**Original Article**

# TO STUDY THE THYROID DYSFUNCTION IN PATIENTS ATTENDING A TERTIARY CARE CENTRE

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**ABSTRACTS**

**Introduction:** Thyroid dysfunction is characterised as an abnormal serum thyroid stimulation hormone (TSH) level in conjunction with normal or altered thyroid hormones (triiodothyronine-T3 and thyroxine-T4). Overt hyperthyroidism is defined as a drop in circulating blood TSH levels along with an increase in circulating T3 and T4, whereas subclinical hyperthyroidism is defined as a decrease in circulating blood TSH levels together with normal circulating T3 and T4 levels. Overt hypothyroidism is defined as an increase in circulating blood TSH with decreased circulating T3 and T4, whereas subclinical hypothyroidism is defined as an increase in circulating blood TSH with normal circulating T3 and T4.

**Aim and Objective:** To Study the Thyroid Dysfunction in Patients Attending a Tertiary Care Centre.

**Material and Methods**: This was a hospital-based study conducted at G.C.R.G Institute of Medical Sciences in Lucknow. This study included 550 respondents, with 390 (71%) being female and 160 (29%) being male. The participants' thyroid condition was classified as euthyroidism, overt hyperthyroidism, subclinical hyperthyroidism, overt hypothyroidism, or subclinical hypothyroidism based on thyroid function test results. Total hypothyroidism consists of overt hypothyroidism as well as subclinical hypothyroidism, whereas total hyperthyroidism consists of overt hyperthyroidism and subclinical hyperthyroidism. Overnight fasting venous blood was obtained from the hospital patients. Thyroid function test panel (T3, T4 and TSH) were assayed by the Cobas e411 immunoassay analyzer and its test kits.

**Results:** The current study found that the prevalence of thyroid dysfunction, specifically hypothyroidism and subclinical hypothyroidism, was higher in this region, although the cause of the ailment remains unknown. Furthermore, the condition was prevalent among women and persons of all ages.

**Conclusion:** The study identifies the prevalence of thyroid dysfunction in this area and might serve as a baseline for future research.

**KEY WORDS:** Thyroid Dysfunction, T3, T4, TSH, Euthyroid

## INTRODUCTION

Diabetes mellitus (DM) is the most prevalent endocrine condition caused by dysfunctional pancreatic b cells [1]. In 2019, it was stated that 463 million adults (aged 20 to 79) worldwide have diabetes, with 79% living in low- or middle-income countries [1]. The American Diabetes Association (ADA) estimates that an additional 374 million people are at risk of developing type 2 diabetes mellitus [2].

Thyroid dysfunction is considered the second most prevalent endocrine condition.[3] In the United States, 4.6% of the population was diagnosed with hypothyroidism, while 1.3% with hyperthyroidism, compared to 3.05% and 0.75 percent in Europe, respectively.[4]

Decreased level of circulating blood TSH with increased levels of circulating T3 andT4 is called overt hyperthyroidism here as decreased level of circulating blood TSH with normal levels of circulating T3 andT4 is called subclinical hyperthyroidism [5]. Increased level of circulating blood TSH with decreased levels of circulating T3 andT4 is called overt hypothyroidism whereas increased level of circulating blood TSH with normal levels of circulating T3 andT4 is called subclinical hypothyroidism [6-8].

About 300 million people in the world are affecting from thyroid dysfunction and over half are presumed to be unaware of their condition [1]. According to American Association of Clinical Endocrinologists, over 27 million Americans have some form of thyroid disease with hypothyroidism being most prevalent among all thyroid dysfunctions [9]. It has been estimated that about 42 million people in India suffer from thyroid diseases[1].Thyroid dysfunction is also called second diabetes of India.

It has been documented that diabetic patients are more susceptible to developing thyroid dysfunction, and many clinical trials have been conducted across the globe to understand the link between them [10]. Several studies have reported the prevalence of thyroid dysfunction among patients with DM to be varying from 4% to 35% [11-13].

Thyroid hormones profoundly influence the basal metabolic rate of the body. Complete lack of thyroid secretion can decrease the BMR to fall 40 to 50 per cent below normal, and extreme excesses of thyroid secretion can increase the BMR to 60 to 100 per cent above normal. Thyroid hormones play a vital role in cell differentiation during fetal development and helps in maintain thermo genic and metabolic homeostasis in the adult, so normally functioning thyroid is essential for the healthy living of an individual [3].

Hypothalamus regulates pituitary gland by releasing thyrotropin releasing hormone (TRH) for the secretion of TSH and pituitary gland regulates thyroid gland by releasing TSH. Thyroid hormone secretion is controlled primarily by TSH secreted by the anterior pituitary gland.TSH stimulates thyroid gland for the secretion of thyroid hormones.TSH is regulated by the negative feedback of thyroid hormone.

Thyroid function test panels (TFTs) are routinely used to screen for and evaluate thyroid impairment. The addition of serum triiodothyronine (T3), thyroxin (T4), and serum thyroid stimulating hormone (TSH) Enzyme linked immune-flourescent assays (ELFA) has improved the sensitivity and specificity of thyroid function tests [14]. The serum TSH assay has been demonstrated to be a sensitive indicator of decreased thyroid functional reserve, as TSH levels rise

before circulating blood thyroxin levels fall below normal. Numerous research from diverse nations produce different prevalence estimates for both overt and subclinical hyper- and hypothyroidism [15]. The disparities in these investigations could be attributed to the subjects' diverse genetic, ethnic, and environmental backgrounds. Furthermore, surveys on thyroid disorders in the general population.
Therefore the present study was undertaken to study the Thyroid Dysfunction in patients attending a Tertiary Care Centre.

## MATERIAL AND METHOD

This was a hospital based cross sectional study conducted in the Department of Biochemistry at G.C.R.G , Institute of Medical Sciences, Lucknow, during the period of 1 year i.e, from July 2017 to June 2018. A total 550 subjects were enrolled in this study out of these 390 were female and 160 were male. The subjects were classified according to thyroid status as euthyroidism, overt hyperthyroidism, subclinical hyperthyroidism, overt hypothyroidism and subclinical hypothyroidism by taking reference of thyroid function test. Total hypothyroidism includes overt hypothyroidism plus subclinical hypothyroidism and total hyperthyroidism represents overt hyperthyroidism plus subclinical hyperthyroidism. All the patients prescribed for Total- TFT who attend outpatient department and in patient department of G.C.R.G , Institute of Medical Sciences, Lucknow, were including in this study.
Overnight fasting venous blood was collected from the subjects attending G.C.R.G , Institute of Medical Sciences, Lucknow. Thyroid function test panel (T3, T4 and TSH) were assayed by the Cobas e411 immunoassay analyzer and its test kits.

### Inclusion criteria:

All clinically undiagnosed cases of thyroid dysfunction were taken for case study.

### Exclusion criteria:

- Patients below the age of 20 years and previously diagnosed cases of thyroid dysfunction were not included in this study.
- Patients suffering from high grade fever, chronic illnesses (TB, HIV etc), jaundice,
- pregnancy, psychiatric disorders, and renal failure were excluded from study.

### Criteria of thyroid dysfunction

The reference interval for T3,T4 and TSH were 0.9– 2.3 nmol /l, 6.0 – 12.0 nmol/dl and 0.25 - 5.0 IU/ml respectively. Thyroid function is considered normal (Euthyroidism) when subjects were presented with normal T3,T4 and TSH. Abnormal thyroid function was further categorized as hyperthyroid (Increased T3,T4 and decreased TSH), Subclinical hyperthyroid (increased T3,T4 and normal TSH), hypothyroidism (decreased T3,T4 and increased TSH), and Subclinical hypothyroidism (decreased T3 andT4)

**Statistical analysis**

Data were entered and analyzed by Microsoft Excel and Software Package for Social Sciences version 16.0 (SPSS 16.0). Data were represented as percentage, frequency and mean.

## RESULTS AND DISCUSSION

In the present study a total of 550 samples were screened for the presence of thyroid dysfunction, out of which the ratio of Males 160 (29%) was less as compared to the females with 390 (71%). Estimates of the prevalence of thyroid dysfunction depend upon methodological factors, classifications of hypothyroidism depends up on the basis of TSH reference value, and composition of the community examined by age, ethnicity, and gender. The prevalence and pattern of TDF depend on ethnic, geographic, and environmental factors including iodine intake status [9].

**Table 1:** Distribution of patients according to the gender

| **Gender of the paient** | **No. of cases** | **Percenta ge** |
|---|---|---|
| Male | 160 | 29% |
| Female | 390 | 71% |
| Total | 550 | 100% |
| Female :male ratio =2.43: 1 | | |

From the Table no. 1 it was observed that 550 patients were enrolled for the study of thyroid dysfunction; in which the ratio of females was greater than male

**Table 2:** Distribution of patients according to the age.

| **Age group (years)** | **No. of cases** | **Percentae** |
|---|---|---|
| 20 – 29 | 133 | 24% |
| 30 – 39 | 98 | 18% |
| 40 – 49 | 90 | 16.3% |
| 50 -59 | 89 | 16.1% |
| 60 – 69 | 92 | 16.7% |
| >70 | 48 | 8.7% |
| Total | 550 | 100% |

Maximum number of patients belonged in the age group of 20-29 [Table 2]. In a similar type of hospital based study conducted by Aryal M et al [16] female: male ratio of the subject was 2.7:1 and maximum number of subject belonged in the age group 15-30 years.

**Table 3:** Distribution of patients on the basis of thyroid function

| **Thyroid function** | **No. of cases** | **Percentage** |
|---|---|---|
| Euthyroidism | 371 | 67.5% |
| Thyroid dysfunction | 179 | 32.5% |
| Total | 550 | 100% |

The prevalence of thyroid dysfunction was 32.5% in subjects in the current study [Table 3]. In the similar hospital based study conducted by Abraham et al. observed 15.8% of the populations were suffering from TDF in Puduchery, India [17] . In another hospital based study performed by Aryal M. et al. observed 25% of TDF [16] Menon VU et al [18] had conducted a population based study in Cochin, India, they found that the prevalence of thyroid dysfunction was19.6%. In our study, we found higher prevalence of TDF in comparison to other hospital based studies.

**Table 4:** Distribution of patients by the sub-classification of thyroid dysfunction

| **Thyroid function** | **No. of cases** | **Percentage** |
|---|---|---|
| Euthyroidism | 371 | 67.5% |
| Overt Hyperthyroidism | 48 | 8.7% |
| Subclinical Hyperthyroidism | 41 | 7.4% |
| Overt Hypothyroidism | 31 | 5.6% |
| Subclinical Hypothyroidism | 59 | 10.7% |
| Total | 550 | 100% |

In the present study, we found 10.7% of total sub hypothyroidism and 5.6% of over hyperthyroidism [Table 4]. In a similar type of study, 11.5% had hypothyroidism and 1.8% had hyperthyroidism [17] .In another hospital based study conducted by Aryal M. et al. prevalence of hypothyroidism was 16% and hyperthyroidism was 9% [16]. Like other studies, we found the prevalence of hypothyroidism was higher than the prevalence of hyperthyroidism. It is observed that higher prevalence of hypothyroidism is observed in iodine deficient hilly areas [16] as well as iodine sufficient costal areas [17]. Aminorroaya A et al. found the overall prevalence of hypothyroidism was 17.6% hypothyroidism. About 37.6% of hypothyroid men and women had positive antithyroperoxidase antibodies [17] . So, increased incidences of hypothyroidism may be because of autoimmune disorders rather than iodine deficiency.

In our study, we found, 7.4%, 5.6%, 10.7% and 8.7% of subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism respectively [Table 4]. In a similar study, 9.5%, 2%, 1.8% and 1.2% of subclinical hypothyroidism, overt hypothyroidism,

subclinical hyperthyroidism and overt hyperthyroidism respectively [17]. In a population bases study,Menon UV et al. found 9.4%, 3.9%, 1.6% and 1.3% of subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism respectively [18]. In another population bases study, Ali M et al. found 6.18%, 1.12%, 0.84% and 1.12% of subclinical hypothyroidism, overt hypothyroidism, subclinical hyperthyroidism and overt hyperthyroidism respectively [19] In our study, we found prevalence of subclinical hypothyroidism was highest among all other types of thyroid dysfunctions and similar results were observed in all other compared studies. In our study, we found subclinical hyperthyroidism was the least common thyroid disorder and similar conclusion was observed by Ali M et al. in their study [19] . Other similar studies showed contrasting result where the least common type of thyroid dysfunction was overt hyperthyroidism.

**Table 5:** Euthyroidism in male and female subjects

| **Thyroid status** | **Female** | **Male** | **Total** |
|---|---|---|---|
| Euthyroidism | 278 | 98 | 371 |
| **Euthyroid female: male ratio = 2.98:1** | | | |

**Table 6:** Distribution of thyroid dysfunction in male and female subjects

| **Thyroid status** | **Male** | **Female** | **Total** |
|---|---|---|---|
| Overt Hypothyroidism | 09 | 24 | 33 |
| Subclinical Hypothyroidism | 23 | 58 | 81 |
| Overt Hyperthyroidism | 23 | 25 | 48 |
| Subclinical Hyperthyroidism | 08 | 09 | 17 |
| Total | 63 | 116 | 179 |
| Percentage | 36% | 64% | 100% |
| **Female: Male ratio = 1.84: 1** | | | |

In the present study, prevalence of TDF is higher in female compared to male [Table 6]. Few studies taken for the comparison with this present study were concordant with the present study which reported the subclinical hypothyroidism and overt hypothyroidism were higher in female as compared to males [19, ] In a population based study conducted in iodine sufficient area of Iran, Aminorroaya A et al. found the overall prevalence of hypothyroidism was 4.8% in men and 12.8% in women heaving a total of 17.6% hypothyroidism [17] . In our study, 36% were male and 64% were female among 119 TDF patients heaving higher female: male ratio of comparison to euthyroid female: [Table 6 and 5].

**Table 7:** Distribution of thyroid dysfunction in different age groups

| Age | No. of cases | Euthyroidism | Overt Hypothyroidism | Suclinical Hypothyroidsm | Overt Hyperthyroidism | Subclinical Hyperthyroidism | Total Thyroid Dysfunction | Percentage |
|---|---|---|---|---|---|---|---|---|
| 20-29 | 133 | 93 | 6 | 10 | 7 | 17 | 40 | 30% |
| 30-39 | 98 | 57 | 9 | 07 | 9 | 16 | 41 | 42% |
| 40-49 | 90 | 63 | 5 | 11 | 8 | 03 | 27 | 30% |
| 50-59 | 89 | 76 | 3 | 03 | 6 | 01 | 13 | 15% |
| 60-69 | 92 | 69 | 4 | 11 | 7 | 01 | 23 | 25% |
| >70 | 48 | 13 | 4 | 17 | 11 | 03 | 35 | 73% |
| Total | 550 | 371 | 31 | 59 | 48 | 41 | 179 | 32.5% |

In the present study, we found highest prevalence of TDF (73%) in the age group of 70 and above 70 years of years followed by 42% in the age group of 30-39 years. It was observed that 30% in the age group of 20-29 and 40-49 was affected. Prevalence of TDF was common in all age groups though highest value was observed in older age group. According to Yu-shan M.et al.

prevalence of subclinical and overt hypothyroidism increases with age [20].In our study, we found that incidences of hypothyroidism were common in all age group.

Recent studies have reported insulin resistance as a major factor in disrupting thyroid hormone functions and causing hypothyroidism in T2DM patients [21]. It does this by modifying thyroid-stimulating hormone (TSH) released from the hypothalamus or affecting peripheral tissue conversion of tetraiodothyronine (T4) to triiodothyronine (T3) [22 ]. In subclinical hypothyroidism, the declining rate of insulin-induced glucose transport is thought to be due to the disrupted gene translocation of glucose type 2 receptor (GLUT-2), leading to insulin resistance [23]. A study conducted by Elgazar *et al* [24] showed a greater incidence of thyroid dysfunction among patients with higher HbA1c levels. Thyroid dysfunction has also been associated with increased levels of serum cholesterol and triglycerides, which amplify the risk of cardiovascular disorders in diabetic patients [25].

**Limitation of the Study**

The TFT test result is a great tool for screening new patients for thyroid disease, but a full thyroid panel is required for an appropriate diagnosis and evaluation of thyroid function. Our investigation was based on a whole thyroid function test, which included serum T3, T4, and TSH measurements. The current study may have been reinforced if free-T4, free-T3, anti-thyroperoxidase (anti-TPO),

anti-thyroglobulin (anti Tg), TSH receptor antibodies, and thyroid stimulating immunoglobulin (TSI) were included for further confirmation of thyroid dysfunction.
Our study was a hospital-based investigation conducted over a restricted time period. We found a significant prevalence of TDF in our study. Further population-based epidemiological investigations are required to establish the precise prevalence and predominant etiological causes of thyroid dysfunction in this northern.

## CONCLUSION

These data indicate that the prevalence of thyroid dysfunction was higher than in other similar hospitalbased studies conducted on symptomatic patients advised for thyroid function testing. So, TFT should be employed as a routine test parameter for patients who are at risk with family history and routine check up in patients with age 40yrs and above.
The current study found that the prevalence of thyroid dysfunction, specifically hypothyroidism and subclinical hypothyroidism, was higher in this region, although the cause of the ailment remains unknown.
Furthermore, the condition was prevalent among women and persons of all ages.

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