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To Study the Drug Utilization Pattern of Drugs Used in Treatment of Thyroid Patients in Tertiary Care Hospital, Bathinda

Koustov Moni Ray[1,*], Rizwan Riyaz[1], Chandan Kumar[1], Juwel Alkawsar Ahmed[2], Amritpal Singh[3], Uma jyoti[3]

Abstract

Aim: *This study aimed to assess the drug prescription trends for thyroid disorders in a tertiary care setting, with a focus on medication choice, dosage patterns, and patient self-medication behaviour.* ***Methods:*** *A prospective observational study was conducted on 84 patients diagnosed with thyroid disorders. Data were collected regarding the type of disorder, prescribed drugs (dose and frequency), comorbidities, and self-medication practices. Descriptive statistics were applied to identify prescription trends.* ***Results:*** *Hypothyroidism was more common (27.1%) than hyperthyroidism (11.3%). Among those with hypothyroidism, 34.5% had coexisting health conditions, while 20.2% of hyperthyroid patients had comorbidities. Levothyroxine was the most prescribed drug for hypothyroidism, typically at 25–50 mcg doses. Methimazole and carbimazole were used for hyperthyroidism, with variable dosages. Alarmingly, 57.1% of patients reported self-medicating without medical supervision, increasing the risk of adverse effects.* ***Conclusion:*** *Hypothyroidism is the predominant thyroid disorder in this cohort, with levothyroxine as the mainstay treatment. High rates of self-medication highlight the urgent need for patient counselling and standardized treatment protocols to improve medication safety and compliance.*

Keywords: Thyroid disorders, hypothyroidism, hyperthyroidism, levothyroxine, methimazole, self-medication, prescription trends

Study Design

- *Setting:* Hospital-based study conducted in the Department of General Medicine, Adesh University, Bathinda, with approval from the Research and Ethics Committees.
- *Duration:* 3 months.
- *Type of Study:* Prospective observational study.
- *Subjects:* Patients attending the Department of General Medicine, selected using inclusion and exclusion criteria, with informed written consent.

Sample Size (n)

- *Known population:* 2 patients/day
- *Duration:* 2 months
- *Total population:* 106
- *Calculated sample size:* 84
- *Level of significance:* 5%

Inclusion Criteria

- Patients aged 18–69 years with hyperthyroidism or hypothyroidism.
- Pregnant and breastfeeding women
- Patients on at least one antithyroid drug

***Author for Correspondence**
Koustov Moni Ray
E-mail: koustovray@gmail.com

[1]Intern, Department of Pharmacy, Aydesh Institute of Pharmacy and Biomedical Sciences, Bathinda, Punjab, India.
[2]Intern, Department of Pharmacy, Desh Institute of Pharmacy and Biomedical Sciences, Bathinda, Punjab, India.
[3]Associate Professor, Adesh Institute of Pharmacy and Biomedical Sciences, Bathinda, Punjab, India.

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Exclusion Criteria

- Patients with thyroid nodules, thyroid cancer, or goitre
- *Statistical Analysis:* Data analyzed using SPSS with suitable statistical tools.
- *Ethical Consideration:* Approval obtained from the Scientific Research and Ethics Committees; informed consent taken from all participants.

INTRODUCTION

The thyroid gland, a butterfly-shaped endocrine organ located anterior to the trachea, plays a pivotal role in regulating the body's metabolism through the synthesis, storage, and release of thyroid hormones [1]. These hormones – primarily triiodothyronine (T3) and thyroxine (T4) – are essential for maintaining metabolic homeostasis, supporting normal growth and development, and influencing vital physiological functions such as energy balance, thermoregulation, and cardiovascular health [2]. Disruption in thyroid function can lead to significant clinical conditions, most notably hypothyroidism and hyperthyroidism, which affect multiple organ systems and overall quality of life [3].

Globally, thyroid disorders are increasingly recognized as a major public health concern. In India, the prevalence of thyroid dysfunction is estimated to affect approximately 11% of the population, with hypothyroidism being more common than hyperthyroidism. Despite this, awareness, diagnosis, and treatment remain suboptimal, particularly in rural and underserved regions [4]. The demographic shift toward an aging population further underscores the need for effective screening and management strategies, as thyroid disorders are more prevalent among elderly individuals and women, especially those who are postmenopausal or pregnant [5].

Advancements in diagnostic modalities, such as thyroid ultrasonography and sensitive hormone assays, have improved the detection and classification of thyroid disorders [6]. However, clinical diagnosis remains challenging due to the nonspecific nature of symptoms and the influence of comorbid conditions. Moreover, the presence of subclinical thyroid dysfunction—where biochemical abnormalities exist without overt symptoms – adds complexity to clinical decision-making [7].

Given the chronic nature of thyroid disorders and the necessity for long-term pharmacological management, understanding drug utilization patterns is crucial [8]. This includes evaluating prescribing trends, adherence to clinical guidelines, and the impact of comorbidities on therapeutic choices. The current study aims to investigate the prescribing patterns of antithyroid medications in a tertiary care hospital setting, with a focus on identifying gaps in practice, assessing patient outcomes, and contributing to the optimization of thyroid disorder management [9].

Overview of Thyroid Function, Hormones, Regulation, and Disorders

The thyroid gland is a crucial butterfly-shaped endocrine organ located in the anterior neck, wrapped around the trachea. It plays a central role in regulating the body's metabolism through the synthesis and secretion of two primary hormones – Thyroxine (T4) and Triiodothyronine (T3) [1]. The key functions of the thyroid gland include controlling basal metabolic rate, maintaining cardiovascular health, supporting cognitive development, regulating temperature, and aiding in digestion, muscle tone, and reproductive function [10]. These effects are exerted by thyroid hormones through systemic circulation.

The mechanism of action of the thyroid gland begins with the uptake of iodine from the bloodstream, which is essential for hormone synthesis [11]. Inside thyroid follicular cells, iodine binds with tyrosine to form T3 and T4, with T3 being the more active form [12]. These hormones enter the bloodstream in response to thyroid-stimulating hormone (TSH), which is secreted by the anterior pituitary gland upon stimulation by thyrotropin-releasing hormone (TRH) from the hypothalamus [13]. This cascade forms a negative feedback loop that regulates hormone levels, ensuring homeostasis. Once secreted, T3 binds

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to nuclear receptors in target tissues, influencing gene expression related to metabolic rate and protein synthesis, while T4 is mostly converted to T3 in peripheral tissues [14].

The thyroid hormones serve distinct but complementary roles. T4 acts primarily as a precursor that is later converted into T3. It helps regulate metabolism, heart rate, and body temperature. T4 undergoes deiodination via iodothyronine deiodinases to become active T3 [15]. T3 is the principal active hormone responsible for increasing oxygen consumption, stimulating protein synthesis, enhancing glucose utilization, and supporting neural development. The release and regulation of these hormones are tightly controlled through the hypothalamic-pituitary-thyroid axis (HPT axis). Any dysregulation in this axis may lead to thyroid disorders, which are broadly classified into hypothyroidism and hyperthyroidism [16]. Hypothyroidism occurs when the thyroid fails to produce sufficient hormones, leading to symptoms such as fatigue, weight gain, bradycardia, constipation, and depression [17]. On the other hand, hyperthyroidism results from excessive hormone production, manifesting as weight loss, tachycardia, heat intolerance, irritability, and frequent bowel movements (Table 1).

Table 1. Comparison of Hypothyroidism and Hyperthyroidism.

Feature	Hypothyroidism	Hyperthyroidism
Hormone levels	↓ T3, ↓ T4, ↑ TSH	↑ T3, ↑ T4, ↓ TSH
Common symptoms	Fatigue, weight gain, cold intolerance	Weight loss, tremors, and heat intolerance
Causes	Hashimoto’s thyroiditis, iodine deficiency	Graves’ disease, toxic nodules
Gender prevalence	More common in women	More common in women
Treatment	Levothyroxine replacement	Antithyroid drugs, RAI, surgery

The types of thyroid disorders include primary and secondary hypothyroidism, autoimmune conditions like Hashimoto's thyroiditis and Graves’ disease, and transient conditions such as postpartum thyroiditis [18]. Hypothyroidism is far more prevalent, especially among females and in iodine-deficient regions. Around 10.95% of people in Bharat are estimated to suffer from hypothyroidism, with postmenopausal women being particularly vulnerable. Conversely, hyperthyroidism affects about 1–2% of the global population and is most frequently caused by autoimmune Graves’ disease, which is also more common in women [19]. Genetic predisposition, iodine intake, medication, and environmental factors are implicated in the pathogenesis of both conditions.

Hypothalamic-Pituitary-Thyroid (HPT) Axis

The hypothalamus secretes thyrotropin-releasing hormone (TRH), which stimulates the anterior pituitary gland to release thyroid-stimulating hormone (TSH). In response, TSH acts on the thyroid gland to promote the synthesis and release of thyroid hormones—triiodothyronine (T3) and thyroxine (T4) [20]. These hormones circulate through the bloodstream to target tissues, regulating metabolism, growth, and energy production. Elevated levels of T3 and T4 exert negative feedback on both the pituitary and hypothalamus to inhibit further secretion of TSH and TRH, thereby maintaining endocrine balance and preventing hormone overproduction [21].

Laboratory evaluation plays a vital role in diagnosing thyroid disorders. The reference ranges for thyroid hormones, though slightly variable between labs, are generally established for clinical use. Total T4 typically ranges from 77–155 nmol/L, while free T4 falls between 0.8–2.2 ng/dL. Total T3 is generally found between 1.2–2.8 nmol/L, and free T3 ranges from 2.3–4.2 pg/mL. TSH levels normally lie between 0.3–4.5 mIU/L in adults. During pregnancy, trimester-specific ranges are considered due to hormonal changes [22]. A combination of hormone assays, thyroid ultrasound, and antibody tests ensures accurate diagnosis and helps distinguish between autoimmune, inflammatory, and structural thyroid disorders [23]. Early detection and appropriate management are essential to improving patient outcomes and reducing complications associated with thyroid dysfunction Figure 1.

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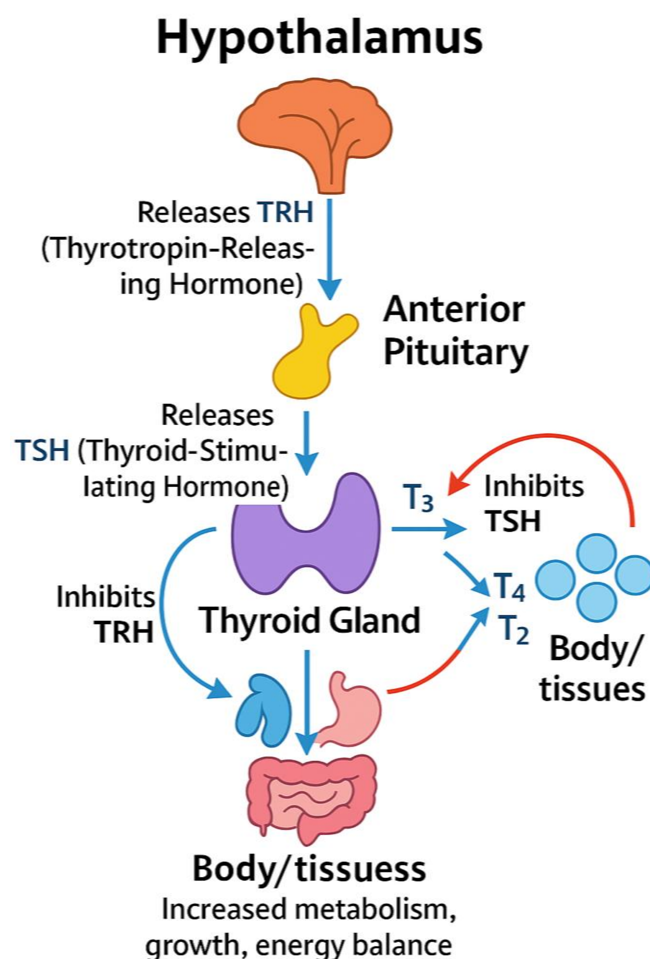

Figure 1. Hypothalamic-Pituitary-Thyroid (HPT) Axis: Hormonal Regulation and Feedback Control.

Materials and Methods

This hospital-based, prospective observational study was conducted over a period of 3 months in the Department of General Medicine, Adesh University, Bathinda, following approval from the Scientific Research and Ethics Committees. Patients aged 18–69 years, diagnosed with hyperthyroidism or hypothyroidism and comorbid conditions, including pregnant and breastfeeding women treated with at least one antithyroid drug, were included. Patients with other thyroid conditions such as nodules, cancer, or goitre were excluded.

Data were collected using a structured data collection form, medication usage evaluation, and a patient questionnaire, upon obtaining informed written consent. Statistical analysis was performed using SPSS software, employing appropriate statistical tools.

RESULT

Distribution of Socio-Demographic Clinical Characteristics

This comprehensive table provides a summary of the socio-demographic and clinical characteristics of 84 patients diagnosed with thyroid disorders. The majority of patients were female (67.9%), and the most affected age group was 36–50 years (50%). In terms of weight, 82.1% of the patients fell within the 61–80 kg range. Normal blood pressure was observed in 73.8% of cases, while the rest had either elevated or decreased levels. Regarding diagnosis, hypothyroidism (with or without comorbidity) was more prevalent (66.6% total) compared to hyperthyroidism (33.3% total). These findings indicate a clear trend of thyroid disorders being more common among middle-aged, moderately weighted females, with a significant portion managing additional comorbid conditions Figure 2.

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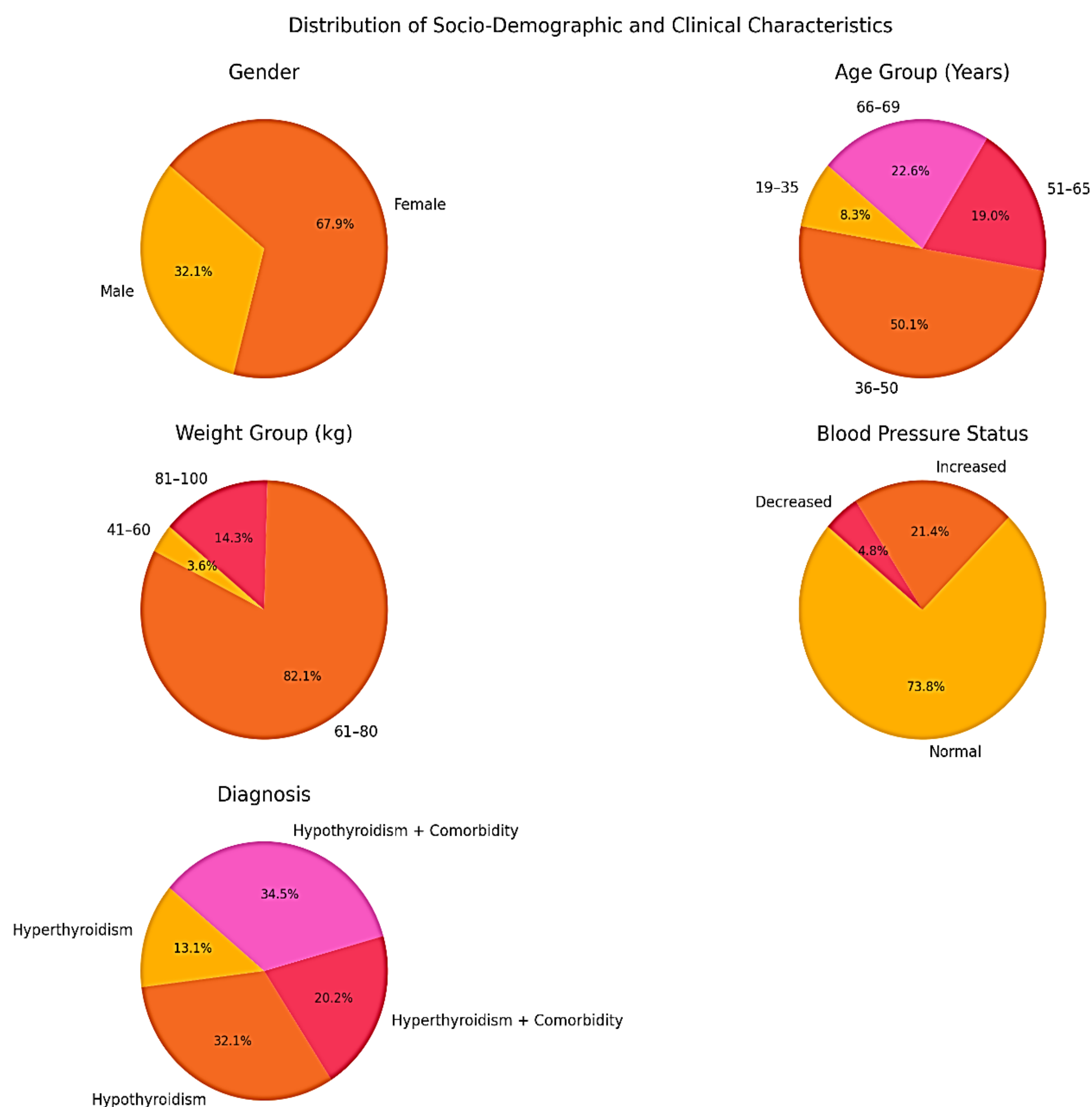

Figure 2. Comprehensive Distribution of Socio-Demographic and Clinical Characteristics of Thyroid Disorder Patients (N = 84).

Clinical, Lifestyle & Treatment Patterns in Thyroid Disorder Patients

This Table 1 provides a comprehensive overview of behavioural, clinical, and pharmacological patterns among 84 thyroid disorder patients. A very small proportion of patients were pregnant (3.6%) or breastfeeding (7.1%), with minimal hyper- or hypothyroidism observed in these subgroups. Notably, *57.1%* of patients admitted to using additional medications beyond their prescribed treatment, raising potential concerns about drug interactions and self-medication practices. While *14.3%* experienced unwanted drug effects, a majority did not report any adverse reactions. Clinically, *69%* of the patients had dietary changes recommended by doctors, but only *14.3%* were advised to follow an exercise regimen, suggesting that lifestyle interventions are underutilized. Additionally, *16.7%* of patients considered seeking a second medical opinion. Regarding hyperthyroid treatment, *33.3%* received specific medications: methimazole was the most common (14.3%), followed by carbimazole (11.9%) and propylthiouracil (7.1%). The prescribed doses for propylthiouracil were mainly 50 mg and 100 mg, while methimazole was given at 5 mg or 10 mg. These findings underscore the importance of individualized therapy, enhanced patient monitoring, and the need for greater physician engagement in lifestyle and education-based interventions for thyroid management Table 2.

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Table 2. Summary of Clinical, Lifestyle & Treatment Patterns in Thyroid Disorder Patients (N = 84).

Parameter	Key data
Pregnancy Cases	3 total: 1 hyperthyroid, 2 hypothyroid (3.6%)
Breastfeeding Cases	6 total: 2 hyperthyroid, 4 hypothyroid (7.1%)
Other Medications Used	48 patients (57.1%)
Unwanted Effects	12 patients (14.3%)
Dietary Changes Advised	58 patients (69.0%)
Exercise Recommended	12 patients (14.3%)
Sought Second Opinion	14 patients (16.7%)
Hyperthyroid Medications	28 patients: Methimazole (12), Carbimazole (10), PTU (6)
PTU Dosage	4 on 50 mg, 2 on 100 mg
Methimazole Dosage	3 on 5 mg, 9 on 10 mg

Distribution of Carbimazole Dose Per Patient

The analysis of carbimazole dosage among 84 patients reveals a marked predominance of patients who were not administered the drug. As shown in Table 02 and the corresponding graph, 74 patients (88.1%) did not receive carbimazole. This high percentage suggests that the majority of patients were either not diagnosed with hyperthyroidism or were treated using alternative antithyroid medications.

Among the patients who were prescribed carbimazole, 7 patients (8.3%) were given a 5 mg dose, indicating a preference for low-dose initiation in selected cases. A further 3 patients (3.6%) received a 10 mg dose, representing the smallest subset of patients on carbimazole therapy.

The graphical representation reinforces the numerical data by showing a significant skew towards the "None" category, visually emphasizing the limited use of carbimazole in this patient population. This distribution may reflect a clinical strategy to individualize antithyroid treatment based on diagnosis, disease severity, or physician preference. Additionally, the low prescription rate could be influenced by concerns over carbimazole-related side effects or institutional guidelines favoring other treatment options.

Overall, this data underscores the need for careful patient selection and individualized dosing strategies when considering carbimazole therapy.

DISCUSSION

This study provides valuable insights into the prescription patterns for managing thyroid disorders. It reveals consistent use of levothyroxine in hypothyroidism, indicating adherence to clinical guidelines, while varied dosages of methimazole and carbimazole highlight the need for standardized treatment protocols. A major concern is the high rate of self-medication, which raises the risk of adverse interactions and poor treatment outcomes. The findings stress the importance of patient education and a multidisciplinary approach to care. Although limited by a small sample size, the study underscores the need for broader research and more uniform, evidence-based treatment strategies for thyroid management.

CONCLUSION

This study offers a comprehensive overview of prescription patterns among thyroid disorder patients, emphasizing trends in medication use and treatment approaches. Hypothyroidism was more prevalent, affecting 27.1% of patients, with an additional 34.5% managing it alongside comorbidities. Hyperthyroidism affected 11.3%, with 20.2% having other health conditions. Levothyroxine was consistently prescribed for hypothyroidism, while methimazole and carbimazole were commonly used for hyperthyroidism, though with varied dosing. A concerning finding was that 57.1% of patients practiced self-medication, highlighting the need for improved patient education and stricter adherence to prescribed therapies to ensure treatment safety and effectiveness.

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Future Perspective

The findings of this study provide an essential foundation for understanding current drug utilization patterns in thyroid disorder management within a tertiary care setting. However, the increasing prevalence of thyroid disorders, especially in women and individuals with comorbidities, highlights the need for broader research.

In the future, multicentric studies with larger, more diverse populations should be conducted to validate and generalize these findings. Longitudinal studies evaluating treatment adherence, medication outcomes, and patient-reported experiences will help in developing evidence-based clinical guidelines tailored to Indian populations. Furthermore, the integration of digital health tools, such as mobile apps for medication tracking and AI-driven decision support systems, may enhance treatment adherence and physician-patient communication.

Another vital area of focus should be the assessment of self-medication behaviour, its root causes, and the development of public health strategies aimed at reducing such practices through targeted awareness programs and pharmacist-led counselling. Incorporating lifestyle interventions, including diet and exercise guidance, into standard treatment protocols may also improve long-term disease control.

Ultimately, a more personalized and multidisciplinary approach involving endocrinologists, pharmacists, dietitians, and mental health professionals will be key to improving the overall quality of life for patients with thyroid disorders.

- *Ethical Approval:* No ethical approval is required in this study
- *Consent to Participate:* Yes
- *Consent to Publish:* Yes
- *Funding:* No Source of Funding
- *Competing Interests:* No Competing Interests
- *Availability of data and materials:* All data are available in the manuscript file.
- *Conflict of Interes:* No conflict of interest

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