



IJCRR

Section: Healthcare

 Sci. Journal  
 Impact Factor  
 4.016

# PREVALENCE OF THYROID DISORDERS IN A TERTIARY CARE CENTER

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## ABSTRACT

**Background:** Thyroid disorders are a widespread endocrinological problem, but data on its prevalence in India is scanty.

**Aims & Objective:** The aim of the present study was to assess the proportion of various thyroid disorders in subjects attending a tertiary care center.

**Material and Methods:** This retrospective hospital based study involved 2076 patients who underwent thyroid function test, in the central clinical biochemistry. Thyroid function tests were performed on Siemens Centaur immunoassay analyzer. Statistical analysis was performed by SPSS version 16 software.

**Results:** We found 22.16% subjects having thyroid dysfunction in our study population. Out of these, 4.24% were overt hypothyroid, 9.44% were subclinical hypothyroid, 2.5% overt hyperthyroid and 5.97% were found to be subclinical hyperthyroid.

**Conclusion:** Our study suggested that the prevalence of thyroid disorders in our study population is high and hypothyroidism is more common than hyperthyroidism. Highest prevalence of thyroid disorder was found in 30-49 years age group. The mean TSH concentration increased with age in euthyroid, hypothyroid (both overt and subclinical) and hyperthyroid (both overt and subclinical) groups studied. The highest TSH concentration was seen in the age group 60- 69 years and lowest TSH was seen in age group 10 – 19 years.

**Key Words:** Hypothyroidism, Hyperthyroidism, TSH

## INTRODUCTION

Diseases of the thyroid gland are among the most abundant endocrine disorders worldwide second only to diabetes, India is no exception. Recent report shows that 300 million people in the world are suffering from thyroid disorders and among them about 42 million people reside in India.<sup>1</sup>

Thyroid disorders are more common in women than in men. One in every eight women during their life time has risk for thyroid disorder. The exact reason is not known. The higher prevalence in females may be associated with estrogen and progesterone.<sup>1</sup>

Our understanding of the effects of thyroid hormones under physiological circumstances, as well as in pathological conditions, has increased dramatically during the last two centuries and it has become clear that overt thyroid dysfunction is associated with significant morbidity and mortality. Both hypothyroidism and hyperthyroidism have been linked

with increased risk from cardiovascular disease and the adverse effects of thyrotoxicosis in terms of osteoporosis risk are well established. Hypothyroidism itself contributes to morbidity from osteoporosis, hyperlipidemia, hypercholesterolemia, cardiovascular and neuropsychiatry disease in the population. The seriousness of thyroid disorders should not be underestimated as thyroid storm and myxedema coma can lead to death in a significant number of cases.<sup>2,3</sup>

Furthermore the prevalence and pattern of thyroid disorders depends on sex, age, ethnic and geographical factors and especially on iodine intake. After successful salt iodination adopted by the Indian government, World Health Organization assessment status classified India as having optimal iodine nutrition in 2004. Still thyroid disorders especially hypothyroidism, both subclinical and overt, contributes significantly to burden of thyroid disorders in India.

Data available on the prevalence of hypothyroidism and hyperthyroidism for Indian population is scanty.<sup>4,5</sup>

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Received: 23.08.2015

Revised: 22.09.2015

Accepted: 25.10.2015

The present study aimed to carry out hospital based study on the proportion of various thyroid disorders. We therefore evaluated cases with high suspicion of thyroid disorders over a six month period to estimate proportion of various thyroid disorders in subjects attending our tertiary care centre.

## MATERIAL AND METHODS

Serum of individuals with suspicion of thyroid dysfunction was subjected to thyroid profile (Total T4, Total T3, Free T4, Free T3 and TSH) using Siemens Centaur immunoassay analyzer. The TSH levels of serum samples were analyzed using a 3rd generation chemiluminescence sandwich immunoassay. The analytical sensitivity was 0.004  $\mu$ IU/ml. The T3, T4, FT4 and FT3 levels were also analysed by chemiluminescent immunoassay using Siemens Centaur immunoassay analyzer. The laboratory's reference values were TSH: 0.55- 4.78  $\mu$ IU/ml; fT3: 2.3- 4.2 pg/ml; fT4: 0.89- 1.76 ng/dl; T3: 60 -181 ng/dl and T4: 4.5- 12.60  $\mu$ g/dl. Analytical sensitivity was 0.004  $\mu$ IU/ml for TSH, 0.4  $\mu$ g/dl for T4, 35 ng/dl for T3, 0.05 ng/dl for FT4 and 1.0 pg/ml for FT3. Coefficient of variation was < 10% for TSH, T4, T3, FT4 and FT3. Hypothyroidism was classified as clinical (overt) if TSH was  $\geq$  4.78  $\mu$ IU/ml and FT4  $\leq$  0.89 ng/dL or T4  $\leq$  4.5  $\mu$ g/dl and subclinical if TSH was  $\geq$  4.78  $\mu$ IU/ml and FT4 / T4 was within the reference range. Hyperthyroidism was classified as clinical (overt) if TSH was  $\leq$  0.55  $\mu$ IU/ml and FT4  $\geq$  1.76 ng/dL or T4  $\geq$  12.6  $\mu$ g/dl and subclinical if TSH was  $\leq$  0.55  $\mu$ IU/ml and FT4 and T4 was within the reference range.

### Statistical Analysis

The data collected were analyzed using Excel 2007, R2.8.0 Statistical Package for Social Sciences (SPSS) for windows version 16.0 (SPSS Inc.; Chicago, IL, USA). We calculated the odds ratio (OR) and their 95% Confidence Interval (95% CI).

The study was carried out over a period of 6 months (June 2014- November 2014). 2076 subjects (250 males; 1826 females) formed part of the study.

## RESULTS

The current study was a retrospective hospital based study, carried out from June 2014 – November 2014 (6 months) involving 2076 subjects (250 males and 1826 females) with suspicion of thyroid disorder who were subjected to thyroid function assay. The highest number was in the 20- 29 age group (34.29 %) and lowest number in the 60-69 age group (5.1%). Out of 2076 with suspected thyroid disorder, 77.84% (n=1616; 1442 F and 250 M) were categorized as euthyroid.

The distribution of various thyroid disorders is depicted in fig 1. The overall frequency of thyroid disorders along with percentage and 95% CI are described in Table 1 and table 2 while gender wise distribution given in Table 3 and table 4.

Subclinical hypothyroidism was detected in 9.44% subjects (n=196; 164F and 32M). 4.24% (n=88; 66F and 22M) individuals were overt hypothyroid with elevated levels of TSH and low levels of total T3 / fT3 and total T4/ fT4 in serum. 2.5% (n=52; 40F and 12M) cases had hyperthyroidism and the laboratory findings of thyroid profile showed significant elevation of total T3/ fT3, total T4/ fT4 in serum and low levels of TSH.

Subclinical hyperthyroidism was detected in 5.97% (n=124; 114F and 10M).

The study cohort was divided in six age groups to determine the occurrence of various thyroid disorders in different age groups (Table 4). The age group division was 10-19 years, 20 to 29 years, 30 to 39 years, 40-49 years, 50-59 years and 60-69 years.

In the age 10-19 years age group, out of 106 cases (6 M,100 F), 92 (86.79%) were euthyroid, 6 (5.66%) were subclinical hypothyroid, 4(3.77%) were clinically hypothyroid, 2(1.88%) were subclinical hyperthyroid whereas 2(1.88%) were clinically hyperthyroid. The 20-29 years age group comprised our largest group with suspicion of thyroid disorders. This group consisted of 712 cases (52 M, 660 F), 616 (86.51%) were euthyroid, 46(6.46%) were subclinical hypothyroid, 18(2.52%) were clinically hypothyroid, 20(2.80%) were subclinical hyperthyroid whereas 12(1.68%) were clinically hyperthyroid. In the age 30-39 years age group, out of 612 cases (62 M,550 F), 470(76.79%) were euthyroid, 62 (10.13%) were subclinical hypothyroid, 22 (3.59%) were clinically hypothyroid, 38(6.20%) were subclinical hyperthyroid whereas 20 (3.26%) were clinically hyperthyroid. In the age 40-49 years age group, out of 364 cases (58 M,306 F), 248 (68.13%) were euthyroid, 56 (15.38 %) were subclinical hypothyroid, 22(6.04%) were clinically hypothyroid, 32 (8.79%) were subclinical hyperthyroid whereas 6(1.64%) were clinically hyperthyroid. In the age 50-59 years age group, out of 176 cases (42 M,134 F), 128 (35.16%) were euthyroid, 14 (3.84%) were subclinical hypothyroid, 12 (3.29%) were clinically hypothyroid, 16 (4.39%) were subclinical hyperthyroid whereas 6 (1.64%) were clinically hyperthyroid. In the age > 60 years age group, out of 106 cases (30 M, 76 F), 62 ( 58.49%) were euthyroid, 12(11.32%) were subclinical hypothyroid, 10 (9.43%) were clinically hypothyroid, 16(15.09%) were subclinical hyperthyroid whereas 6 (5.66%) were clinically hyperthyroid.

The mean TSH concentration increased with age in euthyroid, hypothyroid (both overt and subclinical) and hyperthy-

roid (both overt and subclinical) groups studied. The highest TSH concentration was seen in the age group 60- 69 years and lowest TSH was seen in age group 10 – 19 years.

## DISCUSSION

Thyroid disorders are amongst the most common endocrine diseases in India. However data on the prevalence of thyroid disorders in India is relatively scanty. This retrospective hospital based study was carried out from June 2014 – November 2014 (6 months) involving 2076 subjects (250 males and 1826 females) with suspicion of thyroid disorder who were subjected to thyroid function assay.

We found 22.16% subjects having thyroid dysfunction in our study population. Rebecca et al<sup>6</sup> reported prevalence of 15.8 % of thyroid dysfunction in a study conducted on 505 women in Pondicherry whereas Arindam Bose et al<sup>5</sup> found prevalence of 15.35% in central India in their study.

Various studies have reported variable prevalence of subclinical hypothyroidism. We found 9.44% of our population having subclinical hypothyroidism. The Rotterdam study<sup>2</sup> reported an overall prevalence of 10.8% and Rebecca et al found 9.5% prevalence which was very similar to our finding. In females above 55 years of age, the prevalence was much higher 12.5% as reported by Rebecca et al (our study 9.52% women above 50 years had subclinical hypothyroidism). Colorado study<sup>7</sup> and NHANES III<sup>8</sup> study found 9.5% (TSH >5.1  $\mu$ IU/ml) and 4.3% prevalence of subclinical hypothyroidism respectively. Other studies reported prevalence of 9.4%<sup>9</sup>, 11%<sup>10</sup>, 6.31%<sup>5</sup>. The prevalence of overt hypothyroidism in our study population was 4.24%. Rebecca et al reported 2%, a study from Cochin on 971 adults revealed 3.9%<sup>9</sup> subjects to be hypothyroid whereas Rotterdam study and study by Arindam Bose et al reported 1.1% and 7.45% respectively.

Our study population revealed 5.97% subjects to be subclinical hyperthyroid whereas 2.5% were overt hyperthyroid. Rebecca et al reported 1.8% of their study population to be hyperthyroid out of which 1.2% were overt hyperthyroid and 0.6% were subclinical hyperthyroid. Arindam Bose et al reported 1.79% as hyperthyroid in their study whereas the Hoogendoorn<sup>11</sup> study found 0.4% o and 0.8% prevalence of overt and subclinical hyperthyroidism respectively.

Our study suggested that the prevalence of thyroid disorders in our study population is high and hypothyroidism is more common than hyperthyroidism. The prevalence of subclinical hypothyroidism (9.44 %) as well as subclinical hyperthyroidism (5.97%) is much higher than overt hypothyroidism (4.24%) or overt hyperthyroidism (2.5%).

Various studies have shown female preponderance in thyroid disorders. However we found male preponderance (24.7% vs. 18.2%). We believe this bias was introduced in the study since more number of females with complaints of menstrual irregularity, PCOS, infertility were subjected to thyroid function test as a part of routine protocol. However, only those males with suspicion of thyroid disorders were subjected to TFT.

Also, we found that highest no of subjects with hypothyroidism (both overt and subclinical) was between 30-49 years age group. Other studies like Arindam Bose et al (19-45 years), Vanderpump MP et al<sup>12</sup> (34 years & above) have reported similar age groups. The mean TSH value was found to increase with age in euthyroid, hypothyroid (both overt and subclinical) and hyperthyroid (both overt and subclinical) subjects. Similar finding was reported by Rebecca et al. Several other workers have reported an increase in TSH with age however Hoogendoorn et al<sup>12</sup> found decrease in mean TSH level with age.<sup>2,7,12,13,14</sup>

## CONCLUSION

Our study suggested that the prevalence of thyroid disorders in our study population is high and hypothyroidism is more common than hyperthyroidism. Highest prevalence of thyroid disorder was found in 30-49 years age group. The mean TSH concentration increased with age in euthyroid, hypothyroid (both overt and subclinical) and hyperthyroid (both overt and subclinical) groups studied. The highest TSH concentration was seen in the age group 60- 69 years and lowest TSH was seen in age group 10 – 19 years. We found male preponderance (24.7% vs. 18.2%). We believe this bias was introduced in the study since more number of females with complaints of menstrual irregularity, PCOS, infertility were subjected to thyroid function test as a part of routine protocol. However, only those males with suspicion of thyroid disorders were subjected to TFT. The finding that a large number of subjects unknowingly have laboratory evidence of thyroid dysfunction supports the usefulness of screening of thyroid function after age of 30 years, for early detection and treatment to reduce the ill effects of thyroid dysfunction.

## ACKNOWLEDGEMENT

The authors are grateful to the dean for permitting to publish this article. Authors acknowledge the immense help received from the scholars whose articles are cited and included in references of this manuscript. The authors are also grateful to authors / editors / publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed.

**Source of funding:** Study is not supported by any organisation.

**Conflicts of interest:** There are no conflicts of interest.

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**Table 1: Overall distribution of thyroid disorders**

| Category                    | No. of patients | percentage | 95% CI |       |
|-----------------------------|-----------------|------------|--------|-------|
|                             |                 |            | LL     | UL    |
| Euthyroid                   | 1616            | 77.84%     | 76     | 79.58 |
| Subclinical hypothyroid     | 196             | 9.44%      | 8.26   | 10.78 |
| Overt hypothyroidism        | 88              | 4.24%      | 3.45   | 5.19  |
| Subclinical hyperthyroidism | 124             | 5.97%      | 5.03   | 7.08  |
| Overt hyperthyroidism       | 52              | 2.50%      | 1.92   | 3.27  |
| Total                       | 2076            |            |        |       |

**Table 2: Distribution of thyroid disorders according to age and sex**

| Age group (years) | Total |     | Euthyroid |     | Subclinical Hypothyroid |    | Overt Hypothyroid |    | Subclinical Hyperthyroid |    | Overt Hyperthyroid |    |
|-------------------|-------|-----|-----------|-----|-------------------------|----|-------------------|----|--------------------------|----|--------------------|----|
|                   | M     | F   | M         | F   | M                       | F  | M                 | F  | M                        | F  | M                  | F  |
| 10 TO 19          | 6     | 100 | 6         | 86  | 0                       | 6  | 0                 | 4  | 0                        | 2  | 0                  | 2  |
| 20 TO 29          | 52    | 660 | 34        | 582 | 10                      | 36 | 2                 | 16 | 2                        | 18 | 4                  | 8  |
| 30 TO 39          | 62    | 550 | 40        | 430 | 8                       | 54 | 10                | 12 | 0                        | 38 | 4                  | 16 |
| 40 TO 49          | 58    | 306 | 42        | 206 | 8                       | 48 | 2                 | 20 | 4                        | 28 | 2                  | 4  |
| 50 TO 59          | 42    | 134 | 34        | 94  | 0                       | 14 | 4                 | 8  | 2                        | 14 | 2                  | 4  |
| 60 TO 69          | 30    | 76  | 18        | 44  | 6                       | 6  | 4                 | 6  | 2                        | 14 | 0                  | 6  |

**Table 3: Distribution of thyroid disorders in males**

| Category                    | No.of patients | Percentage | 95 % CI |       |
|-----------------------------|----------------|------------|---------|-------|
|                             |                |            | LL      | UL    |
| Euthyroid                   | 174            | 69.60%     | 63.64   | 74.97 |
| Subclinical hypothyroid     | 32             | 12.80%     | 9.21    | 17.51 |
| Overt hypothyroidism        | 22             | 8.80%      | 5.88    | 12.96 |
| Subclinical hyperthyroidism | 10             | 4.00%      | 2.19    | 7.21  |
| Overt hyperthyroidism       | 12             | 4.80%      | 2.77    | 8.2   |
| Total                       | 250            |            |         |       |

**Table 4: Distribution of thyroid disorders in females**

| Category                    | No.of patients | Percentage | 95 % CI |       |
|-----------------------------|----------------|------------|---------|-------|
|                             |                |            | LL      | UL    |
| Euthyroid                   | 1442           | 78.97%     | 77.04   | 80.78 |
| Subclinical hypothyroid     | 164            | 8.98%      | 7.75    | 10.38 |
| Overt hypothyroidism        | 66             | 3.61%      | 2.85    | 4.57  |
| Subclinical hyperthyroidism | 114            | 6.24%      | 5.22    | 7.45  |
| Overt hyperthyroidism       | 40             | 2.19%      | 1.61    | 2.97  |
| Total                       | 1826           |            |         |       |

**Table 5: Mean TSH values in different age groups**

|                             | 10-19 years | 20-29years | 30-39years | 40-49years | 50-59years | 60-69years |
|-----------------------------|-------------|------------|------------|------------|------------|------------|
| Euthyroid                   | 2.01        | 2.23       | 2.24       | 2.35       | 2.39       | 2.52       |
| Subclinical hypothyroid     | 4.6         | 6.26       | 6.48       | 6.5        | 6.8        | 7.6        |
| Overt hypothyroidism        | 23.7        | 25.34      | 34.01      | 35.26      | 38.56      | 39.15      |
| Subclinical hyperthyroidism | 0.1         | 0.2        | 0.21       | 0.24       | 0.27       | 0.3        |
| Overt hyperthyroidism       | 0.03        | 0.032      | 0.037      | 0.04       | 0.041      | 0.043      |