



## Research Article

# Evaluation of thyroid dysfunction by estimation of serum thyroid stimulating hormone and thyroid hormones in a tertiary care hospital in Assam

Author

**Julie Sarmah\***

Associate Professor of Biochemistry, Tezpur Medical College, Tezpur Assam, India

\*Corresponding Author

**Julie Sarmah**

Associate Professor of Biochemistry, Tezpur Medical College, Bihaguri, Tezpur-784010, Assam, India

Phone: +91 88110 98895, Email: [drjsarma2@gmail.com](mailto:drjsarma2@gmail.com)

## Abstract

Thyroid hormones are necessary for maintenance of balance in various metabolic functions of the body. Thyroid dysfunction leads to manifestation of hypothyroidism or hyperthyroidism which may be subclinical or overt. The prevalence of this dysfunction varies worldwide depending on many factors. The data available for the dysfunction in Indian population especially of Assam is very scanty. Therefore, the present study was undertaken to evaluate the prevalence of thyroid dysfunction amongst the patient attending different clinics in Tezpur Medical College and Hospital which caters to population of Assam residing on the north bank of river Brahmaputra. All the reports of serum TSH, TT4 and TT3 obtained from the samples collected from the OPD and indoor patients as per the requisition made by the clinicians and samples analysed in VitrosECi immunodiagnostic system, except that of neonates, ICU patients and haemolysed samples were statistically analysed. Out of total 11189 samples of the study population 9314(83.24%) were euthyroid and 1875 (16.76%) had thyroid dysfunction. Subclinical hypothyroidism 1342(11.99%) was commonest dysfunction with female preponderance 1000(53.33%) followed by subclinical hyperthyroidism 344( 3.07%). In the age group between 21-40 years the dysfunction was more prevalent. An extensive study may be carried out considering the estimation of antithyroid antibodies, urinary iodine, dietary factors and effect of drugs on thyroid hormones to find out the etiological factors for the better diagnosis and treatment of the dysfunction.

**Keywords:** Anterior pituitary gland, Atherosclerosis, Euthyroid, Hyperthyroidism, Hypothyroidism, Myxoedema Coma, Osteoporosis, Total Triiodothyronine (TT3), Total Thyroxine (TT4), Thyroid stimulating hormone (TSH).

## Introduction

Thyroid dysfunction is one of the most common endocrine disorders. Thyroid hormones are necessary for the maintenance of metabolic homeostasis in the body which is accomplished

by two hormones Thyroxine (T4) and Triiodothyronine (T3) secreted by thyroid gland and is regulated by Thyroid stimulating hormone (TSH) secreted by Anterior Pituitary gland. This dysfunction manifest as Hypothyroidism or

Hyperthyroidism. Based on the presence and absence of T3 and T4 and clinical symptoms they may be Subclinical or Overt. Thyroid dysfunction is associated with dyslipidaemia, atherosclerosis, cardiovascular diseases, osteoporosis, neuropsychiatric manifestation and infertility. Serious problems like thyroid storm and myxoedema coma can cause death in some cases.<sup>[1,2]</sup>

Prevalence of thyroid dysfunction varies in different parts of the world. Studies suggest that 300 million people in the world are suffering from thyroid disorders and among them about 42 million people reside in India. The prevalence varies with age, sex, ethnicity and geographical factors like diet and presence or absence of iodine deficiency in that particular region.<sup>[2,3]</sup> In India, iodine deficiency is common in the sub Himalayan region extending from Kashmir to Assam. Therefore thyroid disorders are very common in this part of the country.<sup>[4,5,6]</sup> There are very few studies<sup>[4]</sup> of the prevalence of thyroid disorder in Assam. Under these circumstances, the present study was undertaken to evaluate the prevalence of thyroid dysfunction, by estimation of serum thyroid stimulating hormone(TSH) and total triiodothyronine (TT3) and total thyroxine(TT4), amongst the patient attending different clinics in Tezpur Medical College and Hospital, Tezpur, Assam .

### Materials and Methods

The study was planned as an observatory study conducted in the Biochemistry wing of Central Clinical laboratory in Tezpur Medical College and Hospital for a period of one year from February 2017 to January 2018. Tezpur Medical College and Hospital is a tertiary care teaching hospital, situated in Sonitpur district of Assam, on the north bank of the river Brahmaputra. It caters to the people belonging to Sonitpur, Biswanath, Lakhimpur, Dhemaji, Udalguri and Darrang district of Assam, the north eastern state of India.

**Inclusion criteria and exclusion criteria:** All the reports of thyroid function test generated in the laboratory except that of neonates, patients in the

ICU (intensive care unit) and of the haemolysed samples, were included in the study.

The samples were collected from the Out Patient Department (OPD) and Indoor patients as per the requisitions made by the clinicians after taking proper consent from the patient. The particulars of the patients— name, age, sex, location, presenting symptom and differential diagnosis were obtained from the requisition form and the history taken from the patient. Under all aseptic and antiseptic care, 5ml of fasting venous blood sample were collected from the antecubital vein of the patient in a clotted vial. The samples were allowed to clot. Then the samples were centrifuged at the rate of 3000 per minutes, for a period of 15 minutes. The clear supernatant serum thus obtained were utilized for the estimation of serum Thyroid stimulating hormone, Total Thyroxine (TT4) and Total Triiodothyronine (TT3) in fully automated analyser — Vitros ECI Immunodiagnostic system using Enhanced Chemiluminescent techniques.

The data obtained from the report were analysed based on the thyroid status as given below<sup>[7]</sup>:

condition	TSH	Thyroid hormones
Overt hyperthyroidism	<0.1 mIU/L	Elevated T4 or T3
Overt hypothyroidism	>4.5 mIU/L	Low T4
Subclinical hyperthyroidism	TSH <0.1 mIU/L	Normal T4 and T3
	0.1 mIU/L <=TSH <0.4 mIU/L	Normal T4 and T3
Subclinical hypothyroidism	4.5 mIU/L < TSH < 10 mIU/L	Normal T4
	TSH >= 10 mIU/L	Normal T4

The prevalence of the thyroid dysfunction in the study population was calculated. The percentage of gender wise and age wise distribution of the thyroid hormone status were also calculated.

**Results**

**Table 1:** Prevalence of thyroid dysfunction in the study population:

Thyroid status	Number of subjects
Total subjects	11189
Euthyroid	9314(83.24%)
Overt Hypothyroidism	112(1%)
Subclinical Hypothyroidism	1342(11.99%)
Overt Hyperthyroidism	77(0.69%)
Subclinical Hyperthyroidism	344(3.07%)

**Table 2:** Gender wise distribution of different types of thyroid dysfunctions in the study population:

Gender	Types of thyroid dysfunction				Total
	Subclinical Hypothyroidism	Overt Hypothyroidism	Subclinical Hyperthyroidism	Overt Hyperthyroidism	
Male	342(18.24%)	44(2.35%)	91(4.85%)	11(0.59%)	488(26.03%)
Female	1000(53.33%)	68(3.63%)	253(13.49%)	66(3.52%)	1387(73.97%)
Total	1342(71.57%)	112(5.97%)	344(18.35%)	77(4.11%)	1875

**Table 3:** Age wise distribution of thyroid dysfunctions in the study population:

Type of thyroid dysfunction	Age in years							Total
	1-10	11-20	21-30	31-40	41-50	51-60	>60	
Subclinical Hypothyroidism	13 (0.69%)	82 (4.37%)	539 (28.75%)	312 (16.64%)	161 (8.59%)	120 (6.40%)	115 (6.13%)	1342 (71.57%)
Overt Hypothyroidism	1 (0.05%)	5 (0.27%)	30 (1.60%)	26 (1.39%)	15 (0.80%)	24 (1.28%)	11 (0.59%)	112 (5.97%)
Subclinical Hyperthyroidism	2 (0.11%)	24 (1.28%)	89 (4.75%)	62 (3.31%)	70 (3.73%)	44 (2.35%)	53 (2.83%)	344 (18.35%)
Overt Hyperthyroidism	0	7 (0.37%)	23 (1.23%)	13 (0.69%)	15 (0.80%)	11 (0.59%)	8 (0.43%)	77 (4.11%)
Total	16 (0.85%)	118 (6.29%)	681 (36.32%)	413 (22.03%)	261 (13.92%)	119 (10.61%)	187 (9.97%)	1875

**Discussion**

The present study was done to evaluate the prevalence of thyroid dysfunction of the patients attending various clinics in Tezpur Medical College and hospital. The reports were generated in the Biochemistry wing of Central Clinical laboratory, of the hospital, from the blood samples collected from the study population.

Of the total 11189 blood samples of the patients tested for thyroid profile (serum TSH, TT3 and TT4) in one year (from February 2017 to January 2018), 9314 (83.24%) were euthyroid and 1875(16.76%) had thyroid dysfunction. Amongst the abnormalities, subclinical hypothyroidism 1342(11.99%) was more common followed by subclinical hyperthyroidism 344(3.07%). Overt hypothyroidism was seen in 112(1%) and overt hyperthyroidism was seen in 77(0.69%).

Lakshminarayana et al found the overall prevalence rate of thyroid function abnormalities 15.73% with subclinical hypothyroidism 7.15% as the commonest abnormality.<sup>[8]</sup>

Marwaha et al also found high prevalence of thyroid dysfunction in the study population with subclinical hypothyroidism as the commonest abnormality affecting 19.3% of the subjects.<sup>[9]</sup>

Roy et al found 16.60% of the patient suffering from hypothyroidism.<sup>[10]</sup>

Unnikrishnan et al conducted an epidemiological study in eight cities of India and found hypothyroidism was 10.95%. 8.02% patients were diagnosed to have subclinical hypothyroidism.<sup>[11]</sup>

A hospital based study on patients in Subharti university thyroid dysfunction was found to be 22%, hypothyroidism was 17% and hyperthyroidism was 5%.<sup>[12]</sup>

Therefore, hypothyroidism mostly subclinical hypothyroidism seems to be more common in the various studies and this is in accordance with the present study. Researchers<sup>[13]</sup> have also suggested that sometimes unsupervised therapy in hypothyroid may cause overcorrection resulting in the change of the initial pathology to hyperthyroidism. This may be the probable reason for a little higher prevalence of subclinical hyperthyroidism in the present study.

In Gender wise distribution, females showed preponderance in subclinical hypothyroidism 1000 (53.33%) followed by subclinical hyperthyroidism 253(13.49%) compared to male subclinical hypothyroidism 342(18.24%) and subclinical hyperthyroidism 91(4.85%).

Various studies showed increased prevalence of subclinical hypothyroidism in females.

Unnikrishnan et al found the high prevalence of hypothyroidism in females (15.86%) and prevalence of subclinical hypothyroidism in females was 8.73%.<sup>[11]</sup>

A population based study carried out in Cochin, India showed a higher prevalence of subclinical hypothyroidism in females (11.4%) compared to males.<sup>[14]</sup>

Roy et al found females (18.15%) more prone to hypothyroidism as compared to males (12.45%).<sup>[10]</sup>

Marwaha et al found the prevalence of thyroid dysfunction was high and commoner in women than men (24.7% vs 18.2%). Subclinical hypothyroidism (SCH) was commonest abnormality encountered and affected 19.3% subjects (21.4% women; 15.9% men).<sup>[9]</sup>

In age wise distribution, thyroid dysfunction was common in age group of 21-30 years followed by 31-40 years. The commonest of all the abnormalities was subclinical hypothyroidism. Higher level of thyroid dysfunction that was observed in the age group of 21-40 years because a large number of female patient in this age group attend labour room and antenatal clinic. During pregnancy the two hormone, human chorionic gonadotropin hormone and oestrogen are

responsible for the changes in thyroid physiology and causes changes serum TSH and thyroid hormone levels.<sup>[15]</sup>

Arindam Bose et al (19-45 years),<sup>[16]</sup> Vanderpump et al (34 years and above)<sup>[17]</sup> have reported similar age groups. Arora et al also found the prevalence of thyroid disorder is higher in the reproductive age group (21-40 years).<sup>[18]</sup>

A clinic based cross sectional study carried out in Srinagar also reported high prevalence of subclinical hypothyroidism in the reproductive age group.<sup>[5]</sup>

Laskninarayanan et al also reported the highest prevalence of subclinical hypothyroidism 8.05% in the age group 20-45 years.<sup>[8]</sup>

A Hospital based cross sectional study carried out in Kolkata in 903 patients observed high prevalence of hypothyroidism (25.7%) with female preponderance (78.02%) and was more prevalent in the age group 36-45 years.<sup>[19]</sup>

A study carried out in Meerut, reported a prevalence of hypothyroidism, mainly subclinical hypothyroidism with female preponderance. This was most prevalent in the age group of 16-30 years.<sup>[20]</sup>

## Conclusion

In the present study the prevalence of thyroid dysfunction was found to be high in this part of the country. Subclinical hypothyroidism was the commonest abnormality amongst all, with female preponderance. This was followed by subclinical hyperthyroidism. In the age group between 21- 40 years this dysfunction was more prevalent. An extensive study may also be carried out by including the estimation of antithyroid antibodies , urinary iodine estimation , dietary factors and effect of drugs on thyroid hormones, to find out the possible etiological factors, for the better diagnosis and treatment of the disorder.

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