



CARDIOVASCULAR CHANGES IN SUBCLINICAL HYPOTHYROIDISM: DESCRIPTIVE OBSERVATIONAL STUDY

General Medicine

**Dr Vaibhav
Lamdhade**

Assistant Professor, Department Of General Medicine, GMC Miraj

**Dr Sachinkumar
Patankar**

Associate Professor, Department Of General Medicine, GMC Miraj

**Dr Kadamduke
Neha**

Assistant Professor, Department Of General Medicine, GMC Miraj

**Dr Hange Ajit
Namdeorao***

Assistant Professor, Department Of General Medicine, GMC Miraj*Corresponding Author

ABSTRACT

Thyroid disorders are the most common endocrine disorders in India. Reduced production of thyroid hormone is central feature of clinical state termed as "hypothyroidism". Iodine deficiency remains a common cause of hypothyroidism worldwide. In areas of iodine sufficiency, autoimmune disease (Hashimoto's thyroiditis) and iatrogenic causes (treatment of hyperthyroidism) are most common. By definition, subclinical hypothyroidism refers to biochemical evidence of thyroid hormone deficiency in patients who have few or no apparent clinical features of hypothyroidism. Subclinical Hypothyroidism is an asymptomatic state in which reduction in thyroid activity is compensated by elevated thyroid stimulating hormone to maintain euthyroid state. Evidence seems to indicate subclinical hypothyroidism is quite prevalent in presumably normal population. Subclinical hypothyroidism is found in 6–8% of women (10% over the age of 60) and 3% of men. Prevalence increases with age. **Methods-** This was an observational study done in medical college and hospital. The study was carried out in the duration of 2 years. All OPD and IPD patients of Hospital, diagnosed with subclinical hypothyroidism, during this period, who fulfilled the inclusion criteria, were included in this study. This study included 54 newly diagnosed patients with subclinical hypothyroidism attending Hospital. **Results-** In this study maximum patients belong to age group ranging from 18-30 (33.33%). Next to it is age group involving 31-40 (31.48%). While least number of patients comes in age group ranging from 61-70 (9.26%). Female (74.07%) preponderance compared to males (25.93%). With male having (25.93%). Male to Female ratio is 1:3. Showing female predominance in hypothyroidism. **Conclusion-** Quite a significant number of patients were in the pre-hypertension group. Various life style modifications can be advised to prevent them from going to stage I hypertension. Skin changes, Facial puffiness, Hoarseness of Voice, cold intolerance, limbs swelling and weight gain these are the symptoms in decreasing order in patients with subclinical hyperthyroidism.

KEYWORDS

Subclinical hypothyroidism, Cardiovascular, Bradycardia

INTRODUCTION

Thyroid disorders are the most common endocrine disorders in India (1). Hypothyroidism is a progressive disorder presenting with different degrees of thyroid failure and metabolic consequences.

By definition, subclinical hypothyroidism refers to biochemical evidence of thyroid hormone deficiency in patients who have few or no apparent clinical features of hypothyroidism.

Subclinical Hypothyroidism is an asymptomatic state in which reduction in thyroid activity is compensated by elevated thyroid stimulating hormone to maintain euthyroid state. Evidence seems to indicate subclinical hypothyroidism is quite prevalent in presumably normal population. If the TSH is elevated, an unbound T4 level is needed to confirm the presence of clinical hypothyroidism, but T4 is inferior to TSH when used as a screening test, because it will not detect subclinical hypothyroidism.

Circulating unbound T3 levels are normal in about 25% of patients, reflecting adaptive deiodinase responses to hypothyroidism. T3 measurements are, therefore, not indicated. Subclinical hypothyroidism represents mild thyroid failure and mild thyroid failure represents an early stage of thyroid disease that will commonly progress to overt hypothyroidism, progression has, in fact, been reported to occur in approximately 3–18% of affected patients per year. Classification systems have been proposed that grade subclinical hypothyroidism based on severity assessment into grade 1 (TSH levels less than 10mIU/L) or grade 2 (TSH more than 10mIU/L) (2). Subclinical hypothyroidism is associated with signs and symptoms of thyroid hormone deficiency.

The most common symptoms associated with this condition are muscle cramps, lethargy, cold intolerance and weakness.

Subclinical hypothyroidism is shown to be associated with increased

incidence of coronary heart disease (3). Myocardial contractility and pulse rate are reduced, leading to a reduced stroke volume and bradycardia. Increased peripheral resistance may be accompanied by hypertension, particularly diastolic.

Blood flow is diverted from the skin, producing cool extremities. Pericardial effusions occur in up to 30% of patients but rarely compromise cardiac function. Although alterations in myosin heavy chain isoform expression have been documented, cardiomyopathy is unusual. Studies have clearly shown that patients with subclinical hypothyroidism have impaired left ventricular diastolic function at rest and systolic dysfunction on effort, which may result in poor physical exercise capacity. Moreover, resting left ventricular diastolic dysfunction is often the first manifestation of heart disease, even preceding systolic dysfunction at rest. Altered serum lipid levels and abnormal vascular reactivity in patients with subclinical hypothyroidism particularly elderly women may confer a higher risk for cardiovascular disease.

The clinical importance of subclinical hypothyroidism in cardiovascular disease and mortality remains controversial, with most studies providing conflicting results. Cardiovascular alterations that occur in overt hypothyroidism have also been identified in subclinical hypothyroidism, effects varying only in the degree of derangement (4). The cardiovascular system is one of the most important targets of thyroid hormones and is very sensitive to a minimal decrease of circulating thyroid hormones. It has long been recognized that some of the most characteristic and common signs and symptoms of thyroid disease are those that result from the effects of thyroid hormone on the heart and cardiovascular system (5,6,7).

The prevalence of hypothyroidism in the developed world is about 4-5% (8,9). The prevalence of subclinical hypothyroidism in the developed world is about 4-15% (10). In a developing and densely populated country like India, communicable diseases are priority

health concerns due to their large contribution to the national disease burden. In India, hypothyroidism was usually categorized under the cluster of iodine deficient disorders (IDDs), which were represented in terms of total goiter rates and urinary iodine concentrations, typically assessed in school-aged children. Women appear to be affected twice as often as men. Men were less commonly affected by subclinical hypothyroidism than women but more likely to experience disease progression.

Adverse consequences of subclinical hypothyroidism-

1.Symptoms- Tiredness, weakness, Dry skin, Feeling cold, Hair loss, Difficulty concentrating and poor memory, Constipation, Weight gain with poor appetite, Dyspnea, Hoarse voice, Menorrhagia (later oligomenorrhea or amenorrhea), Paresthesia, Impaired hearing.

2.Signs (Descending order of frequency)

Dry coarse skin, cool peripheral extremities, Puffy face, hands, and feet (myxedema), Diffuse alopecia, Bradycardia, Peripheral edema, Delayed tendon reflex relaxation, Carpal tunnel syndrome, Serous cavity effusion.

AIM AND OBJECTIVES

1. To study the cardiovascular manifestations in subclinical hypothyroid patients.
2. To study ECG changes in patients with subclinical hypothyroidism.
3. To study Echocardiographic changes in patients with subclinical hypothyroidism.

METHODOLOGY-

This was an observational study done in medical college and hospital. The study was carried out in the duration of 2 years. All OPD and IPD patients of Hospital, diagnosed with subclinical hypothyroidism, during this period, who fulfilled the inclusion criteria, were included in my study. This study included 54 newly diagnosed patients with subclinical hypothyroidism attending Hospital. Electrocardiogram and Echocardiography was also being done in all the patients and if required, TMT is also carried out under study. The cardiovascular changes were analyzed with the TSH levels. The study was done after approval from the institutional ethics committee. An informed consent was being taken from the patients prior to inclusion in the study.

INCLUSION CRITERIA

The Inclusion Criteria for the patients in this study were:

1. Age ≥ 18 yrs.
 2. All the cases of newly detected subclinical hypothyroidism – diagnosed by clinical evaluation and confirmed by serum TSH, free T4 level.
- (Subclinical hypothyroidism is defined as an elevated serum TSH level associated with normal free T4 values). Patients who satisfied above criteria were included in the study. Detailed history and clinical evaluation done.

EXCLUSION CRITERIA

1. Patients who were already diagnosed to have hypothyroidism on thyroid hormone replacement therapy.
2. Patients with other associated diseases like diabetes, hypertension, pernicious anemia, renal failure collagen disorders and other endocrine disorders (hypoparathyroidism, hypogonadism, etc) and pregnancy.

RESULTS

1) Age wise distribution of patients-

In this study maximum patients belong to age group ranging from 18-30 (33.33%). Next to it is age group involving 31-40 (31.48%). While least number of patients comes in age group ranging from 61-70 (9.26%).

2) Sex wise distribution of patients-

Female (74.07%) preponderance compared to males (25.93%). With male having (25.93%). Male to Female ratio is 1:3. Showing female predominance in hypothyroidism.

3) Symptomatology-

a) In most of patients, symptoms starts appearing early in course of disease, i.e. less than 9 months (94.44%) in our study. So early diagnosis in patients with sub clinical hypothyroidism may minimizes further cardiovascular manifestations.

b) Breathlessness is most common cardiac presentation in patients with hypothyroidism, 19 among 54 patients. While palpitation is very rarely be the presenting complaints.

c) Chest pain and effort intolerance are also important complaints taken into consideration.

d) Pallor present in 30 among 54 patients (55.56%). Edema present in 27 patients (50%).

e) Delayed relaxation of ankle jerk is seen in 24 patients (44.44%).

f) Tongue swelling is seen in 10 patients (18.52%).

g) Thyroid swelling is present in 10 patients (18.52%).

So we come know that pallor and edema is present in more than 50% of patients here.

h) Pulse rate which is number of heart contractions in 1 minute. While only 4 patients (7.41%) of patients having bradycardia (pulse rate less than 60 per minute). And none of the patient having tachycardia (pulse rate more than 100 beats per minute).

I) Almost 32 patients (59.25%) have systolic blood pressure less than 120 mm hg. While 16 patients (29.5%) having their systolic blood pressure in pre-hypertension i.e 120-139. And only 6 patients (11.25%) have their systolic blood pressure in the range of 140- 159.

INVESTIGATIONS-

Number of patients under study are divided on the basis of range of serum TSH levels, 5-10 and more than 10. Maximum patients having their serum TSH in the range of 5-10 (75.93%) while rest having their serum TSH more than 10 (24.07%).

According to National Cholesterol Education Program (NCEP) total cholesterol of patients are divided in different ranges; cholesterol up to 200 in 35 patients (64.8%), 200-239 in 11 patients (20.2%) and > 200 in 8 patients (15%). So maximum patient have their cholesterol under control. 9 patients having their triglycerides less than 150 (16.6%), 16 patients in the range of 151-199 (29.4%), 29 in the range of 200-499 (54%). So maximum patients having their triglycerides on abnormal range. And only 9 patients having normal triglycerides levels.

Serum LDL (low density lipoprotein), normally less than 100. Here in study most of patients (66.5%) having serum LDL levels less than 100, while very few of them having more than 130.

HDL, High Density Lipoproteins are one of the five major group of lipoprotein. It is smallest in size with highest density. In this study we can see 15 patients (27.5%), comes in range of 40-50. 29 patients (53.5%) comes under 51-60. While rest of 10 (19%) have serum HDL level more than 60.

Low voltage complexes on ECG seen in 24 patients (44.5%) while 30 Patients (55.5%) having normal voltage on ECG among 54 patients.

Patient showing some significant ST-T changes like T wave changes in various leads of ECG. 2 patients (3.7%) having QT prolongation on eeg and 2 (3.7%) were having prolong PR interval.

Pericardial Effusion (PE) is present in 4 out of 54 patient (7.41%) and remaining 50 patients not having any pericardial effusion on 2D Echo. Very few patients that is 3 out of 54 (5.56%) having diastolic dysfunction on 2D Echo. Rest 51 patients (94.44%) having normal diastolic function. Among positive all 3 patients having grade 1 diastolic dysfunction and none of them having grade 2,3,4 diastolic dysfunction.

Ejection fraction which is also looked on 2D Echo testing. In this study shows 6 patients (11.11%) have their reduced ejection fraction (less than 50%) among 54 patients. While rest having normal ejection fraction on 2D Echo.

Exercise stress test or treadmill test is measures hearts ability to external stress in controlled clinical environment. Trademill test was done in patients who has significant ST-T changes on ECG. Only 1 patient have positive finding on TMT among 16 in this study and rest of

15 having normal response to stress test.

CONCLUSION

1. Subclinical hypothyroidism patients present with symptoms and signs which are mostly non-specific in nature.
2. Quite a significant number of patients were in the pre-hypertension group. Various life style modification can be advised to prevent them from going to stage I hypertension.
3. Electrocardiogram of subclinical hypothyroidism patients shows bradycardia, low voltage complexes and non-specific ST-T changes in few patients.
4. Hypertriglyceridemia was found in few subclinical hypothyroid patients.
5. Pericardial effusion occurs in a low percentage of subclinical hypothyroid patients.
6. Trade mill test and echocardiography showed evidence of left ventricular systolic dysfunction, diastolic dysfunction, pericardial effusion and inducible ischemia in very few patients.
7. Skin changes, Facial puffiness, Hoarseness of Voice, cold intolerance, limbs swelling and weight gain, these are the symptoms in decreasing order in patients with subclinical hyperthyroidism.

REFERENCES

- 1) Kochupillai N. Clinical Endocrinology in India. Current science. 2000;79:1061-67.
- 2) Huber G, Mitrache C, Guglielmetti M, Huber P, Staub JJ Predictors of overt hypothyroidism and natural course: a long-term follow-up study in impending thyroid failure. 71st Annual Meeting of the American Thyroid Association, Portland, OR, 1998; Abstract 109.
- 3) Cooper D, Halpern R, Wool L et al; L -- thyroxine therapy in subclinicalhypothyroidism. Ann intern Med 1984; 101 : 18-24.
- 4) Dean JW, Fowler PBS : Exaggerated responsiveness to TRH :A risk factor in women with coronary artery disease. BMJ 1985; 290: 1555-1561.
- 5) C. Selmer, J. B. Olesen, M. L. Hansen et al., "Subclinical and overt thyroid dysfunction and risk of all-cause mortality and cardiovascular events :a large population study," The Journal of Clinical Endocrinology and Metabolism, vol.99, no.7 ,pp.2372– 23822014.
- 6) Klein I, Ojamaa K. Thyroid hormone and the cardiovascular system. N Engl J Med. 2001;344:501–509.
- 7) Dillmann WH. Cellular action of thyroid hormone on the heart. Thyroid. 2002;12:447–452.
- 8) Canaris GJ, Manowitz NR, Mayor G, Ridgway EC The Colorado thyroid disease prevalence study. Arch Intern Med 2000 ;160:526–534.
- 9) Hollowell JG, Staehling NW, Flanders WD, Hannon WH, Gunter EW, Spencer CA, et al. Serum TSH, T (4), and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III) J Clin Endocrinol Metab. 2002;87:489–99.
- 10) Hoogendoorn EH, Hermus AR, de Vegt F, Ross HA, Verbeek AL, Kiemency LA, et al. Thyroid function and prevalence of anti-thyroperoxidase antibodies in a population with borderline sufficient iodine intake: Influences of age and sex. Clin Chem. 2006;52:104–11.