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Research Article

# ASSESSMENT OF THYROID FUNCTION DISORDERS AMONG THE SUBJECTS ATTENDING CENTRAL LABORATORY OF A TERTIARY CARE HOSPITAL: AN OBSERVATIONAL, CROSS-SECTIONAL STUDY

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**ABSTRACT**

**Objective:** Thyroid disorders are the most common endocrine disorders worldwide and India is not an exception. Several factors may determine the prevalence of thyroid dysfunction including age, gender, geographical and ethnic background, and most importantly iodine intake. Therefore, data related to thyroid disorders from one population cannot be extrapolated to another. In this study, we aimed to assess the disorders of thyroid function among the subjects attending the central laboratory of a tertiary care hospital.

**Methods:** This observational, cross-sectional study was conducted in the Department of Pharmacology and the Department of Biochemistry of the same institute over a period of 3 months. All subjects of either sex attending the central laboratory of the institute for estimating thyroid function on their outpatient visit during the study period were included. Subjects who were on any medications known to alter the thyroid hormone status or diagnosed with a thyroid disorder and/or on therapy were excluded. A pre-designed and pre-tested data collection form was used for taking interviews to collect relevant data including sociodemographic characteristics, comorbid conditions, thyroid illness, and investigational reports.

**Results:** A total of 132 subjects were included in the study. The majority of them were female (72.27%) and residents of urban areas (52.27%). The most common comorbid conditions and presenting symptoms were hypertension (25.76%) and fatigue (46.97%), respectively. The majority of the subjects were found to be euthyroid (81.81%). About 18.19% of the study subjects were having thyroid disorders, most commonly subclinical hypothyroidism (SCH) (13.64%), followed by primary hypothyroidism (2.27%), secondary hyperthyroidism (1.52%), and subclinical hyperthyroidism (0.76%). Thyroid disorders were mainly found in females, such as primary hypothyroidism (66.67%), SCH (66.67%), and subclinical hyperthyroidism (100%). The majority of the thyroid disorders were found in the age group of 26–50 years (20.27%), where females were found to have more primary hypothyroidism (3.17%), and SCH (12.70%).

**Conclusion:** The findings of our study call for a review of current practices regarding thyroid disorders to include active screening of thyroid function among the subjects at greater risks and an emphasis on regular monitoring of the thyroid status.

**Keywords:** Thyroid disorders, Cross-sectional, Tertiary care hospital, Central laboratory.

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## INTRODUCTION

Thyroid dysfunction is a group of illnesses that can show up as hypo or hyperfunctioning thyroid glands, as indicated by levels of thyroid stimulating hormone (TSH), thyroxin (T4), and triiodothyronine (T3) in the blood. Thyroid hormone abnormalities may be the primary cause of pituitary illnesses, secondary to thyroid gland diseases, or tertiary to hypothalamic diseases [1].

The most prevalent endocrine illnesses in the world are thyroid problems. The iodine shortage affects over 1 billion individuals globally; however, it is unclear how frequently this results in hypothyroidism [2]. Geographical location affects the prevalence of thyroid disorders. For instance, the general population's prevalence of overt hypothyroidism varies between 0.2% and 5.3% in Europe [3,4] and between 0.3% and 3.7% in the USA [5]. This number may potentially be greater, ranging from 4% to 15% in the industrialized world, when overt hypothyroidism and subclinical hypothyroidism (SCH) are taken into account [6,7].

In this sense, India is no exception. Out of all the endocrine diseases, thyroid disorders are the most prevalent in India [8]. With a population of around 1.25 billion, an estimated 42 million people suffer from thyroid disorders [8,9]. In India, the prevalence of SCH and overt hypothyroidism is between 4% and 5% [6,9]. There are not many researches that evaluate the prevalence of thyroid problems in India. But there is a lot of variety among those, ranging from 15% to 25% [10-14].

The frequency of thyroid dysfunction may vary depending on several factors. These include age, gender, geography, ethnic background, and iodine intake – the last being the most crucial. As a result, information about thyroid conditions from one community cannot be generalized to another. Thyroid diseases persist in many parts of India despite the National Iodine Deficiency Diseases Control Program being successfully implemented and widely covered [15]. All of these suggest that thyroid diseases are not receiving enough attention [16].

In this study, we aimed to assess the thyroid function disorders among the subjects attending the central laboratory of a tertiary care hospital.

## METHODS

This observational, cross-sectional study was conducted in the Department of Pharmacology and the Department of Biochemistry of the same institute over 3 months, from March to May 2024.

All subjects of either sex attending the Central Laboratory, Medical College, Kolkata for estimating thyroid function on their outpatient visit during the study period, and willing to give written informed consent to participate in the study were included. On the other hand, subjects on any medications known to alter the thyroid hormone status were excluded. Patients already diagnosed with a thyroid disorder and/or on therapy were also excluded.

To collect pertinent data, interviews were conducted using a pre-tested and pre-designed data collection form. The research participants were enlisted in 3 days a week. Information was gathered about co-occurring diseases, thyroid disorders, sociodemographic traits, and investigative reports.

**Subjects were classified using the following definitions**

| Parameters | Definition |
|---|---|
| Primary hypothyroidism | TSH >4.78 mIU/mL and fT4 <0.8 ng/dL or fT3 <60 ng/dL |
| Subclinical hypothyroidism | TSH >4.78 mIU/mL and normal fT4, normal fT3 |
| Secondary hypothyroidism | fT4 <0.8 ng/dL or fT3 <60 ng/dL and a TSH level that is not appropriately elevated |
| Hyperthyroidism | TSH <0.4 mIU/mL and fT3 >180 ng/dL or fT4 >1.76 ng/dL |
| Subclinical hyperthyroidism | TSH <0.4 mIU/mL and normal fT3, normal fT4 |
| Secondary hyperthyroidism | fT3 >180 ng/dL or fT4 >1.76 ng/dL and a TSH level that is not appropriately suppressed |

TSH: Thyroid stimulating hormone, fT4: free T4, fT3: free T3

The subjects were questioned face-to-face by the investigator using a pre-tested, pre-designed, three-part data-collecting form after giving their consent to participate in the study. The demographic information in Part 1 included data on age, sex, place of residence, employment, level of education, marital status, and addiction. Part 2 of the data collection form was used to gather information about thyroid disease and other comorbidities. Part 3 was utilized to collect data from the investigative reports following 5 days of blood collection from the Central Laboratory, Department of Biochemistry. The collected data were transcribed into an Excel database and made ready for analysis.

## RESULTS

A total of 201 study participants were recruited, 69 of them were on medications for thyroid disorders. Hence, after excluding them a total of 132 subjects were included in the study.

The mean age of the study subjects was 39.71±15.09 years. The majority of the subjects were female (72.27%), belonging to the age group of 26–50 years (50.06%), residents of the urban area (52.27%), completed primary level of education (41.67%), married (86.36%), and housewife (56.82%). The majority of them were non-smokers (94.7%), non-alcoholic (98.48%), and did not chew tobacco (83.33%). About 6.06% of the subjects had a positive family history of thyroid disorders. The demographic profile of the study subjects is presented in Table 1.

The distribution of study subjects according to age and sex is presented in Fig. 1.

Hypertension (25.76%) was the most common comorbid condition of the study subjects followed by diabetes mellitus (12.12%) and dyslipidemia (12.12%). Comorbid conditions of the study subjects are presented in Fig. 2.

The majority of the subjects were presented with fatigue (46.97%), followed by generalized body pain/joint/muscle pain (26.52%), and weight gain (15.91%). Other symptoms were irregularity of menstruation (15.15%), infertility (11.36%), and swelling of the anterior aspect of the neck (5.3%). Presenting complaints of the participants are presented in Fig. 3.

A total of 108 (81.81%) subjects were found to be euthyroid. About 18.19% of the study subjects had thyroid disorders, most commonly SCH (13.64%), followed by primary hypothyroidism (2.27%), secondary hyperthyroidism (1.52%), and subclinical hyperthyroidism

**Table 1: Demographic profile of the study subjects**

| Parameter | Distribution (N=132) | Percentage |
|---|---|---|
| Sex | | |
| Male | 30 | 27.73 |
| Female | 102 | 72.27 |
| Age | | |
| 1–25 years | 24 | 18.18 |
| 26–50 years | 74 | 50.06 |
| >50 years | 34 | 31.76 |
| Residence | | |
| Rural | 63 | 47.73 |
| Urban | 69 | 52.27 |
| Education | | |
| Illiterate | 26 | 19.70 |
| Primary | 55 | 41.67 |
| Secondary | 30 | 22.73 |
| HS | 10 | 7.58 |
| College | 11 | 8.32 |
| Profession | | |
| Student | 7 | 5.3 |
| Housewife | 75 | 56.82 |
| Unemployed | 16 | 12.12 |
| Employed | 6 | 4.55 |
| Self-employed | 28 | 21.21 |
| Marital status | | |
| Never married | 13 | 9.8 |
| Married | 114 | 86.36 |
| Widowed | 5 | 3.79 |
| History of alcohol intake | | |
| Yes | 2 | 1.52 |
| No | 130 | 98.48 |
| History of smoking | | |
| Yes | 7 | 5.3 |
| No | 125 | 94.7 |
| History of tobacco chewing | | |
| Yes | 22 | 16.67 |
| No | 110 | 83.33 |
| Family history of thyroid disorder | | |
| Positive | 8 | 6.06 |
| Negative | 124 | 93.94 |

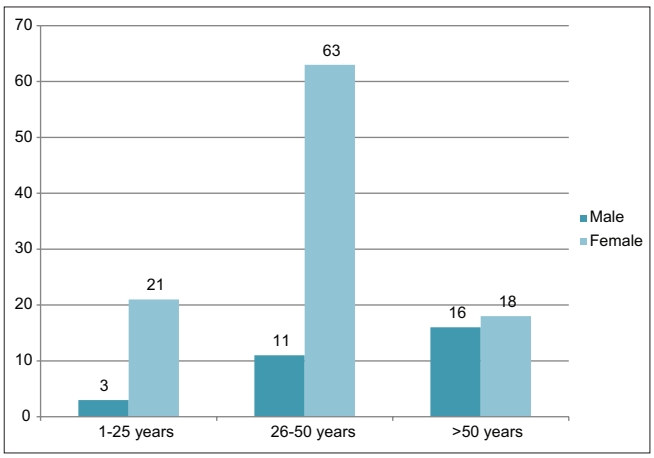


**Fig. 1: Distribution of study subjects according to age and sex (n=132)**

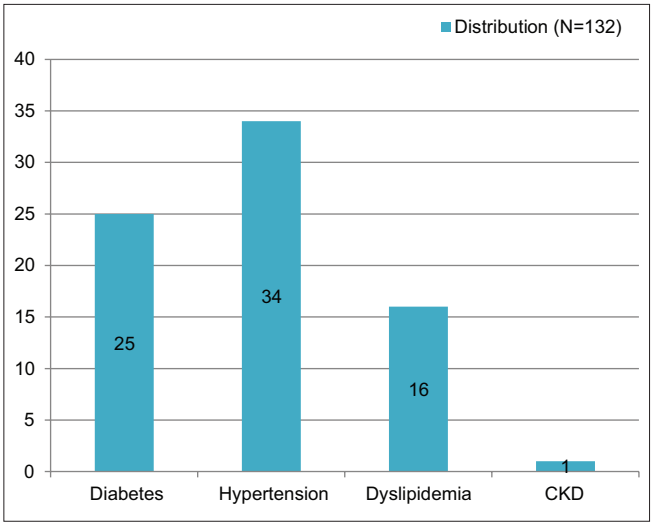


**Fig. 2: Comorbid conditions of the study subjects**

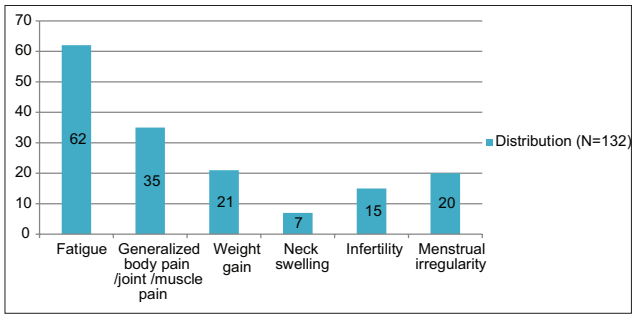


**Fig. 3: Presenting symptoms of the study subjects**

(0.76%). Thyroid disorders in the study subjects are presented in Table 2.

Most of the disorders of thyroid function were commonly found among the females. These included primary hypothyroidism (66.67%), SCH (66.67%), and subclinical hyperthyroidism (100%). Secondary hyperthyroidism was equally found among both the sexes. Thyroid disorders based on gender are presented in Table 3.

The majority of the thyroid disorders were found in the age group of 26–50 years (20.27%), followed by the age group of >50 years (17.65%). In the age group of 26–50 years, females were found to have more primary hypothyroidism (3.17%), and SCH (12.70%). Secondary hyperthyroidism was found to be more common among males (9.09%) than females (1.59%) in this age group. Males were predominant in having thyroid disorders over 50 years (25%) compared to females (11.11%). In this age group, males were found to have more primary hypothyroidism (6.25%), and SCH (18.75%). In the age group of 1–25 years, no male was found to have thyroid disorders. In this age group, 9.52% of the females had SCH. The only subject of subclinical hyperthyroidism was a female belonging to this age group. Thyroid disorders based on gender and different age groups are presented in Table 4.

## DISCUSSION

The current study was carried out at the central laboratory of a tertiary care institution to determine the prevalence of thyroid function problems among the participants undergoing an estimate of thyroid function tests. In this study, 18.19% of the participants had abnormal thyroid function. This high frequency of thyroid problems is consistent with previous data from Gopaliah *et al.* (15.73%) [17] and Unnikrishnan (19.6%) from Cochin [10].

**Table 2: Thyroid disorders in the study subjects**

| Thyroid disorders | Distribution (N=132) | Percentage |
|---|---|---|
| Primary hypothyroidism | 3 | 2.27 |
| Subclinical hypothyroidism | 18 | 13.64 |
| Subclinical hyperthyroidism | 1 | 0.76 |
| Secondary hyperthyroidism | 2 | 1.52 |
| Total subjects with thyroid disorders | 24 | 18.18 |

**Table 3: Thyroid disorders based on gender**

| Thyroid disorders | All subjects (N=132) n (%) | Gender | |
|---|---|---|---|
| | | Male (N=30) n (%) | Female (N=102) n (%) |
| Primary hypothyroidism | 3 (2.27) | 1 (3.33) | 2 (1.96) |
| Subclinical hypothyroidism | 18 (13.64) | 6 (20) | 12 (11.76) |
| Secondary hyperthyroidism | 2 (1.52) | 1 (3.33) | 1 (0.98) |
| Subclinical hyperthyroidism | 1 (0.76) | 0 | 1 (0.98) |
| Total subjects with thyroid disorders | 24 (18.18) | 8 (26.67) | 16 (15.69) |

According to the current study, males had a higher prevalence of thyroid dysfunction (26.67%) than females (15.69%). This, however, contradicts recent Indian studies that found a higher prevalence of thyroid problems in females [11-14].

Approximately 13.64% of the study subjects had the most prevalent thyroid function anomaly, which we identified to be the SCH. This was comparable to other cross-sectional investigations that were carried out in Delhi (19.3%) and Cochin (9.4%) [11,14]. However, in our study, men (20%) were more likely than women (11.76%) to have SCH. Gopaliah *et al.* found that SCH was more common in females (11.76%) than in males (5.71%) in their study [17].

According to multiple studies, the age range of 20–45 years had the highest prevalence of SCH, followed by ≥46 years, whereas the age group of 1–19 years had the lowest frequency. According to this research, the prevalence of SCH rises with age [11,12]. According to our research, SCH was most prevalent in the 26–50-year-old age group (14.86%), followed by the >50-year-old age group (14.70%). In the age range of 1–25 years, SCH was found to be the least common (8.3%).

In our investigation, hypothyroidism – which affected 2.27% of the participants – was found to be the second most prevalent thyroid condition. This was comparable to a small number of population-based investigations carried out in Cochin (3.9%) and Delhi (4.2%) [11,14]. The frequency of hypothyroidism was determined to be 4.2% by Gopaliah *et al.* [17]. However, the prevalence rate of hypothyroidism varies from 8.88% to 21.67% depending on the research location [12]. Thyroid dysfunction is not limited to the traditional iodine-deficient sub-Himalayan region; rather, it is also seen in plain lands and areas where the majority of people consume iodized salt, as evidenced by the high prevalence rate in Cochin and Delhi.

In our study, hyperthyroidism affected 1.52% of survey participants; males were more likely to have it (3.33%) than females (0.98%). Nevertheless, 2.77% of participants in the Gopaliah *et al.* study were found hyperthyroid; this condition is more common in girls than in males [17]. Prior research from Pondicherry's Abraham *et al.* [13] and Cochin's Unnikrishnan and Menon [10] revealed that the prevalence of overt hyperthyroidism was 1.2% and 1.3%, respectively.

According to the current study, the prevalence of subclinical hyperthyroidism in people aged 1–25 was 0.76%. This is smaller than

**Table 4: Thyroid disorders based on gender and different age groups**

| Parameter | All subjects | 1–25 years | | 26–50 years | | >50 years | |
|---|---|---|---|---|---|---|---|
| | | Male (n=3) | Female (n=21) | Male (n=11) | Female (n=63) | Male (n=16) | Female (n=18) |
| Primary hypothyroidism | 3 | 0 | 0 | 0 | 2 | 1 | 0 |
| Subclinical hypothyroidism | 18 | 0 | 2 | 3 | 8 | 3 | 2 |
| Secondary hyperthyroidism | 2 | 0 | 0 | 1 | 1 | 0 | 0 |
| Subclinical hyperthyroidism | 1 | 0 | 1 | 0 | 0 | 0 | 0 |

what was found in research by Gopaliah *et al*., where the prevalence was reported to be 1.60% [17]. Analogous to our research, prior investigations have documented a prevalence rate of subclinical hyperthyroidism ranging from 0.6% to 1.6% [11,13].

## CONCLUSION

The findings of our study call for a review of current practices regarding thyroid disorders to include active screening of thyroid function among the subjects at greater risks and an emphasis on regular monitoring of the thyroid status.

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## AUTHORS' CONTRIBUTIONS

The study protocol was prepared by Alak Kumar Das. Sreyashi Ray was associated with the collection of data. The manuscript was prepared by Jinia Ghosh and Alak Kumar Das.

## CONFLICT OF INTEREST

There is no conflict of interest.

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