

Prevalence of subclinical hypothyroidism in coastal Andhra Pradesh

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Abstract

The objective of the present study is to study the prevalence of subclinical hypothyroidism and its association with dyslipidemia. Thyroid hormone maintains the development and metabolism of the body. Thyroid dysfunction has been associated with complications like infertility, diastolic hypertension, ischemic heart disease, psychiatric disorders. 1157 subjects attending the NRI Hospital, Guntur for routine check up were taken into study. The patients were not under any medication. TSH and lipid profile was determined for all the subjects. The thyroid screening was done on Centaur CP and lipid profile on Dade Behring autoanalyzer. FT₄ was estimated in subjects with TSH level 5.5 to 10 μ IU/ml to confirm SCH. Result: The prevalence of Subclinical Hypothyroidism (SCH) was 8.29% and the SCH was associated with increased dyslipidemia. Total cholesterol, triglyceride, LDL were raised up to 317 mg/dl, 575mg/dl and 201mg/dl respectively. TSH level significantly correlated with total cholesterol and LDL cholesterol.

Keywords: Subclinical hypothyroidism (SCH); lipid profile; screening; dyslipidemia

Accepted May 21 2011

enhanced esterification of fatty acids at hepatic level [1].

Introduction

Thyroid disorders are the most common endocrine disorders. Thyroid disorder may occur at any stage of life. They are more commonly encountered in the mid age and adulthood. Thyroid hormones influence nearly all major metabolic pathways. Their most obvious and well known action is the increase in basal energy expenditure obtained by acting on protein, carbohydrate and lipid metabolism. The lipid metabolism is more influenced by the thyroid hormone [1]. Hypothyroidism is defined as a deficiency of both T₃ and T₄ resulting in decreased thyroid activity. Biochemically decrease in T₃ and T₄ concentration leads to hyper secretion of pituitary TSH and an amplified increase in serum TSH levels [2]. Hypothyroidism is a progressive disorder presenting with different degrees of thyroid failure and metabolic consequence [3]. Hypothyroidism is a well known cause of hyperlipidemia. In hypothyroid patients the most frequent lipid abnormality is hypercholesterolemia, mainly due to an increased concentration of low density lipoproteins (LDL). Elevation of very low density lipoproteins (VLDL) and high density lipoproteins (HDL Cholesterol) have also been reported. Plasma triglycerides are increased because of an

Asymptomatic patients with raised TSH and normal FT₄ concentration are known as subclinical hypothyroid. Subclinical hypothyroidism is mild thyroid disorder if left untreated leads to overt hypothyroidism in many cases. Subclinical hypothyroidism has adverse effect on lipid profile, but available reports are controversial [4]. Some SCH patients have vague complaints like malaise, dizziness, bradycardia, psychiatric disorders.

Materials and Methods

This is a cross sectional study including subjects reporting to NRI General Hospital, Guntur from June 2009 to May 2010 for routine check up. The subjects in the study group had no history of medication for any thyroid disorder, thyroidectomy or any exposure to radioiodine. None of the subjects were diagnosed for any renal, hepatic or pancreatic disorder, diabetes mellitus or familial hypercholesterolemia. Secondary data of the subjects was collected from the outpatient card and report form. The subjects with elevated TSH levels (5.5 μ IU/ml to 10 μ IU/ml) but normal FT₄ were considered as SCH (Subclinical Hypothyroidism).

5 ml venous blood sample was collected from each patient after an overnight fast. The blood was allowed to clot at room temperature and then centrifuged at 3000

rpm for 5 minutes. Serum was separated and was used for analysis. The serum levels of TSH and FT₄ was estimated by Siemens Centaur CP kit on Centaur CP. Lipid profile (Total Cholesterol, Triglyceride and HDL cholesterol) was analyzed using Siemens Dimension Clinical Chemistry (Flex reagent cartridge) kits on Dade Behring instrument. LDL cholesterol was calculated by Friedewald's formula. Bio-Rad Controls were used as Quality Control material. The samples were analyzed only when the control values were within one standard deviation.

Results

1157 subjects in the age group of 17 to 85 years were taken in the study of which included 686 males and 471 females. Out of total subjects screened 96 were found to be SCH. The TSH value above 5.5 to 10µIU/ml and Free

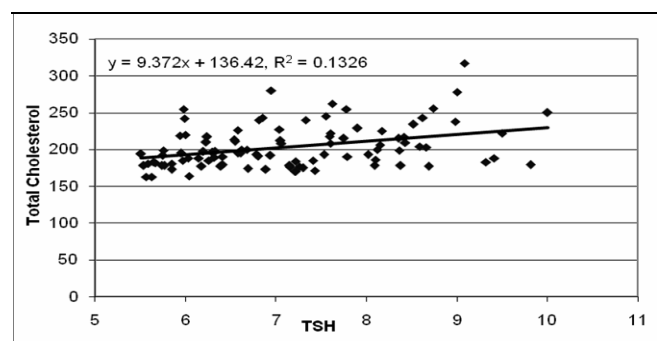
T₄ within normal range was taken as the criteria for SCH. The prevalence of SCH in the study was 8.29%. Of the 96 cases, 45(46.87%) were males and 51(53.13%) were females. The most common age group, mode for males SCH was found to be 69 years whereas mean age was 50.20 years (SD=11.04). In females the mode was 60 years and mean age was found to be 48.02 years (SD=9.89). The regression lines were drawn and regression analysis was performed using MS Office 2003 version. The TSH level is significantly correlated with Total Cholesterol (r=0.364, p=0.0002, F=14.372, df =1, 95). The TSH level is significantly correlated with LDL cholesterol (r=0.293, p=0.003, F=8.844, df =1, 95). Mean of Total Cholesterol was 203.41, SE=2.97. Mean of LDL was 118.1, SE=3.04.

Table 1. Statistical value of different parameters

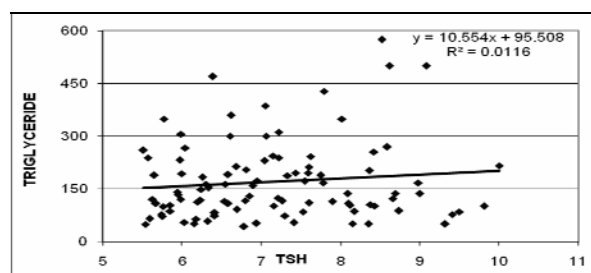
	TSH	T CHOL	TRIG	HDL	LDL	VLDL
Mean ± SD	7.15 ± 1.13	203.41±29.12	170.94± 111.01	40.81 ± 8.22	118.10 ± 29.76	32.26 ± 18.06
Mode	7.6	178	108	38	129	17
Minimum	5.51	163	43	19	63	10
Maximum	10	317	575	62	201	101

Table 2. Correlation coefficient of TSH, Total Cholesterol, Triglyceride, HDL and LDL

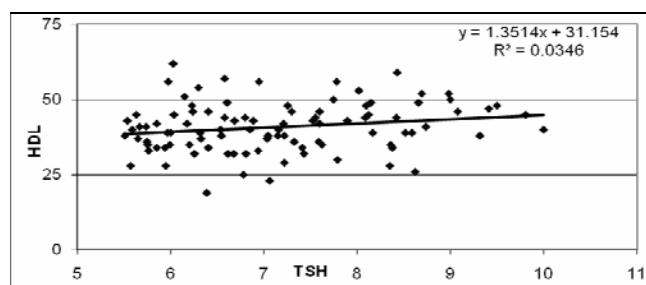
	TSH	T CHOL	TRIG	HDL	LDL
TSH	1	x	x	x	x
T CHOL	0.36	1	x	x	x
TRIG	0.11	0.27	1	x	x
HDL	0.19	0.19	-0.28	1	x
LDL	0.29	0.76	0.03	0.12	1



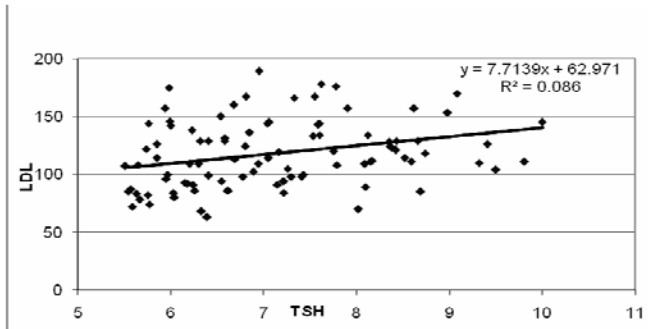
Graph 1. Correlation of TSH with Total Cholesterol x axis indicates TSH (µIU/ml) and y axis indicates Total Cholesterol (mg/dl). Regression equation and R² are represented on graph.



Graph 2. Correlation of TSH with Triglyceride. x axis indicates TSH (µIU/ml) and y axis indicates Triglyceride (mg/dl).



Graph 3. Correlation of TSH with HDL Cholesterol x axis indicates TSH (µIU/ml) and y axis indicates HDL Cholesterol (mg/dl).



Graph. 4. Correlation of TSH with LDL Cholesterol
x axis indicates TSH ($\mu\text{IU/ml}$) and y axis indicates LDL Cholesterol (mg/dl).

Discussion

Thyroid disorders are known to alter the lipid metabolism. Hypothyroidism results in a rise in circulating total cholesterol and LDL cholesterol levels [5]. The elevated LDL cholesterol level in hypothyroidism may occur as a result of increased cholesterol synthesis and absorption, decreased hepatic lipase and lipoprotein lipase activities and defect in the receptor mediated catabolism of LDL cholesterol. The elevation in LDL cholesterol levels may be accompanied by increased formation of oxidized LDL cholesterol contributing to enhanced risk of atherosclerosis[6].

Cardiovascular system is very sensitive to minimal defects of circulating thyroid hormone and cardiovascular diseases are associated with overt hypothyroidism. The abnormalities in myocardial contractility and the changes of lipoprotein profile are frequently documented in hypothyroid patients. Therefore SCH may be considered a true risk factor for the development of coronary heart disease [7]. At a younger age, SCH has more severe pathophysiological effects resulting in accelerated vascular disease through dyslipidemia, endothelial dysfunction or a direct effect on myocardium. With advancing age subjects that are relatively resistant to the adverse vascular effect of SCH may survive, leading to an attenuation of this effect in old age [8].

Whickham survey defined that younger women with a mildly TSH level (6-9mU/L) had a lower risk for progression. The risk of progression was not evenly distributed throughout the follow up period. In patients with SCH and elevated total cholesterol level, L-thyroxine treatment may reduce serum cholesterol and thereby decrease the incidence of coronary artery disease, stroke, and peripheral vascular disease [9].

Studies reported disturbance in the lipid metabolism in patients with SCH [4,10,11,12] but, Rotterdam study re-

port that total cholesterol was not elevated in SCH [13]. SCH was reported to be a strong indicator for the risk of atherosclerosis, CAD and MI [14,15]. SCH group in the present study had higher levels of serum total cholesterol and LDL cholesterol which was found to be in positive correlation with TSH level. Similar report was demonstrated in the study done by Serpil Turhan et al. [16] SCH is relatively common among hypercholesterolemic patients, thus the serum TSH levels should be screened [5,9,17]. The severity of lipid abnormality does not parallel with the degree of hypothyroidism. The triglyceride and HDL cholesterol did not correlate with the TSH levels in the study. Triglyceride levels were not raised in the present study contrary to few studies [12,15]. In this study the elderly men and women were more commonly affected with SCH similar to other studies [13,17,18,19].

SCH impairs ventricular function. LV diastolic dysfunction was found in SCH many studies, and this abnormalities may be reversed by a short term substitutive L-thyroxine therapy [7,14,15,20]. Mirjam et al reported that after 48 weeks of L-thyroxine treatment, total cholesterol and LDL cholesterol were significantly reduced whereas HDL-cholesterol and triglycerides remained unchanged. Thyroid hormone replacement in hypothyroidism has been observed to result in increased LDL clearance due to increased LDL receptor activity in the liver [21]. Thyroid hormones enhance intravascular catabolism of VLDL, triglycerides and lower plasma total cholesterol and LDL cholesterol. It is clear that thyroid hormone replacement therapy has beneficial effects on the serum lipid profile and on the risk of CAD in overt hypothyroid cases [7,8,15,17].

The community should be screened for SCH in high risk group to identify the patients and treat them. Treatment of SCH in pregnant women is mandatory to decrease the risk for pregnancy complication and impaired cognitive development in offspring. Children with SCH should be treated to prevent growth retardation [7,22,23]. Studies have reported psychiatric problems such as panic disorder, anxiety and depression disorders are more common in SCH [24].

Conclusion

1157 subjects were screened, 96 were SCH 45(46.87%) males and 51(53.13%) females. All SCH subjects had dyslipidemia and TSH levels were significantly correlated with total cholesterol and LDL cholesterol.

A longitudinal multi-centric study will throw more light on the subject. Meta-analysis may also be taken up for better comprehension of the hypothesis.

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