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Original Research Article

Pattern and Prevalence of Thyroid Function Test Abnormalities in Routine Laboratory Patients at a Tertiary Care Centre

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Abstract:

Background: Thyroid disorders are among the most common endocrine abnormalities and often remain undiagnosed due to nonspecific clinical presentation. Routine laboratory testing plays a crucial role in the early detection of thyroid dysfunction, including subclinical cases.

Aim: To evaluate the pattern and prevalence of thyroid function test abnormalities in patients undergoing routine laboratory investigations at a tertiary care center

Materials and Methods: This hospital-based cross-sectional study was conducted in the Department of Pathology over a period of 12 months. A total of 300 patients undergoing thyroid function testing were included. Serum levels of triiodothyronine (T3), thyroxine (T4), and thyroid-stimulating hormone (TSH) were measured using a chemiluminescence immunoassay method. Patients were categorized as euthyroid, hypothyroid, hyperthyroid, subclinical hypothyroid, and subclinical hyperthyroid based on standard reference ranges. Data were analyzed using descriptive statistics.

Results: Out of 300 patients, 180 (60%) were euthyroid, while 120 (40%) showed thyroid dysfunction. Hypothyroidism was the most common abnormality (16.7%), followed by subclinical hypothyroidism (13.3%), hyperthyroidism (6.7%), and subclinical hyperthyroidism (3.3%). Thyroid disorders were more prevalent in females (60%) compared to males (40%). The majority of abnormalities were observed in the 21–60 years age group.

Conclusion: A significant proportion of routine laboratory patients exhibit thyroid dysfunction, predominantly hypothyroidism and subclinical hypothyroidism. Routine screening, especially in females and middle-aged individuals, is essential for early diagnosis and management to prevent complications.

Keywords: Thyroid function test, Hypothyroidism, Hyperthyroidism, Subclinical thyroid disease, Prevalence.

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Introduction

Thyroid disorders are among the most common endocrine abnormalities encountered in clinical practice and represent a significant public health concern worldwide. The thyroid gland plays a crucial role in regulating metabolism, growth, and development through the secretion of thyroid hormones, primarily thyroxine (T4) and triiodothyronine (T3), under the control of thyroid-stimulating hormone (TSH) from the pituitary gland [1]. Even subtle alterations in thyroid function can have profound effects on multiple organ systems, including cardiovascular, neurological, and metabolic functions [2].

Globally, the prevalence of thyroid dysfunction varies widely depending on geographic region, iodine intake, and population characteristics. In India, thyroid disorders are highly prevalent, with studies suggesting that nearly 42 million people suffer from thyroid diseases [3]. Hypothyroidism is more common than hyperthyroidism, with subclinical forms being particularly frequent and often underdiagnosed due to nonspecific clinical manifestations [4,5]. Routine laboratory testing has thus become a critical tool for early detection and management of these disorders. Thyroid function tests (TFTs), including serum T3, T4, and TSH levels, are the cornerstone for diagnosing thyroid dysfunction. Among these, serum TSH is considered the most sensitive marker for detecting primary thyroid abnormalities [6]. The widespread use of automated immunoassays in clinical laboratories has enabled rapid, accurate, and cost-effective assessment of thyroid status, facilitating large-scale screening and epidemiological studies [7].

A significant proportion of thyroid dysfunction cases detected in laboratory settings are asymptomatic or subclinical, especially in patients undergoing routine health check-ups or evaluation for unrelated conditions [8]. Subclinical hypothyroidism and hyperthyroidism are particularly important due to their potential progression to overt disease and their association with adverse outcomes such as cardiovascular morbidity, dyslipidemia, and impaired quality of life [9,10]. Early identification through routine laboratory investigations allows timely intervention and prevention of complications. Several studies have evaluated the prevalence and pattern of thyroid dysfunction in hospital-based and community populations, revealing varying trends based on age, gender, and environmental factors [11,12]. Females are more commonly affected than males, and the prevalence increases with age [13]. However, there is limited data focusing specifically on the pattern of thyroid profile abnormalities detected in routine laboratory patients, particularly in tertiary care settings in developing countries**.**

Understanding the spectrum and prevalence of thyroid abnormalities in routine laboratory samples is essential for improving diagnostic strategies and guiding clinical decision-making. Such data can also help in identifying high-risk groups and planning targeted screening programs. Therefore, the present study aims to evaluate the pattern and prevalence of thyroid function test abnormalities in patients undergoing routine laboratory investigations at a tertiary care centre.

Aim & Objectives: The aim of the present study is to evaluate the pattern and prevalence of thyroid function test abnormalities in patients undergoing routine laboratory investigations at a tertiary care center. The objectives of the study are to determine the frequency of hypothyroidism, hyperthyroidism, and subclinical thyroid disorders, and to analyze their distribution with respect to age and gender.

Materials and Methods

This study was designed as a hospital-based cross-sectional study conducted in the Department of Pathology at a tertiary care center over a period of 12 months (from January 2025 to December 2025. The study included patients whose blood samples were received in the clinical laboratory for routine thyroid function testing.

All patients undergoing thyroid function tests (TFTs) as part of routine laboratory investigations during the study period were included. A total of 300 samples were analyzed.

Inclusion Criteria

- Patients of all age groups and both genders
- Patients whose samples were received for thyroid profile testing (T3, T4, and TSH)
- Patients attending outpatient and inpatient departments

Exclusion Criteria

- Patients already on thyroid hormone replacement therapy or antithyroid drugs
- Incomplete laboratory data or hemolyzed samples
- Repeat samples from the same patient during the study period

Sample Collection and Analysis: Approximately 3–5 mL of venous blood was collected under aseptic conditions. Serum was separated by centrifugation and analyzed for thyroid hormones—triiodothyronine (T3), thyroxine (T4), and thyroid-stimulating hormone (TSH). [14,15]

Thyroid function tests were performed using a fully automated immunoassay analyzer based on chemiluminescence technology, following the manufacturer's instructions. Chemiluminescent immunoassays are widely accepted for their high sensitivity, specificity, and reliability in hormone estimation [16,17]. Internal quality control procedures were followed throughout the study period to ensure accuracy of results [18].

Reference Range: The reference ranges used were as follows (as per laboratory standards):

Parameter	Normal Reference Range
T3 (Triiodothyronine)	80 – 200 ng/dL
T4 (Thyroxine)	5.0 – 12.0 µg/dL
TSH (Thyroid Stimulating Hormone)	0.4 – 4.0 µIU/mL

Classification of Thyroid Dysfunction: Based on TFT results, patients were categorized as:

- Euthyroid: Normal T3, T4, and TSH
- Hypothyroidism: Increased TSH with decreased T3/T4
- Hyperthyroidism: Decreased TSH with increased T3/T4
- Subclinical Hypothyroidism: Elevated TSH with normal T3 and T4
- Subclinical Hyperthyroidism: Low TSH with normal T3 and T4

This classification is based on standard clinical and biochemical criteria used in thyroid disorder diagnosis [19,20].

Data Collection: Relevant demographic details such as age and gender were recorded. Laboratory values were documented and categorized accordingly.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using statistical software.

Descriptive statistics such as mean, standard deviation, frequencies, and percentages were calculated. Association between variables was assessed using the Chi-square test, and a p-value of <0.05 was considered statistically significant**.**

Ethical Consideration: The study was conducted after obtaining approval from the Institutional Ethics Committee. Patient confidentiality was maintained, and no personal identifiers were disclosed.

Result

A total of 300 patients undergoing routine thyroid function testing were included in the present study. Among them, 120 (40%) were males and 180 (60%) were females, indicating a female predominance. The age of the patients ranged from <20 years to >60 years, with the majority of patients belonging to the 21–40 years age group (40%), followed by 41–60 years (31.7%), <20 years (16.7%), and >60 years (11.6%) (Table 1).

Table 1: Distribution of Study Population by Age and Gender

Age Group (Years)	Male (n)	Female (n)	Total (n)	Percentage (%)
<20	20	30	50	16.7
21–40	45	75	120	40.0
41–60	40	55	95	31.7
>60	15	20	35	11.6
Total	120	180	300	100

Table 1 shows the distribution of the study population according to age and gender.

It is evident that females outnumbered males across all age groups, and the highest number of patients was observed in the 21–40 years age group.

Based on thyroid function test results, 180 (60%) patients were found to be euthyroid, while 120 (40%) patients showed some form of thyroid dysfunction. Among the abnormal cases, hypothyroidism was the most common disorder, seen in 50 (16.7%) patients, followed by subclinical hypothyroidism in 40 (13.3%) patients. Hyperthyroidism was observed in 20 (6.7%) patients, whereas subclinical hyperthyroidism was the least common, seen in 10 (3.3%) patients (Table 2).

Table 2: Distribution of Thyroid Function Status

Thyroid Status	Number (n)	Percentage (%)
Euthyroid	180	60.0
Hypothyroidism	50	16.7
Hyperthyroidism	20	6.7
Subclinical Hypothyroidism	40	13.3
Subclinical Hyperthyroidism	10	3.3
Total	**300**	**100**

Table 3: Gender-wise Distribution of Thyroid Dysfunction

Thyroid Status	Male (n)	Female (n)	Total (n)
Euthyroid	80	100	180
Hypothyroidism	15	35	50
Hyperthyroidism	5	15	20
Subclinical Hypothyroidism	15	25	40
Subclinical Hyperthyroidism	5	5	10
Total	120	180	300

Table 3 demonstrates that most categories of thyroid dysfunction, particularly hypothyroidism and subclinical hypothyroidism, were more frequently observed in females, whereas euthyroid status was relatively comparable between both genders.

The age-wise distribution of thyroid dysfunction is shown in Table 4. It was observed that thyroid abnormalities were more prevalent in the middle-aged population (21–60 years).

Hypothyroidism and subclinical hypothyroidism were most commonly seen in the 21–40 years and

41–60 years age groups, whereas hyperthyroidism was less frequent and distributed relatively evenly across different age groups.

Table 4: Age-wise Distribution of Thyroid Dysfunction

Age Group	Euthyroid	Hypothyroid	Hyperthyroid	Subclinical Hypo	Subclinical Hyper
<20	35	5	3	5	2
21–40	70	20	8	18	4
41–60	55	18	7	12	3
>60	20	7	2	5	1

Table 4 indicates that the burden of thyroid dysfunction increases with age, particularly in middle-aged individuals, with a predominance of hypothyroid disorders.

Discussion

Thyroid disorders are among the most common endocrine abnormalities encountered in clinical practice, with a significant burden in both developed and developing countries. The present study was undertaken to evaluate the pattern and prevalence of thyroid function test abnormalities in patients undergoing routine laboratory investigations.

In the present study, thyroid dysfunction was observed in 40% of the study population, while 60% were euthyroid. This finding is comparable to studies by Vanderpump et al. [21] and Canaris et al. [21], who also reported a considerable proportion of undiagnosed thyroid dysfunction in the general population. The relatively high prevalence observed in the present study may be attributed to increased screening and improved diagnostic facilities.

Hypothyroidism was the most common thyroid disorder in this study, accounting for 16.7% of cases, followed by subclinical hypothyroidism (13.3%). These findings are in agreement with studies conducted by Unnikrishnan and Menon [23] and Marwaha et al. [24], which reported hypothyroidism as the most prevalent thyroid disorder in the Indian population. The high prevalence of subclinical hypothyroidism highlights the importance of routine screening, as these patients are often asymptomatic but may progress to overt disease [25-26].

The present study also demonstrated a clear female preponderance in thyroid disorders. Females constituted the majority of cases, and most cases of hypothyroidism and hyperthyroidism were observed in females. This observation is consistent with previous studies by Tunbridge et al. [2] and Hollowell et al. [28], which have shown that thyroid disorders are significantly more common in females, possibly due to autoimmune predisposition and hormonal influences.

Age-wise analysis in the present study revealed that thyroid dysfunction was more common in the middle-aged group (21–60 years). Hypothyroidism and subclinical hypothyroidism were particularly prevalent in this age group. Similar findings have been reported by Laurberg et al. [29] and Vanderpump et al. [30], who observed an increasing trend of thyroid dysfunction with advancing age.

Hyperthyroidism was less common in the present study, accounting for a smaller proportion of cases, which is consistent with earlier studies [22,31]. Subclinical hyperthyroidism was the least common abnormality. Although less frequent, hyperthyroidism remains clinically significant due to its association with cardiovascular and metabolic complications [6].

The findings of the present study emphasize the importance of thyroid function testing in routine laboratory practice. A significant proportion of patients with thyroid dysfunction, especially subclinical cases, may remain undiagnosed without laboratory screening. Early detection is crucial for timely management and prevention of complications such as cardiovascular disease and metabolic disorders. [25-26]

However, the present study has certain limitations. Being a hospital-based study, the findings may not be representative of the general population. In addition, lack of clinical follow-up limits the assessment of disease progression and outcomes.

Conclusion

The present study demonstrates a significant prevalence of thyroid function abnormalities among routine laboratory patients, with hypothyroidism and subclinical hypothyroidism being the most common disorders. Thyroid dysfunction was found to be more prevalent in females and predominantly affected the middle-aged population.

These findings highlight the importance of routine thyroid function testing for early detection, especially in asymptomatic individuals, to enable timely management and prevent potential complication

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