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Original Research Article

A Study on Dyslipidemia in Patients with Hypothyroidism for More than 10 Years

Deepa VS[1*], J Aaron Vetha Jose[2], R Sonya[3]

[1]Associate Professor, Department of Biochemistry, Kanyakumari Government Medical College, Asaripallam, Tamil Nadu, India

[2,3]Assistant Professor, Department of Biochemistry, Kanyakumari Government Medical College, Asaripallam, Tamil Nadu, India

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Corresponding Author: Dr. Deepa VS

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Abstract:

Introduction: Thyroid dysfunction has a great impact on lipids as well as a number of other cardiovascular risk factors. Hypothyroidism is relatively common and is associated with an unfavorable effect on lipids. Substitution therapy is beneficial for patients with overt hypothyroidism, improving lipid profile. Therefore, the mechanism of hypothyroidism-related dyslipidemia is associated with the decrease of TH and the increase of TSH levels. Our objective was to study lipid profile in patients of chronic hypothyroidism for more than 10 years

Methods: This observational study was conducted for a period of one year at a tertiary care teaching hospital in patients diagnosed with Hypothyroidism and on treatment for more than 10 years. 96 patients with hypothyroidism were selected after careful exclusion; lipid profile was evaluated in this patient in relation to TSH levels.

Results: There exists correlation between rising TSH levels and total cholesterol in patients with chronic hypothyroidism. The relation is statistically significant with a p value of 0.001. Similarly triglycerides, HDL and LDL also had statistically significant relation.

Conclusion: Thyroid dysfunction can have an important effect on lipid profile. Biochemical screening for thyroid dysfunction is critical in all dyslipidemia 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.

Keywords: Chronic Hypothyroidism, Lipid Profile.

Introduction

Dyslipidemia is often coexistent in patients with hypothyroidism. Management of dyslipidemia is important because it is considered as one of the important risk factors for atherosclerosis, metabolic syndrome, cardiovascular mortality and morbidity. It is estimated that 2.8% of the patients who visited outpatient lipid clinic with dyslipidemia had elevated levels of TSH and reduced levels of FT4. [1]

Hypothyroidism causes alteration of lipid profile. Clinical hypothyroid patients have altered lipid profile as compared to euthyroid patients [2].The preponderance of evidence suggests that total cholesterol, LDL cholesterol, and possibly triglycerides are increased in patients with hypothyroidism, whereas high-density lipoprotein (HDL) cholesterol and Lp(a) remain unchanged [3].

Overt hypothyroidism is known to be associated with increased lipid profiles, but the effect of subclinical hypothyroidism on lipid profile remains controversial [4]. Therefore our study aims to evaluate the prevalence of dyslipidemia in patients with hypothyroidism for more than ten years period to know the effect of chronic presence of abnormal thyroid hormone levels on lipid profile. Most lipid abnormalities in patients with overt hypothyroidism are shown to resolve with thyroid hormone replacement therapy [3].

Statistical analysis of Colorado thyroid prevalence study showed significant elevation of total cholesterol and LDL in hypothyroidism compared to euthyroid controls. A meta-analysis conducted to evaluate the effect of thyroxine treatment on the lipid profile in hypothyroidism has shown significant reduction in total cholesterol level and LDL levels.

A study conducted in north India comprising 100 patients, in the age group of 15 to 60 years having hypothyroidism was screened for lipid abnormalities. They were found to have significant elevations in triglyceride and VLDL levels and nominal increases in cholesterol and LDL levels.

[5,6] The changes noted in lipid abnormalities depends on multiple variables like age, race, sex and pre-treatment lipid values. In view of lipid abnormalities and its association with cardiovascular abnormalities it is important to investigate the effect of hormone on lipid profile in hypothyroidism. Hence as a whole our understanding is that thyroid function regulates a wide array of metabolic parameters. Thyroid function significantly affects lipoprotein metabolism as well as some cardiovascular disease (CVD) risk factors, thus influencing overall CDV risk [7,8,9]. Indeed, even within the normal range of thyroid-stimulating hormone (TSH) values, a linear increase in total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C) and triglycerides (TGs) and a linear decrease in high-density lipoprotein cholesterol (HDL-C) levels has been observed with increasing TSH [4].Our study also aims to evaluate the abnormalities in the lipid profile of patients with clinical hypothyroidism for more than ten years.

Materials and Methods

This study was done as a hospital based Observational study done in a tertiary care teaching hospital by department of biochemistry at Kanyakumari Government Medical College for a period of six months in 96 patients. Patients diagnosed with clinical hypothyroidism and on treatment for more than ten years will be included for the study. Patients aged twelve or less, known case of diabetes and hypertension, on treatment for CKD, CLD and patients already on hypolipidemic drugs were excluded.

Cases were selected from patients presenting to general medicine op, general surgery op, endocrinology op and obstetrics and Gynecology op. Patients presenting with clinically confirmed hypothyroidism and on treatment for more than 1o years were selected. They are evaluated for hypothyroidism by doing fasting TFT particularly TSH and fasting lipid profile is also done for the patient. Among the 550 patients screened for hypothyroidism during study period of one year, 96 turned out to satisfying our inclusion criteria.
Clinical data comprises of thorough symptomatic analysis and physical examination and detailed history regarding past illness and drug intake. Laboratory analysis of blood urea, serum creatinine, TFT and fasting lipid profile. In our college, thyroid function test was done using ELISA and lipid profile using enzymatic kit method. Data will be entered Excel and analyzed using SPSS Version 24.0.

Results

In our study population of 96 patients cases (91.7%) were females and 8 cases (8.3%) were males Among the 96 patients ranging from 11 years to 60 years with maximum 33% were between 46 to 55 years and next common being 36-45 years with 30 patients only 9 patients were above 55 years. The mean age was 41.3 years.

Among the 96 cases the mean TSH value was 12.3 mIU/l ranging between 5.8 and 25 mIU/l. 49% of cases were having TSH less than 10 mIU/l and 34% were having TSH between 10 to 20 mIU/l and rest 17% had TSH above 20 mIU/l.

We also studied lipid profile levels in our study group and correlate lipid profile with TSH level in our study patients. To start with when we analyzed total cholesterol levels it was high in 39 patients and borderline in 18 patients. Hypercholesterolemia was found in 40.6% of patients. Among 96%patients, 39 cases had high total cholesterol values. Borderline high valueswere found in 18.8 % of patients. Mean cholesterol value of 213 mg/dl ranging from minimum of 119 to 310 mg/dl.

Serum LDL values were analyzed and it was high in 41 patients and borderline in 14 patients. LDL was elevated in 42.7% of cases. Among 96 cases, 41 patients had elevated LDL levels more than 160 mg/dl. Borderline high LDL values were found in 14.6%. The mean LDL value was 139 mg/dl ranging from minimum of 76 to 290 mg/dl.

While triglycerides was high in 10 patients and borderline in 16 patients. Triglyceride was elevated in only 27.1%. Among 96 cases, only 26cases had high triglyceride values. Mean triglyceride value of 121.3 mg/dlranging from minimum of 76 to 222 mg/dl. HDL was low in 32 patients in our study. HDL values were found to be normal in 66.7% of cases .the mean HDL was 51.9 mg/dl ranging from minimum of 33 to 70 mg/dl.

Table 1: Correlation between TSH and Total Cholesterol

Total Cholesterol			TSH range			Total
			< 10	10 - 20	> 20	
TC	Normal	Count	29	10	0	39
		% within TSH range	61.7%	30.3%	0.0%	40.6%
	Borderline	Count	11	7	0	18
		% within TSH range	23.4%	21.2%	0.0%	18.8%
	High	Count	7	16	16	39
		% within TSH range	14.9%	48.5%	100.0%	40.6%
Total		Count	47	33	16	96
		% within TSH range	100.0%	100.0%	100.0%	100.0%

There exists correlation between rising TSH levels and total cholesterol in patients with chronic hypothyroidism. The relation is statistically significant with a p value of 0.001

Table 2: Correlation between TSH and LDL

LDL RANGE			TSH range			Total
			< 10	10 - 20	> 20	
LDL range	Normal	Count	27	13	1	41
		% within TSH range	57.4%	39.4%	6.3%	42.7%
	Borderline	Count	11	3	0	14
		% within TSH range	23.4%	9.1%	0.0%	14.6%
	High	Count	9	17	15	41
		% within TSH range	19.1%	51.5%	93.8%	42.7%
Total		Count	47	33	16	96
		% within TSH range	100.0%	100.0%	100.0%	100.0%

There exists a relation between rising TSH and LDL levels .thecorrelation is statistically significant with a p value of 0.000

Table 3: Correlation between TSH and Triglyceride

TSH RANGE			TSH range			Total
			< 10	10 - 20	> 20	
TGL	Normal	Count	43	24	3	70
		% within TSH range	91.5%	72.7%	18.8%	72.9%
	Borderline	Count	4	6	6	16
		% within TSH range	8.5%	18.2%	37.5%	16.7%
	High	Count	0	3	7	10
		% within TSH range	0.0%	9.1%	43.8%	10.4%
Total		Count	47	33	16	96
		% within TSH range	100.0%	100.0%	100.0%	100.0%

There exists correlation between rising TSH values and rise in serum triglyceride levels. The correlation is statistically significant with ap value of 0.000

Table 4: Correlation between TSH and HDL

			TSH range			Total
			< 10	10 - 20	> 20	
HDL range	Abnormal	Count	6	14	12	32
		% within TSH range	12.8%	42.4%	75.0%	33.3%
	Normal	Count	41	19	4	64
		%within TSH range	87.2%	57.6%	25.0%	66.7%
Total		Count	47	33	16	96
		% within TSH range	100.0%	100.0%	100.0%	100.0%

There seems to exist some correlation between rising TSH andserum HDL levels with a p value less than 0.001.

Discussion

Hypothyroidism is an endocrine disorder, where the patients mostly has no or only few symptoms and signs for diagnosis, andthe diagnosis is made from elevated serum TSH and the serum free T4 and free T3 levels are within the reference range.

The diagnosis of hypothyroidism is important in the society, as the patients do not display any signs and symptoms consistentwith thyroid dysfunction. So this necessitates, early diagnosis and management of hypothyroidism as they may transform to true hypothyroidism

The rate of conversion of subclinical hypothyroidism to overt is around 2 to 5% per year. Though hypothyroidism is asymptomatic, the consequences of hypothyroidism warrants further evaluation and treatment. It includes insulin resistance, obesity, and increase in total cholesterol and LDL levels. Increase in vascular intima and media thickness, endothelial dysfunction, increase in peripheral resistance. Decreased myocardial contractility, neuropsychiatric manifestation and Infertility

In this study we included patients diagnosed with hypothyroidism and under treatment for 10 years and evaluation of dyslipidemia in these patients. Among 96 cases of chronic hypothyroidism, 33% of them were found to be between age group of 46 to 55 years. The mean age of presentation was found to be 41.3 years, ranging from minimum of 11 years to maximum of 60 years. This prevalence rate increases as age increases.

The BMI distribution among hypothyroidism has no correlation to serum TSH levels. Among 96 patients with hypothyroidism, 61.5% of patients had a normal BMI between 20 and 25 kg/m^2 and 13.5% of patients had BMI beyond 25 kg/m^2.

In regard to the sex distribution of patients, it was clearly evident that the prevalence of hypothyroidism is more common among women. Among 96 cases of hypothyroidism, only 8 cases were men.

On analyzing TSH distribution, it was found that among 96 cases, the mean TSH value was 12.3 mIU/l. The TSH values range from minimum of 5.8 mIU/l to maximum of 25mIU/l. 34% of the cases had TSH values between 10 and 20 mIU/l.

On analyzing the lipid profile abnormalities, patients were subjected to fasting lipid profile comprising serum total cholesterol, serum triglyceride, serum HDL and serum LDL.

Hypercholesterolemia was found in 40.6% of patients. Among 96% patients, 39 cases had high total cholesterol values. Borderline high values were found in 18.8% of patients. Mean cholesterol value of 213 mg/dl ranging from minimum of 119 to 310 mg/dl.

LDL was elevated in 42.7% of cases. Among 96 cases, 41 patients had elevated LDL levels more than 160 mg/dl. Borderline high LDL values were found in 14.6%. The mean LDL value was 139 mg/dl ranging from minimum of 76 to 290 mg/dl.

Triglyceride was elevated in only 27.1%. Among 96 cases, only 26 cases had high triglyceride values. Mean triglyceride value of 121.3 mg/dlranging from minimum of 76 to 222 mg/dl. HDL values were found to be normal in 66.7% of cases. The mean HDL was 51.9 mg/dl ranging from minimum of 33 to 70 mg/dl. TG comes from circulating exogenous or intracellular FFAs produced by glycolysis and fat. TH could reduce the production of VLDL-TG in liver [10]. When the rate of lipolysis remains unchanged, hypothyroidism will lead to decreased lipid oxidation rates and elevated TG. [11]

Statistical analysis of Colorado thyroid prevalence study showed significant elevation of total cholesterol and LDL in hypothyroidism compared to euthyroid controls. A meta-analysis conducted to evaluate the effect of thyroxine treatment on the lipid profilein hypothyroidism has shown significant reduction in total cholesterol level and LDL levels. A study conducted in north India comprising 100 patients, in the age group of 15 to 60 years having hypothyroidism were screened for lipid abnormalities. They were found to have significant elevations in triglyceride and VLDL levels and nominal increases in cholesterol and LDL levels. [12,13]

There is no established evidence for lowering of serum lipid profile with replacement therapy. The meta-analysis conducted comprising 13 studies showed a significant reduction in total cholesterol by 8 to 15 mg/dland LDL by 10 mg/dl with thyroxine therapy. The triglyceride and HDL showed no significant changes. [14] similar results was found in one another study, in a meta-analysis, the mean decrease of serum TC and LDL-C levels after thyroxine substitution was -7.9 mg/dL and -10 mg/dL, respectively [15]. The reduction was larger in individuals with higher pretreatment cholesterol levels and in hypothyroid individuals taking suboptimal T4 doses.

The changes noted in lipid abnormalities depends on multiple variables like age, race, sex and pretreatment lipid values. In view of lipidabnormalities and its association with cardiovascular abnormalities it is important to investigate the effect of hormone on lipid profile in hypothyroidism.

Among 96 patients, 39 patients had high total cholesterol values and 18 cases were having borderline high total cholesterol values. It isimportant to note that among the 39 cases with high cholesterol values, 16 patients were having TSH between 10 to 20 mIU/l and other 16 of themwere having TSH >20 mIU/l .

Similarly among the 96 cases, 41 patients had high serum LDL levels and 14 had borderline high LDL levels .among those 41 patients 17of them were having TSH between 10 to 20 mIU/l and 15 of them were having TSH > 20 mIU/l. so TSH levels has significant correlation with total cholesterol and LDL levels . As the TSH level increases, the serum total cholesterol and LDL also increases. HDL synthesis decreases in hypothyroidism. A study has documented a positive relationship between FT4 and plasma pre-β-HDL formation in type 2 diabetes mellitus patients [16]. TH strongly induces ApoA1 gene and protein expression [17], thereby increasing cholesterol efflux from peripheral tissues to HDL in reverse cholesterol transport (RCT). There seems to exist some correlation between rising TSH and serum HDL levels with a p value less than 0.001.

Conclusion:

Consensus on the treatment of hypothyroidism varies among different physicians on keeping in mind the adverse lipid abnormalities and the cardiovascular abnormalities. High risk population Screening will be useful in all patients at risk. Those with lipid abnormalities, mostly benefits from treatment with thyroxine.

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