

Comparative Study of Hypothyroidism with Cardiometabolic Risk

T Sudhakar¹, Sabitha Kandi², B Venugopal², K. Bhagwan Reddy³, K V Ramana^{4*}

¹Lab incharge, Apollo Reach Hospital, Karimnagar, Telangana, India

²Department of Biochemistry, Chalmeda Ananda Rao Institute of Medical sciences, Karimnagar, Telangana, India

³Department of Biochemistry, Prathima Institute of Medical sciences, Karimnagar, Telangana, India

⁴Department of Microbiology, Prathima Institute of Medical sciences, Karimnagar, Telangana, India

*Corresponding author: ramana_20021@rediffmail.com

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Abstract Hypothyroidism is a thyroid deficient state which shows its influence on other metabolic pathways whereas sub-clinical hypothyroidism (SCH) is a condition where there is decreased secretion of Thyroid Stimulating Hormone (TSH) with no significant clinical symptoms. Thyroid hormones (T₃, T₄ and TSH) play an effective role in various aspects of metabolism, development and differentiation of cells. In the present study which included 558 male subjects who came for regular health checkup, 68 (12.18%) were newly diagnosed as suffering from hypothyroidism and among them, 27 (4.83%) had altered lipid parameters. The presenting symptoms included unknown cause of fatigue and weight gain. The atherogenic lipid abnormalities in subjects with hypothyroidism in Indians should be interpreted with paramount importance as there is unexpected improvement or worsening of their lipid profile which may be influenced by abnormal thyroid hormone secretion. The altered lipid profile is seen in conditions where TSH is more than 10 mIU/ml which can result in increased risk of cardiac diseases and altered hemodynamic states. Alcoholism, smoking, sedentary life style, genetic predisposition and stress are added factors to earlier onset of SCH. The important aspects in management of thyroid diseases include the public health awareness, regular screening for the presence of dyslipidemia and thyroid function tests.

Keywords: subclinical hypothyroidism (SCH), altered lipid parameters in hypothyroidism, cardiometabolic risk in hypothyroidism

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1. Introduction

Hypothyroidism is believed to be a common health issue in India, as it is worldwide. Thyroid disease is associated with various metabolic abnormalities due to the effects of thyroid hormones on nearly all major metabolic pathways. In thyroid disease, dyslipidemia and the co-existing metabolic abnormalities, in combination with the thyroid hormone – hemodynamic alterations, explains the high risk of cardiovascular disease [1-5]. The prevalence of 42 million people in India suffers from thyroid diseases [6]. Thyroid disorders are known to influence lipid metabolism, dyslipidemia is common in these patients. The thyroid dysfunction includes five common disorders, the patients with hypothyroidism are arguably among the commonest endocrine disorders world wide, India too is no exception. Clinical diagnosis of thyroid dysfunction is suspected by the presence of even a small swelling of the thyroid gland. Thyroid hormones play an essential role in regulating energy balance, metabolism of Glucose and Lipids and development and differentiation of cells [7]. Thyroid gland secretes the thyroid hormones, thyroxine

(T₄) and the more biologically active form Triiodothyronine (T₃) [8]. Thyroid is a non-communicable disease, chronic in nature which is increasingly diagnosed affecting women more than male population and is most common endocrine disorder after diabetes [9].

Guidelines for detection of Thyroid dysfunction [10]:

Normal - T₃, T₄ & TSH were in normal range (0-5.5 mIU/ml).

Primary hypothyroidism - TSH > 5.5 mIU/ml, T₃&T₄< normal

Subclinical hypothyroidism (SCH) - TSH >5.5 mIU/ml, T₃&T₄ < normal

WHO recommends the use of sensitive TSH assays as the first line in the assessment of thyroid function as well as FT₃, FT₄ and anti TPO antibodies for differential diagnosis of thyroid diseases. The automated immunoanalysers used are third generation assays with functional sensitivity of 0.01 mIU/ml. The prevalence of subclinical hypothyroidism in thyroid disease varies between 3 to 15% of female adult population with increase in the age [11-15].

The present study aims to determine the percent prevalence of dyslipidemia in clinical hypothyroidism in men of south India (Telangana).

2. Materials and Methods

558 persons of age between 40 -58 years, who had attended Out-Patient (OP) department for master Health checkup in Karimnagar district, Telangana state (south India). Detailed history of each study subject regarding age, address, marital status and personal history was documented with informed consent recorded in proforma designed for master health check up. A total of 4ml venous blood was collected from cubital vein after 12 hours of fasting by standard aseptic precautions, sample was then centrifuged at 4000 rpm for twenty minutes to separate serum. The serum was analyzed for various biochemical parameters. Thyroid investigations (T₃, T₄, TSH) were analyzed on Architect (CMIA - chemiluminiscent microparticle immunoassay is referred to as chemiflex, USA) instrument and the lipid profile (Total Cholesterol, HDL-c, Serum Triglyceride and LDL-c) was determined on CS400 fully automated chemical analyzer, Diamond diagnostics, USA. The recorded data for these parameters were sequentially arranged to calculate % prevalence in hypothyroidism with dyslipidemia.

Inclusion Criteria: Newly diagnosed and untreated cases of hypothyroidism.

Exclusion criteria: Diabetes mellitus, Tuberculosis, Liver disorders, Renal disorders, Congestive cardiac failure, pregnancy, Other systemic illness

3. Results

It is noted that in 558 study subjects, 68 cases are grouped under hypothyroidism and the % prevalence of hypothyroidism is 12.18%, 7.52% hyperlipidemic, 1.43% hypercholesteremic, and raised S. triglyceride in 2.5% cases. In 68 cases of newly diagnosed hypothyroid cases the % prevalence of hyperlipidemia is 61.76%, hypercholesteremia – 11.76%, hypertriglyceridemia is 20.58% (Table 1) and the percent prevalence are shown in pie diagram (figure 1)

Table 1. %prevalence of hypothyroidism, hyperlipidemia, hypercholesteremia, hypertriglyceridemia

	No. of cases	%prevalence in total 558 persons	% prevalence in 68 patients
Hypothyroidism	68	12.18	
Hyperlipidemia	42	7.52	61.76
Hypercholesteremia	8	1.43	11.76
Hypertriglyceridemia	14	2.5	20.58

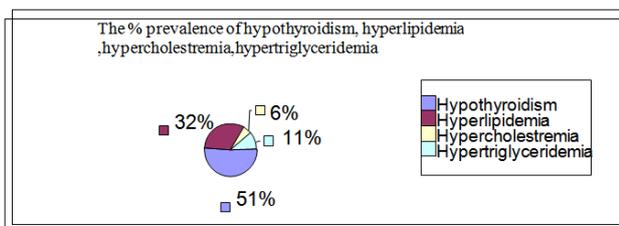


Figure 1. The Pie diagram showing the % prevalences of hypothyroidism, hyperlipidemia, hypercholesteremia, hypertriglyceridemia

The % prevalence of altered lipid parameters are seen in 27 patients of 68 newly diagnosed hypothyroid cases is 39.7% which become 4.83% in comparison to total study

group of 558 cases. The altered lipid parameters are seen in hypothyroids whose TSH levels are <10 mIU/ml more prone to cardiac risk. (Table 2) and the pie diagram shown in Figure 2

Table 2. % Prevalence of TSH levels in Hypothyroidism with lipid parameters

TSH levels	Cases of altered lipid parameters	% Prevalence in total study group(558)	% Prevalence in 68 patients
< 10 mIU/ml	27	4.83	39.7
> 10 mIU/ml	16	2.87	23.52

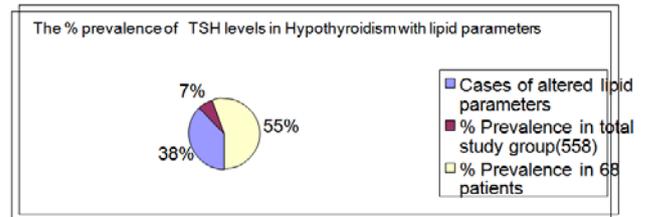


Figure 2. The pie diagram showing % prevalence of TSH levels in Hypothyroidism with lipid parameters

4. Discussion

The thyroid abnormalities affect a considerable portion of the population. The prevalence pattern depends on ethnic and geographical factors as iodine sufficiency in male to female sex ratio 1:5.4 as studied previously in Indians. The diagnosis for labeling hypothyroidism, TSH levels is the main stay along with T₃ and T₄ estimation for the kind of hypothyroidism to be classified. The serum TSH prevalence of SCH was 11.3% (male to female ratio 1: 3.7) and 74% belonged to 35 – 54 years [16]. World health organization (WHO) recommends use of sensitive TSH assay as the first line of assessment of thyroid as well as freeT₃ and freeT₄ and anti TPO antibodies for differential diagnosis of thyroid disorders [17]. The prevalence of hypothyroidism in the developed world is about 4 – 5% [18,19] and the prevalence of SCH in developed world is about 4 -15% [20,21]. In Indian population, among all cities, Kolkata recorded highest prevalence of SCH and least in coastal regions 9.45%. The % prevalence of hypothyroidism is highest is in the age group of 46 to 54 years as 13.11% and lowest in the age group of 18-35 years as 7.53% [22]. The prevalence of hypothyroidism is higher 29% in all age group in the people of Gangetic basin of West Bengal [23]. Therefore in comparison to the present study men of age 40 – 58 years in 558 cases, 68 newly diagnosed clinical hypothyroidism the % prevalence is 12.18% in Telangana state (TSH > 5 mIU/ml). The % prevalence of hypothyroidism is 14.75% in Indian population when compared with china, Mexico and Brazil it is in the range of 3.4 – 8.7% [24,25,,26].

Various studies have shown that SCH associated with hyperlipidemia [27,28,29,30]. In the present study the clinical hypothyroidism is shown to have increase of lipid parameters with positive correlation in these patients, similar to the statement by Pradeep sharma et al. and the serum triglyceride levels more than 160 and <200 mg/dl showed significant % prevalence for TSH levels <10

mIU/ml. These findings are not in accordance with the R K Marwaha et. al., statement of atherogenic lipid profile noted in Indian population with TSH >10 mIU/ml [31]. In a population based study by kuldeep et al., from north India in age group of 15 – 65 years with SCH a significant increase in serum triglyceride & VLDL levels are observed and there was no significance found in the lipid fraction with change in severity of SCH [32]. The present study in South India reveals that the status of patients with altered lipid parameters are observed in cases whose TSH levels are <10 mIU/ml in clinical hypothyroidism.

5. Conclusion

The atherogenic lipid abnormalities in subjects with hypothyroidism in Indians should be interpreted with paramount importance as there is unexpected improvement or worsening of their lipid profile. The risk of cardiac diseases are attributed to hemodynamic alterations as well as high risk of atherosclerosis with TSH levels <10 mIU/ml. The individuals with presenting symptoms including undiagnosed fatigue and weight gain needs to be examined for presence of SCH and such symptoms should be included under the absolute screening guidelines in males for possible thyroid dysfunction. Sedentary life style, increased stress conditions, alcoholism and smoking may be added factors in addition to genetic predisposition for possible onset of SCH. In view of inconsistent reports on the prevalence of dyslipidemia in SCH the state of lipidomics should be warranted in Indian Population due to apparently asymptomatic nature of illness. The American Thyroid Association (ATA) has recommended routine population screening of both sexes at age 35 years and thereafter for every 5 years for early detection and treatment of SCH. Early diagnosis and treatment remains the corner stone of management. The results of the current study impresses on the fact that sub clinical hypothyroidism may contribute to dyslipidemia and risk of cardiometabolic disorders. Subclinical hypothyroidism, if not diagnosed early may result in severe morbidity which poses a public health challenge and is a significant concern to the policy makers and health care professionals.

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