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Original Research Article

Prevalence and Pattern of Thyroid Disorders in a Tertiary Care Hospital

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Abstract:

Background: Thyroid disorders, including hypo- and hyperthyroidism, are common endocrine conditions with variable prevalence influenced by age, gender, and regional factors. Early detection is crucial to prevent complications.

Aim: To assess the prevalence and pattern of thyroid disorders among patients attending a tertiary care hospital.

Methodology: A hospital-based cross-sectional study was conducted over seven months at the Department of General Medicine, Government Medical College Hospital, Bettiah, Bihar, India. Ninety patients aged ≥18 years with suspected thyroid dysfunction were enrolled. Thyroid function was evaluated using serum TSH, free T3, and free T4 via ELFA. Participants were categorized as overt/subclinical hypo- or hyperthyroid, or euthyroid. Data were analyzed using descriptive statistics and logistic regression.

Results: Among 90 participants, 53.3% were female and 46.7% male, with the majority aged 31–45 years (31.1%). Hypothyroidism (overt 22.2%, subclinical 20%) was more prevalent than hyperthyroidism (overt 13.3%, subclinical 8.9%). Euthyroid status was observed in 35.6% of cases. Females showed higher rates of hypothyroidism, while males were more frequently euthyroid. Biochemical profiles aligned with standard endocrine patterns.

Conclusion: Hypothyroidism is the predominant thyroid disorder in this tertiary care setting, particularly among middle-aged females, highlighting the need for targeted screening and early intervention.

Keywords: Thyroid disorders, hypothyroidism, hyperthyroidism, prevalence, tertiary care hospital, India

Introduction

Thyroid disorders represent one of the most common endocrine abnormalities worldwide, affecting individuals across all age groups and both genders. The thyroid gland operates as a small butterfly-shaped organ which controls metabolic processes and growth and development through its secretion of thyroid hormones that include thyroxine and triiodothyronine [1]. The hypothalamic-pituitary-thyroid axis controls thyroid function through its system which uses anterior pituitary Thyroid Stimulating Hormone (TSH) to activate thyroid gland production of T3 and T4. Any disruption in this axis can lead to either hypo- or hyperthyroid states which may present with subtle symptoms or overt clinical manifestations.

Medical professionals divide thyroid disorders into four main categories which include hypothyroidism, hyperthyroidism, thyroid nodules and structural abnormalities that include goiter. Hypothyroidism occurs when the body does not produce enough thyroid hormones which leads to symptoms such as fatigue and weight gain and cold intolerance and constipation and bradycardia [2]. Hyperthyroidism occurs when the body produces excessive thyroid hormones which causes symptoms that include weight loss and heat intolerance and palpitations and tremors and anxiety. The two most common structural thyroid diseases that exist in areas with iodine deficiency are goiter and thyroid nodules. The global prevalence of thyroid disorders has risen because people experience nutritional deficiencies and their bodies respond to environmental and genetic and autoimmune conditions [3].

Epidemiological studies have proven that women experience thyroid disorders at higher rates than men. The main reason for this difference exists

because autoimmune thyroid diseases such as Hashimoto's thyroiditis and Graves' disease affect women at higher rates than men [4]. The risk of developing thyroid dysfunction grows with age advancements which become especially pronounced after individuals reach their fortieth birthday. The elderly population shows high rates of subclinical hypothyroidism according to multiple studies which report that this condition often goes undetected because its symptoms do not have distinct characteristics [5].

The worldwide population faces a substantial health burden from thyroid disorders. Studies indicate that approximately 6–8% of the adult population suffers from hypothyroidism, whereas 1–2% have hyperthyroidism [6]. The population shows a high prevalence of subclinical disorders which present abnormal TSH results together with normal free T3 and T4 levels. This finding demonstrates the need for routine tests which should target high-risk groups that include pregnant women and elderly individuals and people who have a family history of thyroid disease. Thyroid disorders have become a major public health issue in India because their occurrence is rising in both urban and rural communities. The increasing prevalence of this condition results from two main factors: nutritional deficiencies of iodine and genetic susceptibility and autoimmune disorders.

Thyroid disorders require both clinical assessment and laboratory testing to achieve proper diagnostic results. Serum TSH measurement serves as the most sensitive test for thyroid dysfunction while free T3 and T4 tests deliver additional details about gland functioning [7]. The use of imaging techniques including ultrasonography and radionuclide scans allows doctors to assess structural abnormalities such as nodules and goiters. The study of thyroid disorder patterns in hospital populations helps doctors to diagnose patients earlier while enabling them to develop specific treatment methods and management plans.

Despite the increasing acknowledgment of thyroid disorders, research studies that measure hospital-based thyroid disorder rates continue to face restrictions across various areas, especially at tertiary hospitals where patients present with multiple medical conditions. Tertiary care hospitals function as referral centers that handle both complex medical cases and advanced medical cases, which enables them to demonstrate the complete range and intensity of thyroid disorders. Clinicians can use distribution patterns based on age and gender and disorder type to identify high-risk groups and create specific treatment protocols.

The early detection of thyroid disorders needs to happen together with treatment because untreated thyroid disorders result in serious health problems. Untreated hypothyroidism leads to cardiovascular problems and cognitive decline and myxedema which occurs in extreme situations. Uncontrolled hyperthyroidism leads to atrial fibrillation and osteoporosis and thyrotoxic crisis. Healthcare professionals must monitor thyroid nodules because they present a risk of cancer which requires continuous assessment. The study of thyroid disorder patterns and their frequency at a tertiary care hospital demonstrates both community disease burden and hospital readiness and resource distribution.

The research study investigates how many people have thyroid disorders and how these disorders are distributed among patients who visit the General Medicine Department at the tertiary care hospital. The research examines demographic characteristics and clinical symptoms and laboratory results to establish complete thyroid disease patterns which will help develop evidence-based treatment methods that suit the local population. The study results will provide essential epidemiological information for hospitals while helping create both preventive measures and treatment methods for thyroid disorders in the area".

Methodology

Study Design: This study was designed as a hospital-based observational cross-sectional study aimed at assessing the prevalence and pattern of thyroid disorders among patients attending the outpatient department. The study primarily focused on correlating clinical presentation with hormonal assays to categorize various thyroid dysfunctions.

Study Area: The study was conducted in the Department of General Medicine, Government Medical College Hospital, Bettiah, West Champaran, Bihar, India

Study Duration: The study was carried out over a period of seven months from April 2025 to September 2025.

Study Participants

Inclusion Criteria

- Patients aged 18 years and above attending the Medicine OPD.
- Patients clinically suspected of thyroid dysfunction by the treating physician.
- Individuals who provided written informed consent to participate in the study.

Exclusion Criteria

- Patients on current thyroid hormone therapy or antithyroid medications.
- Pregnant or lactating women.
- Patients with chronic systemic illnesses affecting thyroid function, such as severe liver or renal disease.
- Individuals unwilling to provide consent or incomplete laboratory data.

Sample Size: A total of 90 participants fulfilling the inclusion and exclusion criteria were enrolled for the study.

Procedure: Blood samples were collected from all participants using standard Vacutainer tubes. The samples were allowed to clot and then centrifuged immediately. The separated serum was stored at -20°C until further analysis. Assessment of thyroid function was performed by measuring free triiodothyronine (fT3), free thyroxine (fT4), and thyroid-stimulating hormone (TSH) using the Enzyme-Linked Fluorescent Assay (ELFA) technique on an automated immunoanalyzer (VIDAS-BioMérieux Clinical Diagnostics). All assays were performed following the manufacturer's standardized protocol. The reference intervals used were: fT3 (4.0–8.3 pmol/L), fT4 (9.0–20.0 pmol/L), and TSH (0.25–5.0 mIU/ml).

Participants were categorized based on their hormonal profile:

- **Group 1: Overt Hyperthyroidism** – TSH <0.25 mIU/ml with high fT4 (>20.0 pmol/L) and fT3 (>8.3 pmol/L).
- **Group 2: Overt Hypothyroidism** – TSH >5.0 mIU/ml with low fT4 (<9.0 pmol/L) and fT3 (<4.0 pmol/L).
- **Group 3: Subclinical Hyperthyroidism** – TSH <0.25 mIU/ml with normal fT3 and fT4.
- **Group 4: Subclinical Hypothyroidism** – TSH >5.0 mIU/ml with normal fT3 and fT4.
- **Group 5: Euthyroid** – TSH, fT3, and fT4 all within normal reference ranges.

Clinical diagnosis was correlated with the laboratory findings to determine the prevalence of different thyroid disorders in the study population. No further immunoassays for thyroid antibodies were performed. All data were carefully recorded in laboratory registers and then entered into a structured Microsoft Excel TM spreadsheet for further analysis.

Statistical Analysis: Data analysis was conducted using SPSS version 27.0. The normality of quantitative variables was tested using the Kolmogorov-Smirnov test. Normally distributed data were presented as mean ± standard deviation (SD), whereas non-parametric data were expressed as median with interquartile range (IQR). Categorical variables were described using percentages and ratios. Logistic regression models were applied to estimate odds ratios (ORs) with corresponding 95% confidence intervals (CIs) to identify potential associations. A p-value of <0.05 was considered statistically significant throughout the analysis".

Result

Table 1 shows the demographic distribution of study participants (N = 90). The majority of participants belonged to the 31–45 years age group, accounting for 28 individuals (31.1%), followed by those aged 46–60 years with 25 participants (27.8%). The 18–30 years age group comprised 22 participants (24.4%), while individuals aged more than 60 years constituted the smallest proportion, with 15 participants (16.7%). This indicates that most of the study population was concentrated in the middle-aged categories. Regarding gender distribution, females slightly outnumbered males, with 48 participants (53.3%) compared to 42 males (46.7%), demonstrating a relatively balanced gender representation with a marginal female predominance in the study sample.

Table 1: Demographic Distribution of Study Participants (N = 90)

Age Group (years)	**Frequency (n)**	**Percentage (%)**
18–30	22	24.4
31–45	28	31.1
46–60	25	27.8
>60	15	16.7
Total	90	100
Gender	**Frequency (n)**	**Percentage (%)**
Male	42	46.7
Female	48	53.3
Total	90	100

Table 2 shows the distribution of thyroid disorders among the 90 study participants. The largest proportion of subjects were euthyroid, accounting for 32 cases (35.6%), indicating that over one-third of the study population had normal thyroid function. Among those with thyroid dysfunction, overt hypothyroidism was the most common disorder, observed in 20 participants (22.2%), followed closely by subclinical hypothyroidism in 18 participants (20%). In contrast, hyperthyroid disorders were comparatively less frequent, with overt hyperthyroidism present in 12 cases (13.3%) and subclinical hyperthyroidism in 8 cases (8.9%). Overall, hypothyroid conditions (both overt and subclinical) were more prevalent than hyperthyroid conditions in this study population, suggesting a higher burden of reduced thyroid function abnormalities compared to excessive thyroid activity.

Table 2: Distribution of Thyroid Disorders (N = 90)		
Thyroid Disorder	**Frequency (n)**	**Percentage (%)**
Overt Hyperthyroidism	12	13.3
Subclinical Hyperthyroidism	8	8.9
Overt Hypothyroidism	20	22.2
Subclinical Hypothyroidism	18	20
Euthyroid	32	35.6
Total	90	100

Table 3 shows the mean thyroid hormone levels among study participants across different thyroid disorders, highlighting clear biochemical differences. Overt hyperthyroidism had markedly suppressed TSH (0.12 ± 0.05 mIU/ml) with elevated fT3 (10.5 ± 1.2 pmol/L) and fT4 (25.3 ± 2.1 pmol/L), while subclinical hyperthyroidism showed low TSH (0.18 ± 0.04 mIU/ml) but near-normal fT3 and fT4 levels. In contrast, overt hypothyroidism demonstrated significantly elevated TSH (12.3 ± 2.5 mIU/ml) with reduced fT3 (3.2 ± 0.4 pmol/L) and fT4 (7.8 ± 1.0 pmol/L). Subclinical hypothyroidism showed raised TSH (6.8 ± 1.1 mIU/ml) with normal thyroid hormone levels. The euthyroid group had normal TSH (2.5 ± 1.0 mIU/ml), fT3 (5.8 ± 0.6 pmol/L), and fT4 (14.5 ± 1.2 pmol/L), serving as the reference pattern. Overall, TSH levels varied inversely with thyroid hormone levels in hyperthyroidism and directly in hypothyroidism.

Table 3: Mean Thyroid Hormone Levels in Study Participants			
Thyroid Disorder	**Mean TSH (mIU/ml)**	**Mean fT3 (pmol/L)**	**Mean fT4 (pmol/L)**
Overt Hyperthyroidism	0.12 ± 0.05	10.5 ± 1.2	25.3 ± 2.1
Subclinical Hyperthyroidism	0.18 ± 0.04	6.8 ± 0.6	15.5 ± 1.4
Overt Hypothyroidism	12.3 ± 2.5	3.2 ± 0.4	7.8 ± 1.0
Subclinical Hypothyroidism	6.8 ± 1.1	5.2 ± 0.5	14.8 ± 1.6
Euthyroid	2.5 ± 1.0	5.8 ± 0.6	14.5 ± 1.2

Table 4 shows the gender-wise distribution of thyroid disorders among the study participants (N = 90), comprising 42 males and 48 females. Among males, the most common category was euthyroid status (45.2%), followed by overt hypothyroidism (19.0%), subclinical hypothyroidism (16.7%), overt hyperthyroidism (11.9%), and subclinical hyperthyroidism (7.1%). In contrast, among females, overt hypothyroidism was the most prevalent disorder (25.0%), followed by subclinical hypothyroidism (22.9%), overt hyperthyroidism (14.6%), subclinical hyperthyroidism (10.4%), while a smaller proportion were euthyroid (27.1%). Overall, hypothyroid disorders (both overt and subclinical) were more common in females compared to males, whereas a higher proportion of males were euthyroid. These findings indicate a greater burden of thyroid dysfunction, particularly hypothyroidism, among female participants in the study.

Table 4: Gender-wise Distribution of Thyroid Disorders (N = 90)		
Thyroid Disorder	**Male (n, %)**	**Female (n, %)**
Overt Hyperthyroidism	5 (11.9%)	7 (14.6%)
Subclinical Hyperthyroidism	3 (7.1%)	5 (10.4%)
Overt Hypothyroidism	8 (19.0%)	12 (25.0%)
Subclinical Hypothyroidism	7 (16.7%)	11 (22.9%)
Euthyroid	19 (45.2%)	13 (27.1%)
Total	42 (100%)	48 (100%)

Table 5 shows the age-wise distribution of thyroid disorders among 90 study participants. The highest number of patients belonged to the 31–45 years age group (28), followed by 46–60 years (25), 18–30 years (22), and >60 years (15). Overt hypothyroidism was the most common thyroid disorder overall (20 cases), particularly observed in the 46–60 years age group (7 cases) and 31–45 years group (6 cases). Subclinical hypothyroidism was the second most common condition (18 cases), distributed relatively evenly across age groups but slightly higher in 31–45 and 46–60 years (5 cases each). Overt hyperthyroidism (12 cases) and subclinical hyperthyroidism (8 cases) were less frequent, with slightly higher occurrence in the 31–45 years group. Euthyroid individuals constituted 32 cases, with similar distribution across younger and middle age groups but comparatively fewer in those above 60 years. Overall, the findings indicate that thyroid dysfunction, particularly hypothyroidism, was more prevalent in middle-aged individuals.

Table 5: Age-wise Distribution of Thyroid Disorders (N = 90)						
Age Group (years)	**Overt Hyper**	**Subclinical Hyper**	**Overt Hypo**	**Subclinical Hypo**	**Euthyroid**	**Total**
18–30	3	2	3	4	10	22
31–45	4	3	6	5	10	28
46–60	3	2	7	5	8	25
>60	2	1	4	4	4	15
Total	12	8	20	18	32	90

Discussion

The present study results, which show that hypothyroidism (subclinical and overt forms) represents the most common thyroid condition at our tertiary care hospital, reveal that the condition affects women and middle-aged patients (31-60 years) at higher rates.

Our study showed that female participants outnumbered male participants because 53.3% of the sample were women, which matched the findings from the Colorado Thyroid Disease Prevalence Study conducted by Canaris et al. (2000) [8] that showed 9.5% of women had elevated TSH levels while only 2.8% of men showed this condition. Bikas (2019) [9] conducted a thorough review of thyroid epidemiology which showed that women developed thyroid disorders 5 to 8 times more than men. Our research showed that both overt and subclinical hypothyroidism occurred more often in females which demonstrated that autoimmune thyroid disorders that affect women more frequently serve as a primary cause of this condition. The Thyroid Epidemiology Audit and Research Study conducted by Leese et al. (2008) [10] showed that therotic toxicosis cases increased among women while men showed no such rise which demonstrated the existing gender differences".

The research 'results demonstrated that most hypothyroid cases occurred among people who belonged to the 31 to 45 and 46 to 60 age groups. The pattern matches the Whickham Survey follow-up study results which found that hypothyroidism rates increase with age, especially among middle-aged and elderly women (Vanderpump et al., 1995) [11]. The study found that thyroid dysfunction rates rose with advancing age, even though only a few participants crossed the age 60 threshold, which matched the findings from Wang and Crapo (1997) [12] who found that adult females had hypothyroidism rates between 3 and 7.5 percent which increased in older age groups.

Our research demonstrated that hypothyroidism occurs more frequently than hyperthyroidism according to the study's results which analyzed overall disease prevalence patterns. This finding matches the results discovered in Nepal and all other South Asian territories. Baral et al. (2002) [13] reported that hypothyroidism accounted for the majority of thyroid dysfunction cases in Eastern Nepal with a substantial proportion of subclinical cases. The study by Mahato et al. (2015) [14] found that 17.19% of patients who visited a tertiary care hospital in Central Nepal suffered from hypothyroidism while hyperthyroidism was less common. The results showed that overt hypothyroidism represented the most widespread condition, whereas subclinical hypothyroidism ranked second in frequency.

The study found that India produced results which matched other research studies. Abraham et al. (2009) [15] reported a high prevalence of subclinical hypothyroidism 11.3% among women in Puducherry which was accompanied by 3.9% of cases demonstrating overt hypothyroidism. Usha Menon et al. (2009) [15] found that 9.4% of adults from an iodine-sufficient South Indian population had hypothyroidism while only 1.6% of the population experienced hyperthyroidism. The findings of our study demonstrate that decreased thyroid function states occur more frequently than hyperactive thyroid function states in tertiary medical facilities.

The study results show opposite outcomes in different study locations. Yadav et al. (2012) [16] studied the population of Far Western Nepal and found more people with hyperthyroidism than with hypothyroidism. The study shows that geographical differences and iodine nutritional status and environmental factors and referral patterns create discrepancies. Bayram et al. (2009) [17] conducted research in an iodine-sufficient area of Iran which showed that 12.8% of the population experienced thyroid dysfunction and that subclinical hypothyroidism occurred more frequently at 4.3% compared to overt hypothyroidism which occurred at a rate of 2.4% and hyperthyroidism occurred at a lower rate. Our research shows a resemblance to their results because both studies found high rates of subclinical hypothyroidism.

The biochemical patterns our study found through research demonstrated that hyperthyroidism patients showed TSH suppression while their fT3 and fT4 levels increased which matched established endocrine functionality and supported results from extensive epidemiological studies (Canaris et al., 2000). The study found that subclinical hypothyroidism occurred in a significant percentage which produced clinical value because Whickham cohort longitudinal research showed that increased TSH levels led to

a yearly development rate of 2 to 4 percent toward overt hypothyroidism in their study population especially among women who tested positive for thyroid antibodies (Vanderpump et al., 1995).

The study's lower hyperthyroidism rate maintains alignment with Vanderpump et al. (1995) who found about 0.8 annual hyperthyroidism cases per 1000 women while hypothyroidism occurred at a rate of 3.5 per 1000 women. The study by Leese et al. (2008) found that Scotland experienced less overall hyperthyroidism cases than hypothyroidism cases although both conditions showed an increasing pattern.

The pattern which our tertiary care hospital observed shows similarity with both global and regional epidemiological data. The main condition which requires assessment among women between the ages of 30 and 60 years needs specific screening methods because hypothyroidism shows higher incidence rates among women and middle-aged people.

Conclusion

This study demonstrates that hypothyroidism, both overt and subclinical, is the most prevalent thyroid disorder among patients attending a tertiary care hospital, with a higher burden observed in females and middle-aged individuals (31–60 years). Euthyroid status was more common among males, while females exhibited greater susceptibility to reduced thyroid function, likely due to autoimmune and hormonal influences. Biochemical analyses revealed expected patterns, with TSH inversely related to thyroid hormones in hyperthyroidism and directly related in hypothyroidism. The findings align with regional and global data, emphasizing the predominance of hypothyroid conditions in adult populations. These results highlight the importance of routine screening, early diagnosis, and gender- and age-specific interventions to manage thyroid dysfunction effectively and reduce associated morbidity.

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