

## Prevalence of thyroid dysfunction among young females in a South Indian population

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### ABSTRACT

**Background:** Thyroid disorders are common in India but scarce data exists on its prevalence in young women. **Materials and Methods:** This study was conducted in female college students in seven colleges in Madurai District, Tamil Nadu. Thyroid-stimulating hormone (TSH) was used as the screening test to diagnose thyroid dysfunction. The abnormal TSH values were classified as mild TSH elevation (TSH 4.5–10 mIU/ml), significant TSH elevation (TSH > 10 mIU/ml), and low TSH (TSH < 0.4 mIU/ml). **Results:** A total of 1292 subjects were screened of whom 161 subjects (12.5%) had abnormal TSH. The overall prevalence of elevated TSH was 11% out of which 9.7% had mild TSH elevation. A low TSH was seen in 1.3% of the study population. **Conclusion:** Thyroid dysfunction was common in young women in south India. One out of every eight young women had thyroid dysfunction, and mild TSH elevation was the most common abnormality.

**Key words:** Epidemiology, hyperthyroidism, hypothyroidism, India, prevalence, thyroid-stimulating hormone, women

### INTRODUCTION

It is now well-known that thyroid disorders are common in India. In the past focus have been on iodine deficiency disorders (IDDs). It has been more than three decades since universal salt iodization program was introduced in India.<sup>[1]</sup> India is undergoing a transition from iodine deficient to iodine sufficient state. Studies looking at the prevalence of thyroid disorders in the post-iodization era are far and few. Marwaha *et al.* did a country-wide study in school children in India to look at the prevalence of thyroid disorders, two decades after salt-iodization.<sup>[2]</sup> The prevalence of hypothyroidism and hyperthyroidism in their study was 7.3% and 0.3%. The most recent nationwide study showed that hypothyroidism was common in India; in this population 88% was consuming

iodized salt.<sup>[3]</sup> This study focuses on young women attending college and this is a female population likely to become pregnant in future. Several studies have highlighted the importance of diagnosing and treating hypothyroidism in pregnancy.<sup>[4-8]</sup> Hypothyroidism in young women is also linked to menstrual irregularities, polycystic ovaries, and infertility.<sup>[9-17]</sup> The prevalence of hypothyroidism in young women is unknown and we present the first report from India.

### MATERIALS AND METHODS

The study was conducted in seven colleges in the area of Madurai District. This was representative of the mix of the urban plus rural population. This study subjects were women aged 18–25 years. We visited each college and all female students in the above age group were invited to participate in the study. Only those who were willing to give blood samples were included in the study after informed consent.

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Thyroid-stimulating hormone (TSH) assay was done in all blood samples as a screening test for thyroid disease. TSH assay was performed using electrochemiluminescence immunoassay on the Elecys 2010 Analyzer (Roche Diagnostics) It is a sandwich assay and the method has been standardized against the 2<sup>nd</sup> IRP WHO Reference Standard 80/558. The functional sensitivity of the TSH kit was 0.014 mIU/ml. The laboratory's reference value for TSH was 0.4–4.5 mIU/ml. All the subjects with abnormal TSH were requested to come for follow-up for further testing.

Abnormal TSH values were grouped into three categories:

- Mild TSH elevation: TSH of 4.5–10 mIU/ml
- Significant TSH elevation: TSH >10 mIU/ml
- Suppressed TSH: TSH <0.4 mIU/ml.

## RESULTS

A total of 1292 subjects were screened with TSH from seven colleges, and the results were analyzed. The number of subjects with abnormal TSH and the number of subjects in each TSH category are discussed below.

### Prevalence of abnormal thyroid-stimulating hormone

Among the 1292 subjects, abnormal TSH was seen in 161 subjects and the overall prevalence of abnormal TSH was 12.5%.

### Thyroid-stimulating hormone values of 4.5–10 mIU/ml

Of 161 subjects with abnormal TSH, 77.6% (125) had TSH values between 4.5–10 mIU/ml. The overall prevalence of mild TSH elevation among the 1292 subjects was 9.7%.

### Thyroid-stimulating hormone values > 10 mIU/ml

Totally, 17/161 subjects (10.6%) had TSH values >10 mIU/ml. The overall prevalence of TSH values >10 was 1.3% in the study population.

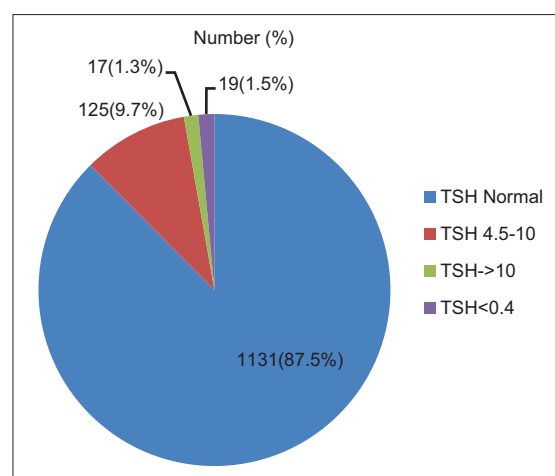
### Thyroid-stimulating hormone values <0.4 mIU/ml

Among the 161 subjects with TSH abnormality, 19 had a TSH value <0.4 mIU/ml (11.8%). The overall prevalence of suppressed TSH was 1.5% in the study population.

The results are summarized in Figure 1.

## DISCUSSION

The prevalence of thyroid disorders depends on various factors such as age, sex, geographical factors, and iodine intake. Thyroid disorders need to be addressed as a priority in two important age groups – neonates and pregnant women. We decided to focus on women in early reproductive age group. In the present study, we assessed the prevalence of thyroid disorders based on TSH in



**Figure 1:** Number (%) of subjects with thyroid-stimulating hormone abnormality

female college students in Madurai district of South India. The population of Madurai district was 3,041,038 as per 2011 census.<sup>[18]</sup> Goiter survey done under National IDD Control Program in Madurai District in 2000 showed a goiter prevalence of 6.3%.<sup>[19]</sup>

The overall prevalence of thyroid dysfunction in this study was 12.5%. Kochupillai *et al.* in 2000 estimated the prevalence of thyroid disorders in India to be around 42 million.<sup>[20]</sup> A cross-sectional survey in central Kerala found the overall prevalence of thyroid function abnormalities in 19.6% of the population.<sup>[21]</sup> In a study on the prevalence of thyroid disorders in women of Pondicherry, 15.8% had thyroid dysfunction.<sup>[22]</sup>

The most common abnormality in our study was elevated TSH (11%). Of the 11%, the majority (9.7%) had mild TSH elevation (4.5–10 mIU/ml). The majority of this group could have sub-clinical hypothyroidism. A small number in this group could also have overt hypothyroidism (with low free T<sub>4</sub>) and rarely may have central hypothyroidism. TSH value >10 mIU/ml was found in 1.3% of our subjects. The prevalence of hypothyroidism (clinical + subclinical) was 13.3% and 11.5% in the study from Kerala and Pondicherry, respectively.<sup>[21,22]</sup> In the most recent nationwide study in India, the prevalence of overt undiagnosed hypothyroidism was 3.5% and the prevalence of subclinical hypothyroidism was 8.5%.<sup>[3]</sup> In a study from Delhi in 2012 by Marwaha *et al.*, subclinical hypothyroidism was present in 19.3% of subjects and 4.2% had overt hypothyroidism.<sup>[23]</sup>

Low TSH (<0.4 mIU/ml) was seen in 1.5% of the study population. This group would include both subclinical and overt thyrotoxicosis. In the study from Cochin the combined prevalence of subclinical and clinical thyrotoxicosis was 2.9%.<sup>[21]</sup> The prevalence of thyrotoxicosis in women of Pondicherry was found to

be 1.8%.<sup>[22]</sup> In the epidemiological study in eight cities of India, the prevalence of clinical plus subclinical thyrotoxicosis was 1.9%.<sup>[3]</sup>

WHO assessment of global iodine status classified India as having optimal iodine nutrition in 2004.<sup>[24]</sup> The reasons for the high prevalence of thyroid disease in spite of the improvement in iodine status need to be looked at. It has been argued but not convincingly, that iodine supplementation may precipitate the emergence of thyroid autoimmunity.<sup>[25]</sup> In the epidemiological study of eight cities, 88% of the population was taking iodized salt.<sup>[3]</sup> In a countrywide screening of goitrous young girls by Marwaha *et al.*, the prevalence of juvenile autoimmune thyroiditis was 7.5%.<sup>[26]</sup> In a study among school children in Delhi, 28.3% of the children with goiter had evidence of autoimmune thyroiditis.<sup>[27]</sup>

This is the first large-scale study in Madurai district, South India to look the prevalence of thyroid disorders. Thyroid dysfunction was seen in one out of every eight young women in this region (12.5%). Our study results are consistent with reports from other studies. Nonrandomized design and lack of clinical data are an important limitation in this study and some patients with low or normal TSH may have taking levothyroxine. Furthermore, we were not able to do FT4 and thyroid antibodies do to economic constraints.

Nevertheless given that one out of eight women has thyroid dysfunction, our study does raise some clinical issues. For instance, given the high prevalence of hypothyroidism in young women, some of whom are destined to conceive in the years to come, is there a role for more aggressive screening of the population? This young population is at risk of infertility, reproductive dysfunction and possibly fetal abnormalities – all important enough to deserve further study and research.

## CONCLUSION

Thyroid dysfunction was common in young women in Madurai District, South India. One out of every eight young women had abnormal TSH with the most common abnormality being mild TSH elevation.

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## Conflicts of interest

There are no conflicts of interest.

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