofunction is often accompanied by other pituitary hormone deficiencies that might affect directly or indirectly the kidney function [6]. Primary hypothyroidism is associated with a reversible elevation of serum creatinine in both adults and children this increase is observed in more than half (55%) of adults with hypothyroidism. Moreover, some authors have reported an elevation of serum creatinine associated with subclinical hypothyroidism [7].

MATERIALS AND METHODS

Informed consent was obtained from the subjects after the study guidelines had been explained to them the control groups consisted of 25 non-hospitalized adults with no history of systemic disease (matched for age and sex). A total of 25 diagnosed hypothyroidisum patients. Subject was fasting 12-14 hr. at the time of blood withdrawal. Their age range between 25-60 years where included in this study. The chemicals and kits that were used in this study were of the highest purity. The determination of serum creatinine, urea, total cholesterol, triglyceride, high density lipoprotein (HDL),low density lipoprotein (LDL), free Triiodothyronine(FT3), free Thyroxine (FT4) .Inclusion criteria: 1) Patients who fulfill selection criteria were included in this study. 2) Adult patients age between 20-60 years of either sex. 3) Patients who did not received supplementations with thyroid hormone. 4) Patients who did not received supplementations with lipid lowering medication. Exclusion criteria: 1) Patients with history of underlying disease. 2) Chronic renal failure (CRF). 3) Liver disease. 4) Pregnancy, 5) Hypertension (HTN), 6) Age under 20 years with hypothyroidism, 6) Patients with history of diabetes mellitus. Data were collected by interviewer administered structured questionnaire. The variables included were age, sex, BMI and symptoms of hypothyroidism, Clinical history and symptoms. Serum TSH, FT4 level was measured by Immuno radiometric assay. HDL cholesterol, Serum total cholesterol and Triglycerides were measured by enzymatic colorimetric method and LDL cholesterol calculated by Friedewald's Formula. Data analysis was done using SPSS version 10 and results were presented in a tabulated form. The level of statistical significance was taken as *p*d"0.05.

RESULTS

Table: 1 shows the FT3, FT4, and TSH Levels among both the groups. Clinical characteristics of the study subjects are shown in Group I The mean (±SD) serum TSH, FT 3(mIU/L), in Group I was significantly higher than that in Group II, The median (range) Free T4 in Group was lower than that in Group II.

Table: 2 Shows the Lipid Profile Levels and Renal Profile Levels among Both the Groups. In Group I The mean (±SD) Serum Urea, Serum Creatinine, Uric Acid, Total Cholesterol, Serum Triglycerides LDL, HDL in Group I was significantly higher than that in Group II.

Table-1: shows the FT3, FT4, and TSH Levels among both the groups

Thyroid profile	TSH (mIU/L)	FT 3(mIU/L)	FT 4, (mIU/L)	P Value
Group I	3.49 ± 1.82	2.38 ±0.72	0.96 ±0.52	P> 0.05
Group II	2.14 ±2.73	2.64 ±1.13	1.31 ±0.21	P> 0.05

Table-2: Shows the Lipid Profile Levels and Renal Profile Levels among Both the Groups

Parameters	Group I	Group II	P Value
Serum Urea (mg/dl)	13.46 ± 8.9	11.08 ±3.70	P< 0.001
Serum Creatinine (mg/dl)	2.83±2.6	1.89±0.76	P< 0.001
Uric Acid(mg/dl)	6.012±1.37	4.684±0.64	P< 0.001
Total Cholesterol(mg/dl)	143.00 ± 32.34	104.73 ± 27.19	P< 0.001
Serum Triglycerides(mg/dl)	113.8 ±5. 99	110.166± 38.72	P< 0.001
LDL(mg/dl)	102.86 ±21.63	87.44 ±24.30	P< 0.001
HDL(mg/dl)	22.06 ±4.56	33.68 ±14.09	P< 0.001

DISCUSSION

This study was carried out with an objective to evaluate whether hypothyroidism is associated with dyslipidemia and impaired renal function and also to estimate the lipid profile, assess renal function and determine association of dyslipidemia and impaired

renal function with hypothyroidism. [8]While hyperthyroidism can cause hyperfiltration in the kidneys along with a hyperdynamic physiology, moderate to severe hypothyroidism and myxedema can result in the impairment of GFR. A significant correlation between thyroid function and purine nucleotide metabolism has been established in hypothyroidism. The prevalence of hypothyroidism was significantly higher in patients with gouty arthritis [9]. Overall, 15% of these patients, 25% of women and 12% of men, had hypothyroidism. These rates were 2.5-fold greater in women and six fold greater in men than found in the controls. In the literature, while the correlation between hypothyroidism is well established [10]. The study, even if based on a limited number of cases, showed a high prevalence of hyperuricemia in hypothyroid patients, 33.3%, which is substantially in accordance with the values reported by others. This finding is particularly relevant when compared with the prevalence, ranging from 2 to 10%, in the general population. Moreover, our study showed that hyperuricemia in hypothyroidism is associated with increased serum creatinine and decreased creatinine clearance. This fact suggests that hypothyroid hyperuricemia is secondary to a reduction in renal plasma flow and glomerular filtration, already well demonstrated in thyroid hormone deficiency syndromes [11]. The above described abnormalities of lipid metabolism associated with overt hypothyroidism may predispose to the development of atherosclerotic coronary artery disease (CAD). Furthermore, hypothyroidism may contribute to the development of atherosclerosis by other mechanisms as outlined below: a) Decreased thyroid function not only increases the number of LDL particles but also promotes LDL oxidability.Thyroid failures accompanied by an increase in plasma homocysteine levels with its known adverse effect on the cardiovascular system c) Hypothyroidism is strongly associated with arterial hypertension (especially diastolic) via sympathetic and adrenal activation and increased aortic stiffness [12]. The insufficient concentration of thyroid hormones induces a hypercoagulable state. Several studies have shown conflicting results concerning the effect of levothyroxine substitution therapy on lipid parameters in patients total cholesterol was decreased by 15mg/dl irrespective of the initial level. In another follow-up study, restoration of euthyroidism in 37 patients with SH resulted in no significant changes in serum lipid parameters except for a significant decrease in HDL cholesterol concentration by 6.8%41.However, patients with high pre-treatment total cholesterol levels (TC > 240 mg/dl) as well as high pretreatment levels of serum TSH (> 10 mU/L) exhibited a significant reduction in both total and LDL cholesterol levels following thyroid substitution therapy. On the other hand, levothyroxine replacement did not produce any significant changes in LP (a) concentrations in any of the studied groups [13].

CONCLUSION

Biochemical screening for thyroid dysfunction is of paramount importance in all dyslipidemic patients, as well as in all patients with unexpected improvement or worsening of their lipid profile. Underlying thyroid disorders should be recognized and treated in this setting. On the other hand, there is an absolute need for large studies designed to answer the question as to whether thyroid abnormalities (and especially SH) are associated with increased risk for CAD and whether therapy of these disorders might influence cardiovascular mortality.

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