

Study of Lipid Parameters in Subclinical Hypothyroidism

Kanakapudi Ramyasree¹, Sanjay HK², Narayana³, Vekatrajaiah⁴

¹Junior Resident, ²Professor and HOD, ^{3,4}Professor, Department of General Medicine, Chalmeda Anandrao Institute of Medical Sciences, Karimnagar, Telangana, India.

How to cite this article: Kanakapudi Ramyasree, Sanjay HK, Narayana et. al. Study of Lipid Parameters in Subclinical Hypothyroidism. Indian Journal of Public Health Research & Development 2023;14(4).

Abstract

Introduction: The Diagnosis of subclinical hypothyroidism is mostly biochemical as most of the patients have a serum TSH above the normal and serum free and total T4 and T3 are normal. Due to recent increasing prevalence of sub-clinical hypothyroidism and metabolic risk factors such as adverse cardiac function and hyperlipidemia, it recommended the importance of screening by assessment of serum TSH.

Aims: To assess the lipid profile in patients diagnosed with sub-clinical hypothyroidism

Methods and Materials: This study is a hospital based cross sectional study and comprised a total of 96 subjects performed in Chalmeda Anandrao Institute of Medical Sciences. Patients presenting to OPD with vague complaints of hypothyroidism are selected. They are screened for subclinical hypothyroidism by doing fasting TFT comprising freeT4, freeT3 and TSH and fasting lipid profile is also done for the patient. Laboratory analysis of blood urea, serum creatinine done.

Results: A Total number of 96 patients were studied, majority of them were between age group of 46 to 55 years.

The BMI distribution among SCH has no correlation to serum TSH levels.

Prevalence of subclinical hypothyroidism is more common among women.

TSH values range from minimum of 5.8 mIU/l to maximum of 25mIU/l.

Hypercholesterolemia was found in 40.6% of patients. LDL was elevated in 42.7% of cases. Triglyceride was elevated in only 27.1%. HDL values were found to be normal in 66.7% of cases.

Conclusion: Our study concludes that there are significant elevations in total cholesterol and serum LDL in subclinical hypothyroidism. There is no much significant changes in triglycerides and HDL levels.

Keywords : SCH- Sub-clinical hypothyroidism, TSH- Thyroid stimulating hormone, LDL- Low density lipoprotein, HDL- High density lipoprotein.

Introduction

The diagnosis of subclinical hypothyroidism is mostly biochemical as most of the patients have

a serum thyroid stimulating hormone above the normal reference range and serum free and total thyroxine T4 and T3 are normal¹.

Corresponding Author: Kanakapudi Ramyasree, Junior Resident, Department of General Medicine, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, India.

E-mail: kramyasree07@gmail.com

Mobile: 9908612499

The prevalence is 7 to 26% in studies conducted in elderly. Since the hormone levels are normal there comes a confusion between compensated hypothyroidism and euthyroid state².

It is also associated with dyslipidemia and adverse cardiovascular risk profile. Now the recent practical approach of treatment of subclinical hypothyroidism is levothyroxine therapy for persons with serum TSH of more than 10mIU/L and the therapy is individualised for patients with a TSH value of less than 10mIU/L³.

Subclinical hypothyroidism is a common endocrine problem with 3 to 8% prevalence among general population. Antithyroid antibodies are positive in 80% of patients with Sub clinical hypothyroidism. Prior radioiodine therapy, external neck and head irradiation may cause mild form of thyroid dysfunction³. Transient elevation of TSH values may occur after episodes of postpartum thyroiditis. Due to recent increasing prevalence of Subclinical hypothyroidism and metabolic risk factors such as adverse cardiac function and hyperlipidemia, the American Thyroid association has recommended the importance of screening by assessment of serum TSH values above the age of 35 years and followed up every 5 years later. Because of high likelihood of SCH to cause complications during pregnancy and brain development of fetus, screening of pregnant women for subclinical hypothyroidism is suggested³.

“In the conclusions of Whickham survey⁴, the risk of acquiring hypothyroidism was 4.3% per year in women in a year, if both the levels serum TSH and anti-thyroid antibodies were found to be elevated, 2.6% chance in patients with elevated TSH alone, and 2.1% chance per year with positive anti-thyroid antibodies alone.” On follow up of the course of patients with subclinical hypothyroidism, a recent prospective study by Gerold Huber and team⁵ concluded that high risk factors for progression to overt hypothyroidism were base line TSH >12uIU/mL, reduced thyroid reserve and positive for thyroid peroxidase antibody. So treatment of subclinical hypothyroidism holds good in various situations and in prevention of conversion to overt hypothyroidism².

AIMS

To assess the lipid profile in patients diagnosed with sub-clinical hypothyroidism

Materials and Methods

Study design and duration

A cross sectional study was undertaken from January 2022 to December 2022

Sample size:

A Total of 96 patients presenting to the OPD with vague complaints of hypothyroidism are selected.

Study centre:

The Study was Conducted in the Department of General Medicine, Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar.

Inclusion Criteria

- All newly detected cases of subclinical hypothyroidism [normal t3, t4, free t4 and TSH > 5.5 mU/L]

Exclusion Criteria

- Patients aged twelve or less.
- Patients on thyroxine
- Known case of diabetes and hypertension
- Chronic renal failure
- Chronic liver disease
- Primary adrenal failure
- On drugs like beta blockers ,diuretics, steroids, OCP,
- Patients already on hypolipidemic drug

Procedure

Cases were selected from patients presenting to general medicine op, general surgery op, endocrinology op and obstetrics and gynaecology op. Patients presenting to these op with vague complaints of obesity, recent gain of weight, tiredness, coarse facial features, hair loss, dry skin, infertility, voice changes, memory disturbance, cognitive dysfunction, mood disorders, swelling of neck, menstrual irregularities are selected. They are screened for SCH by doing fasting TFT comprising freeT4, freeT3 and TSH and fasting lipid profile is

also done for the patient. Among the 620 patients screened for subclinical hypothyroidism, 96 turned out to have the disease. All pregnant females are screened with TFT. Patients are selected after they fit into the inclusion and exclusion 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 comprising of free T3, free T4, and TSH. And fasting lipid profile. Thyroid function test was done using ELISA and lipid profile using enzymatic kit method.

Ethics Approval

This is to certify the ethical committee of Chalmeda Anand Rao Institute Of Medical sciences, Karimnagar, has unanimously approved Dr. K. Ramyasree, Post Graduate student in the subject of M.D. General Medicine at Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar to take up the work entitled "Study of lipid parameters in subclinical hypothyroidism".

Result

The collected data was analysed with SPSS 16.0 version. To describe about the data descriptive statistics, frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To assess the relationship between the variables Pearson's Correlation was used. To find the significance in categorical data Chi-Square test was used. In both the above statistical tools the probability value .05 is considered as significant level. Using this computer software, multiple variables like mean range percentages, standard deviation, chi square and p value etc are used to test for the statistical significance of the study. A p value of less than 0.05 denotes significant relationship.

Table 1: TSH Distribution

TSH	Frequency	Percent
<10	47	49.0
10-20	33	34.4
>20	16	16.7
TOTAL	96	100

Table 2: Total Cholesterol Distribution

Total cholesterol	Frequency	Percentage
Normal	39	40.6
Borderline	18	18.8
High	39	40.6
Total	96	100.0

Table-3: LDL Distribution

LDL	Frequency	Percent
Normal	41	42.7
Borderline	14	14.6
High	41	42.7
Total	96	100.0

Table-4: Triglyceride Distribution

Triglyceride	Frequency	Percent
Normal	70	72.9
Borderline	16	16.7
High	10	10.4
Total	96	100.0

Table-5: HDL Distribution

HDL	Frequency	Percentage
Abnormal	32	33.3
Normal	64	66.7
Total	96	100.0

Discussion

In this study I screened patients for subclinical hypothyroidism and evaluation of dyslipidemia in these patients. Among 96 cases of subclinical 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 subclinical hypothyroidism has no correlation to serum TSH levels. Among 96 patients with subclinical hypothyroidism, 61.5% of patients had a normal BMI between 20 and 25 kg/m² and 13.5% of patients had BMI beyond 25 kg/m². In regard to the sex distribution of patients, it was clearly evident that the prevalence of subclinical hypothyroidism is more common among women. Among 96 cases of subclinical 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 analysing the lipid profile abnormalities, patients were subjected to fasting lipid profile comprising serum total cholesterol, serum triglyceride, serum HDL and serum LDL. The reference range of serum lipid profile. Total cholesterol:

Normal:	200mg/dl
Borderline:	201 to 239
High:	> 240mg/dl
Normal:	< 200 mg/dl

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/dl ranging 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.

Similarly among the 96 cases, 41 patients had high serum LDL levels and 14 had borderline high LDL levels. among those 41 patients 17 of 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.

Statistical analysis of Colorado thyroid prevalence study⁶ showed significant elevation of total cholesterol and LDL in subclinical hypothyroidism compared to euthyroid controls. A meta-analysis conducted to evaluate the effect of thyroxine treatment⁷ on

the lipid profile in subclinical hypothyroidism has shown significant reduction in total cholesterol level and LDL levels.

“In a randomised control trial, patients with subclinical hypothyroidism treated with thyroxine showed significant lowering of total cholesterol and serum LDL levels^{8,9}”.

A metaanalysis in patients treated with thyroxine for subclinical hypothyroidism showed significant reduction in total cholesterol levels, without much significant change in serum HDL and triglyceride levels. The lowering of serum cholesterol was noticed in patients with levels more than 240mg/dl¹⁰.

Analysis of reports has showed increased prevalence of depression and bipolar affective disorder in patients with subclinical hypothyroidism¹¹. Improvements in neuropsychiatric manifestations are seen with appropriate treatment with thyroxine^{10,11}. These analysis concluded impairment of working memory in subclinical hypothyroidism. Also treatment with l-thyroxine showed improvement in memory performance and frontal executive functions^{12,13}. “Subclinical hypothyroidism undetected during pregnancy adversely affect the survival and neuropsychological development of fetus. So this suggest the importance of screening of pregnant women for hypothyroidism and treatment of subclinical hypothyroidism¹³.”

The major practical benefit of initiation of treatment in subclinical hypothyroidism is improvement of symptoms, cognitive function like memory, lowering of levels of serum total cholesterol and serum LDL levels. Also treatment significantly improves cardiac function like myocardial contractility.¹⁴

Conclusion

Lipid parameters in sub-clinical hypothyroidism has Increased prevalence among females.

And Increased prevalence of subclinical hypothyroidism beyond the age group of 50 years of which 34% of patients has TSH levels between 10 to 20 mIU/l. Significant elevations in total cholesterol and serum LDL in subclinical hypothyroidism.

Association of TSH with total cholesterol and LDL elevations. No much significant changes in triglycerides and HDL Levels.

Conflict of Interest: Nil

Source of Funding: Nil

References

1. Harrison's principles of internal medicine-20th and 21st edition.
2. Monzani, F, Di Bello, V, Caraccio, N, et al. Effect of levothyroxine on cardiac function and structure in subclinical hypothyroidism: a double blind, placebo-controlled study. *J Clin Endocrinol Metab* 2001; 86:1110.
3. Subclinical Hypothyroidism: An Update for Primary Care...www.ncbi.nlm.nih.gov > NCBI > Literature. Consequence of Subclinical Thyroid Dysfunction - [Medscape](http://medscape.com)[www.medscape.com /viewarticle/776505](http://www.medscape.com/viewarticle/776505)
4. Vanderpump MP, Tunbridge WM, French JM, Appleton D, Bates D, Clark F, Grimley Evans J, Hasan DM, Rodgers H, Tunbridge F, et al. The incidence of thyroid disorders in the community: a twenty-year follow-up of the Whickham Survey. *Clin Endocrinol (Oxf)*. 1995 Jul;43(1):55-68. doi: 10.1111/j.1365-2265.1995.tb01894.x. PMID: 7641412.
5. Huber G, Staub JJ, Meier C, Mitrache C, Guglielmetti M, Huber P, Braverman LE. Prospective study of the spontaneous course of subclinical hypothyroidism: prognostic value of thyrotropin, thyroid reserve, and thyroid antibodies. *J Clin Endocrinol Metab*. 2002 Jul;87(7):3221-6. doi: 10.1210/jcem.87.7.8678. PMID: 12107228.
6. Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado thyroid disease prevalence study. *Arch Intern Med*. 2000 Feb 28;160(4):526-34. doi: 10.1001/archinte.160.4.526. PMID: 10695693..
7. Chen Y, Tai HY. Levothyroxine in the treatment of overt or subclinical hypothyroidism: a systematic review and meta-analysis. *Endocr J*. 2020 Jul 28;67(7):719-732. doi: 10.1507/endocrj.EJ19-0583. Epub 2020 Mar 31. PMID: 32238664.
8. Arem, R, Escalante, DA, Arem, N, et al. Effect of l-thyroxine therapy on lipoprotein fractions in overt and subclinical hypothyroidism with special reference to lipoprotein a. *Metabolism* 1995; 44:1559
9. Kung, AW, Pang, RW, Janus, ED. Elevated serum lipoprotein in subclinical hypothyroidism. *Clin Endocrinol* 1995; 43:445
10. Danese MD, Ladenson PW, Meinert CL, Powe NR. Effect of thyroxine therapy on serum lipoproteins in patients with mild thyroid failure: a quantitative review of the literature. *J Clin Endocrinol Metab* 2000; 85:2993.
11. Joffe RT, Levitt AJ. Major depression and subclinical (grade 2) hypothyroidism. *Psychoneuroendocrinology* 1992;17:215.
12. Mandel SJ, Larsen PR, Seely EW, et al. Increased need for thyroxine during pregnancy in women with primary Hypothyroidism *N Engl J Med* 990;323:91-6.
13. Haddow JE, Palomaki GE, Allan WC, et al. Maternal thyroid deficiency during pregnancy and subsequent neuropsychological development of the child [see comments]. *N Engl J Med* 1999; 341:549-55
14. Surks, MI, Ortiz, E, Daniels, GH, et al. Subclinical thyroid disease: scientific Review and guidelines for diagnosis and management. *Journal of American Medical Association*, 291(2), 228-238.