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Original Research Article

A Clinical Evaluation of the Spectrum of Thyroid Disorders Among Patients Attending a Tertiary Care Hospital

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Abstract:

Background: Thyroid diseases are considered to be some of the most prevalent endocrine diseases in the world second only to diabetes mellitus. They have a large impact on metabolism, growth, and health of the body in general especially in those areas where there is variation on the intake of the iodine.

Aim: The aim of the study was to clinically assess range, frequency and biochemical characteristics of thyroid disorders among patients admitted in a tertiary care hospital.

Methodology: A cross-sectional research was undertaken at a hospital called the Department of General Medicine, Nalanda Medical College and Hospital, Patna, Bihar and involved 80 patients aged more than 18 years. Clinical assessment, thyroid analysis (T3, T4, TSH), ultrasound and lipid profile were done. Analysis of data was done in SPSS version 27.0.

Results: Thyroid disorders were most prevalent among middle-aged females, particularly from rural areas. Hypothyroidism (42.5%) was the most common disorder, followed by hyperthyroidism (25%) and subclinical hypothyroidism (22.5%). Fatigue, weight changes, and cold intolerance were the predominant symptoms. Biochemically, hypothyroid patients showed elevated TSH and dyslipidemia, whereas hyperthyroid patients exhibited suppressed TSH with lower lipid levels.

Conclusion: The study emphasizes the high prevalence of hypothyroidism, particularly in women, and its strong association with lipid abnormalities. Routine thyroid screening and early management are crucial to prevent long-term metabolic and cardiovascular complications.

Keywords: Thyroid disorders, Hypothyroidism, Hyperthyroidism, TSH, Lipid profile, Clinical evaluation.

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Introduction

Thyroid disorders are one of the commonest endocrine disorders in the world second only to diabetes mellitus in frequency [1]. The thyroid gland is crucial in metabolism, growth, and development due to the regulation of secretion of thyroid hormones (triiodothyronine (T3) and thyroxine (T4) by the thyroid-stimulating hormone (TSH) secreted by the anterior pituitary gland. Any form of disruption to the healthy operation of this complicated regulatory axis results in thyroid dysfunction where it may either be hypothyroidism, hyperthyroidism, or structural defects like goiter and nodules [2]. The disorders may have significant systemic consequences, which include cardiovascular, gastrointestinal, reproductive, and neuropsychiatric functions. Considering the varied clinical manifestations and the possible chronic morbidity, a comprehensive assessment of the range of thyroid conditions in hospital-based clinical settings would be of great clinical significance.

Thyroid dysfunction is a widespread crissis around the globe and depends on the geographical, dietary, and genetic factors. In the developing world, iodine deficiency remains heavily involved in thyroid disease, whereas in the iodine-sufficient world, autoimmune diseases like the Hashimoto thyroiditis and Graves' disease are the leading causes [3]. Thyroid disorders are becoming widely accepted as one of the critical concerns of the population in India. According to epidemiological surveys, an average of 42 million individuals in the country are victims of some kind of thyroid disease [4]. The spectrum consists of goiter, subclinical hypothyroidism, open hypothyroidism, hyperthyroidism, thyroid nodules as well as malignancies. This burden is caused by

factors like age, gender, lifestyle, dietary habits and regional iodine status. The most affected group is women, especially during their reproductive age, probably because of the effect of estrogen and the susceptibility of autoimmune. Diagnosis and proper management in its early stages will be crucial in the prevention of complications such as infertility, dyslipidemia, cardiovascular dysfunction and neurocognitive impairment.

The thyroid disorders are quite unrecognized because they have almost no specificity with slightly noticeable symptoms which can easily resemble other diseases affecting the body [5]. Clinical manifestations are based on the extent and term of hormonal imbalance. The major symptoms of hypothyroidism are fatigue, weight gain, cold sensation, and slowness of the heart, and those of hyperthyroidism include weight loss, heat intolerance, anxiousness, tremor, and rapid heart rate. Moreover, both functional and non-functional thyroid diseases could be accompanied by goiter. Subclinical thyroid dysfunctions (in which there are biochemical abnormalities that are not detected by clinical symptoms) have become a significant subject of present-day studies because they can escalate to overt disease when not detected. Diagnosis is based on laboratory testing through serum T3, T4 and TSH levels and in some cases, ultrasonography and fine-needle aspiration cytology (FNAC) are used to aid the diagnosis of morphological and neoplastic lesions [6].

Clinical assessments done in hospitals have been useful in learning the distribution, clinical presentation and biochemical spectrum of thyroid diseases in a specific population [7]. The studies are also fundamental in determining the local trends, orientation of clinicians on diagnostic strategies, as well as the development of management guidelines to suit specific patients. A tertiary care hospital, in particular, offers an all-in-one platform on which patients with a wide range of demographic and clinical characteristics could get assessed systematically. The statistics of such centers may provide an idea of the difference in the region, the rates of various thyroid conditions, and risk factors. Also, clinical assessment studies have the potential of filling the gap between the community prevalence survey and the individualized patient management by matching clinical presentation with biochemical and radiological results.

The role of the detection and treatment of thyroid disorders cannot be overestimated because undertreatment or absence of treatment may cause serious complications [8]. In hypothyroidism, untimely treatment could lead to myxedema coma, infertility or atherosclerosis and unmanaged hyperthyroidism could lead to thyrotoxic crisis, arrhythmias, and osteoporosis. In addition, thyroid nodules and malignancies though less prevalent need early diagnosis to achieve the best prognosis. Therefore, screening measures, education, and regular checking of thyroid functionality in the high-risk population (women, older people, and patients with metabolic or autoimmune disorders in particular) can be deemed as the key ingredients of preventive healthcare.

So, the current research will be carried out under the title A Clinical Evaluation of the Spectrum of Thyroid Disorders Among Patients Attending a Tertiary Care Hospital to examine the clinical trends, biochemical data, and demographic characteristics of the thyroid diseases among the patients visiting the hospital. Through the analysis of the different presentations and comparison with the laboratory results, the study aims at establishing the most prevalent types of thyroid dysfunction and the risk factors associated with the same in the local population. The findings are likely to play a role in enhancing the existing knowledge of the epidemiological trends of thyroid diseases and help to increase the diagnostic efficiency, patient awareness, and treatment outcomes.

Methodology

Study Design: This study was a hospital-based, cross-sectional clinical investigation conducted to evaluate the spectrum, prevalence, and clinical presentation of various thyroid disorders among patients attending a tertiary care hospital. The study aimed to identify the distribution pattern, demographic characteristics, and biochemical profiles of thyroid dysfunction in the selected population.

Study Area: The study was carried out in the Department of General Medicine, Nalanda Medical College and Hospital, Patna, Bihar, India for five months

Study Participants:

Inclusion Criteria:

- Patients aged above 18 years attending the outpatient and inpatient departments with symptoms suggestive of thyroid dysfunction.
- Patients who provided informed written consent to participate in the study.
- Patients diagnosed with thyroid disorders confirmed by biochemical tests (TSH, T3, and T4).

Exclusion Criteria:

- Patients below 18 years of age.
- Pregnant and lactating women.
- Patients suffering from severe systemic illnesses or those taking drugs known to affect thyroid function (e.g., amiodarone, lithium).
- Patients unwilling to give consent for participation.

Sample Size: A total of 80 patients who met the inclusion and exclusion criteria were enrolled for this study.

Procedure: All the patients who came with the clinical features indicating a possible thyroid dysfunction were fully assessed. An extended history was acquired, comprising of demographic data, presenting complaints, time of symptoms, family history of thyroid disease and the past medical history. There was a thorough clinical examination with keen consideration of the size of thyroid glands, presence of goiter, eye symptoms, skin texture, hair alterations, pulse rate, and other general signs and symptoms. They carried out laboratory tests of thyroid functions (serum TSH, free T3, and free T4), complete blood tests, lipid tests, liver and renal test, and blood sugar level estimation. Thyroid gland ultrasonography was carried out on the chosen patients to determine the morphology of glands and the presence of nodules or cystic changes. FNAC was performed in cases with a definite indication to establish cytological diagnosis. The patients were grouped under various categories according to the clinical and biochemical results under the hypothyroidism, hyperthyroidism, subclinical hypothyroidism, subclinical hyperthyroidism, and other thyroid related infections. All the findings were presented in an orderly manner and analyzed.

Statistical Analysis: Data collected were tabulated and inputted in Microsoft Excel spreadsheets and a SPSS software version 27.0 was used to analyze the data. The data was summarized using descriptive statistics such as mean, standard deviation and percentage. Chi-square test was used to evaluate the relationship between the variables that were categorical and the student t-test or ANOVA was used to evaluate the relationship between the continuous variables where needed. A p-value below 0.05 was regarded to be significant.

Result

The demographic features of the research participants are provided in Table 1 (n = 80). Most of the patients (37.5) were in the age category of between 31-45 years, another group of 27.5 factors between 46-60 years, 22.5 of between 18-30 years, and 12.5 of above 60 years. The proportion of females in the study population (72.5%-constitutes majority) was higher than that of males (27.5%-constitutes minority) showing that females were prevalent or had higher partaking in the state of the study. In terms of residence, 56.2% of partakers were rural with 43.8% being urban-based indicating that a slight majority were rural in origin. On the whole, the population of the study was dominated by the middle-aged, female and rural representatives.

Table 1: Demographic Characteristics of Study Participants (n = 80)

Parameters	Number of Patients (n)	Percentage (%)
Age Group (years)		
18–30	18	22.5
31–45	30	37.5
46–60	22	27.5
>60	10	12.5
Gender		
Male	22	27.5
Female	58	72.5
Residence		
Urban	35	43.8
Rural	45	56.2

Table 2 shows how the patients are distributed based on the type of thyroid disorder. Hypothyroidism was the most common between the total 80 patients under study with 34 patients (42.5%), and the second common was hyperthyroidism with 20 patients (25%). The subclinical hypothyroidism was found in 18 cases (22.5% and subclinical hyperthyroidism in 6 cases (7.5%). Only a few small numbers of patients were diagnosed with other thyroid conditions like goiter or thyroiditis; 2 cases (2.5%). This distribution shows that hypothyroidism and its subclinical variant among them have been the dominant thyroid abnormalities in the population studied.

Table 2: Distribution of Patients According to Type of Thyroid Disorder

Type of Thyroid Disorder	Number of Patients (n)	Percentage (%)
Hypothyroidism	34	42.5
Subclinical Hypothyroidism	18	22.5
Hyperthyroidism	20	25
Subclinical Hyperthyroidism	6	7.5
Other thyroid disorders (e.g., goiter, thyroiditis)	2	2.5
Total	**80**	**100**

The proportion of patients having clinical manifestations of thyroid disorders is shown in Table 3. Fatigue or weakness was reported and occurred most frequently in 68.8% of the patients, then there was a weight change which was reported in 52.5. The intolerance of cold was observed in 37.5% of the patients, goiter/neck swelling, and loss of hair were observed in 35 and 31.3 percent of the patients respectively. Irregular menstrual cycles in female patients were reported in 27.5 and palpitations were reported by 25 percent of the participants that participated in the study. The commonest symptom was heat intolerance with 22.5% of the patients reporting heat intolerance with only 12.5% of patients reporting tremors. Such observations reveal that the most common clinical manifestations amongst patients with thyroid disorders included nonspecific symptoms of fatigue, weight changes and cold intolerance.

Table 3: Clinical Manifestations among Patients with Thyroid Disorders

Clinical Feature	Number of Patients (n)	Percentage (%)
Fatigue/Weakness	55	68.8
Weight changes	42	52.5
Cold intolerance	30	37.5
Heat intolerance	18	22.5
Palpitations	20	25
Goiter/Neck swelling	28	35
Hair loss	25	31.3
Menstrual irregularities (in females)	22	27.5
Tremors	10	12.5

Table 4 shows the biochemical profile of the patients with different thyroid disorders; there are specific differences in the serum T3, T4 and TSH. The average concentration of T3 and T4 (65 ± 10ng/dL and 3.5 ± 1.2 mcg/dl respectively) was much lower than the normal level and the mean TSH level (18.6 ± 6.2 mcg/dl) was much higher, which means low activity of the thyroid gland. The subclinical hypothyroid patients exhibited mildly reduced levels of T3 and T4 with moderately increased levels of TSH (9.2 ± 3.4 µIU/mL). In hyperthyroidism on the other hand, T3 (205 ± 25 ng/dL) and T4 (13.8 ± 3.6 µg/dL) were increased above normal and TSH (0.12 ± 0.06 µIU/mL) was highly suppressed. Subclinical hyperthyroidism had almost normal values of T3 and T4 with a slight reduction in TSH (0.30 ± 0.09 µIU/mL). These results are indicative of the general biochemical changes in relation to the various thyroid functional conditions.

Table 4: Biochemical Profile of Patients with Thyroid Disorders

Thyroid Disorder	Mean T3 (ng/dL)	Mean T4 (µg/dL)	Mean TSH (µIU/mL)
Hypothyroidism	65 ± 10	3.5 ± 1.2	18.6 ± 6.2
Subclinical Hypothyroidism	90 ± 12	5.8 ± 1.5	9.2 ± 3.4
Hyperthyroidism	205 ± 25	13.8 ± 3.6	0.12 ± 0.06
Subclinical Hyperthyroidism	145 ± 18	10.6 ± 2.5	0.30 ± 0.09
Normal Range	80–180	4.5–12.0	0.4–4.2

Table 5 represents the relationship between the thyroid disorders and the lipid profile with some significant differences observed between hypothyroidism, hyperthyroidism, and subclinical thyroid disorders. Hypothyroid patients had a much higher level of total cholesterol (220 ± 35mg/dL), LDL (135 ± 22 mg/dl), and triglycerides (180 ± 30 mg/dl) than the other groups and showed a propensity towards dyslipidemia. On the other hand, patients with hyperthyroidism displayed significantly lower amounts of total cholesterol (145 ± 25 mg/dL), LDL (90 ± 20 mg/dl) and triglycerides (110 ± 25mg/dl) which are indicators of hyper metabolism and therefore high rate of lipid turnover. The highest level of HDL was found in the hyperthyroid patients (58 ± 10 mg/dL) and lowest level of HDL in the hypothyroid patients (42 ± 8 mg/dL) indicating high lipid clearance in hyperthyroidism. Subclinical thyroid diseases showed mid-range lipid levels, which showed a slight change in lipid metabolism than the explicit thyroid pathology.

Table 5. Correlation between Thyroid Disorders and Lipid Profile			
Lipid Parameter (mg/dL)	**Hypothyroidism (n=34)**	**Hyperthyroidism (n=20)**	**Subclinical Thyroid Disorders (n=24)**
Total Cholesterol	**220 ± 35**	**145 ± 25**	**190 ± 28**
LDL	**135 ± 22**	**90 ± 20**	**120 ± 18**
HDL	**42 ± 8**	**58 ± 10**	**48 ± 9**
Triglycerides	**180 ± 30**	**110 ± 25**	**155 22**

Discussion

The current clinical research comprehensively explored demographic, biochemical, and metabolic features of thyroid diseases in patients who visit a tertiary care facility. The results give a detailed picture of the epidemiological and hormonal patterns related to the thyroid dysfunction in this group of people. Thyroid disorders were the most common in the middle-aged group of adults particularly in ages between 3145 years and then 4660 years. Such a trend is in line with other studies by Strieder et al. (2003) [9] who reported prevalence of thyroid abnormalities to be higher in adults, particularly women in the third decade of their lives, which they attribute to hormonal and autoimmune causes. On the same note, Wiersinga (1995) [10] indicated that thyroid dysfunctions were more prevalent in the adult population compared to the young populations and subclinical hypothyroidism and hypothyroidism were the most common types. These are reproducible and support the idea that thyroid disease is a peculiarity of the middle age, which can be associated with a cumulative effect of endocrine and metabolic stressors.

The research revealed that the gender gap was high since 72.5 percent of the respondents are females. This observation is consistent with the previous results of Alam Khan et al. (2002) [11] who observed that women are highly prone to thyroid dysfunctions as a result of hormonal changes triggered by pregnancy, menstruation and menopause. It was also reported that the frequency of autoimmune thyroid disorders is much higher in women (Strieder et al., 2003) [9] which may be explained by the impact of estrogen on the immune control. On the other hand, a recent study by Gerenova et al. (2003) [12] revealed a comparatively smaller gender difference in cases of surgical treatment of thyroid disease, which could be due to the fact that males seek care later when there is clear evidence of disease. Therefore, although the high number of females with thyroid disease is a steady trend, it differs according to the factors of the population and access to healthcare.

Distribution wise, hypothyroidism emerged as the most widespread thyroid disease with hyperthyroidism and subclinical conditions as the subsequent ones. This aligns with the trends in the world showing that hypothyroidism, both blatant and non-blatant, is almost two-thirds of thyroid diseases (Morgan et al., 1994) [13]. Wiersinga (1995) [10] also found that subclinical hypothyroidism was 8 percent of thyroid dysfunctions whereas overt hypothyroidism was 8 percent and a confirmation that thyroid hypofunction takes the center stage in most population. The findings of our study are quite similar, as they also demonstrate a similar preponderance of cases of hypothyroidism. Gerenova et al. (2003) [12], however, indicated that there was an increased incidence of hyperthyroid conditions in Graves' disease patients indicating that etiology and status of the iodine nutrition might contribute to the distribution of the disease.

In terms of clinical manifestations, fatigue and weakness developed as the most common ones, and weight change, cold intoleration, and goiter followed. Simon et al. (2002) [14] added these nonspecific yet classical symptoms, adding that both hypo- and hyperthyroidism may present with mood, energy and metabolic changes that are easily confused with a psychiatric disorder. The cold intolerance, loss of hair and menstrual irregularities were very frequent in the present study which is consistent with findings by Ladenson (2003) [15] who stated that these were characteristic signs of thyroid hormone deficiency. On the other hand, the fact that palpitations, tremors, and heat intolerance are manifested in hyperthyroid individuals is well-substantiated by the findings of Morreale de Escobar et al. (2004) [16] who emphasized the hypermetabolic effect of increased thyroid hormones on cardiovascular systems and neuromuscular systems.

The present study biochemical results were in line with the clinical classification of thyroid disorders. According to Morgan et al. (1994) [13], hypothyroid patients had low T3 and T4 and significantly elevated TSH, which indicates primary thyroid failure. On the same note, subclinical cases of hypothyroidism expressed moderately high TSH with almost normal levels of thyroid hormone, which was an indication of early disease stages as Wiersinga (1995) indicates [10]. Conversely, hyperthyroid subjects were characterized by an increase in T3 and T4 and inhibition in TSH, which is indicative of negative feedback control, which the Strieder et al. (2003) [9] found to be a consistent biochemical symptom of hyperthyroidism.

Amazingly, thyroid status had a significant effect on lipid metabolism in the current study. The hypothyroid patients had increased total cholesterol, LDL and triglycerides and reduced HDL levels whereas

hyperthyroid patients had the reverse. This result compliments that by Alam Khan et al. (2002) [11], who found that hypothyroidism caused hypercholesterolemia by lowering the activity of the LDL receptors and obstructing the lipid clearance. Also, Schulze et al. (2003) [17] showed that even subclinical hypothyroidism could impact negatively on the lipid parameters, predisposing them to cardiovascular dangers. On the contrary, patients who are hyperthyroid are less likely to have lipid since there is an increase in lipolysis and hepatic LDL receptor (Wiersinga, 1995) [10]. These alterations in metabolism emphasize the need to measure lipid profile in all thyroid patients to identify early risks to cardiovascular disease and manage it.

The high prevalence of hypothyroidism and high occurrence of females in the rural population of this study could also be because of difference in dietary iodine and inequality in the access to healthcare. The differences in iodine intake by the variations in the regions and seasons may contribute to the stimulation of thyroid hormone synthesis and the increased prevalence of thyroid disorder in rural populations. Poor nutritional supplementation, limited awareness and accessibility to diagnostic facilities within the regions can also increase the burden of thyroid dysfunction. Also, women in rural areas are possibly at a disadvantage because of physiological factors like pregnancy, and lactation, which raise the level of iodine requirement and expose them to hypothyroidism in cases where dietary intake is not adequate.

Conclusion

The current research indicates that thyroid diseases are prevalent in middle-aged adults, whereby there is significant prevalence in females and rural communities. Hypothyroidism was the most common thyroid abnormality, and hyperthyroidism and subclinical forms came second and third with the importance of early diagnosis and frequent follow up. There was a preponderance of nonspecific symptoms, which included fatigue, change in weight and cold intolerance and the biochemical analysis proved the typical changes in T3, T4 and TSH with references to various thyroid conditions. The dyslipidemia witnessed in the hypothyroid patients also emphasizes the metabolic effects of thyroid dysfunction and how it is related to cardiovascular risk. This set of results supports the relevance of regular thyroid screening within high-risk groups in order to diagnose timely, manage properly, and achieve better health outcomes.

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