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Research Article

The Prevalence of Thyroid Dysfunction in Women of Sub Himalayan Region Undergoing Routine Health Screening

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Abstract

Background: There is limited data regarding the prevalence of thyroid disorders in women in India in general and of Himachal in particular, and this study assesses the thyroid disorder prevalence in women of Hamirpur district of Himachal, reporting in tertiary care Hospital.

Methods: All women who underwent blood sampling for estimation of thyroid function tests (TFTs) on their initial visit to the Hospital were included in the study.

Results: The study population included 1766 subjects from 18 to 50 years, and the mean age of study population was 27.56 years. They were divided in groups, 18 to 25 (40.2%), 26-35 (51.5%), 36-45 (7.5%) and >45 years (0.8%). Among these women, 1511 were referred by Anti Natal clinic and 255 were from rest of the Hospital. The mean age of ANC patients was 26.57 and of Non ANC was 33.41.

Conclusions: The thyroid function abnormalities are common in females and the prevalence increases with age. The prevalence rates of thyroid function disorders on the basis of uniform criteria for both pregnant and non-pregnant females were 7.18%, 11.41%, 23.66% and 42.86% in age groups of 18-25, 26-35, 36-45 and ≥ 45 years respectively. Overall prevalence of thyroid function disorders in females was 10.88% on screening and hypothyroidism (7.88%) being more common than hyperthyroidism (3%). The primary hypothyroidism (77.7%) was the commonest abnormality, followed by subclinical hypothyroidism (16.6%), secondary hyperthyroidism (5.7%) in the hypothyroid patients. While in hyperthyroid group of patients, the pattern was: subclinical (41.5%), followed by secondary (30.2%) and primary (30.2%).

Keywords: Prevalence; Thyroid Function Disorders; Hypothyroidism; Hyperthyroidism

Introduction

Thyroid gland is one of largest endocrine gland situated in humans and its weight is about 20 grams in an adult. Two major hormones secreted by it are thyroxin and triiodothyronine, which are controlled by thyroid stimulating hormone secreted by anterior pituitary. Thyroid hormones play key roles in all major metabolic pathways, including protein, carbohydrate, and lipid metabolism. They are also important for functions like cell differentiation, body growth and reproductive physiology.

Among all the endocrine diseases in India, thyroid gland disorders are the most common [1].

The prevalence of overt/primary hypothyroidism and subclinical hypothyroidism was significantly increased during late transition and post menopause in Korean women. In contrast, subclinical and overt hyperthyroidism were not significantly associated with menopausal stages [2].

One of the recently done nationwide study on females, has shown that hypothyroidism was common in India. In the popula-

tion, which was covered under this survey, 88% subjects were consuming iodized salt. This study focuses on young women attending college and this is a female population likely to become pregnant in future [3].

WHO assessment of global iodine status classified India as having optimal iodine nutrition in 2004 [4].

Unnikrishnan., *et al*. [5], in their epidemiological study of eight cities in India, has found that 88% of the population was taking iodized salt. Still thyroid dysfunction is common in our country and the reason for this is not clearly understood.

It has been suggested that iodine supplementation may precipitate the emergence of thyroid autoimmunity [6]. And this is the field where further clinical and epidemiological studies need to be carried out to find the cause.

Marwaha., *et al*. [7] in their study from Delhi in 2012, have listed that subclinical hypothyroidism was present in 19.3% of subjects and 4.2% had overt/primary hypothyroidism.

In a study from Cochin by Usha Menon., *et al*. [8] the combined prevalence of subclinical and clinical thyrotoxicosis was 2.9%.

Material and Methods

Study design and subjects

This screening study was conducted at Dr Radhakrishnan Govt Medical College, Hamirpur, Himachal Pradesh. Female subjects who underwent estimation of thyroid function tests (TFTs) on their first outpatient visit in 2018-19, were included in it. Aims of the study were to measure the prevalence of thyroid disorders in females across wide range of age groups (18-50 years) as assessed by measurement of thyroid hormones. A total of 1766 subjects who underwent estimation of TFTs at their first visit to the hospital were included for the study. Subjects were categorized into different groups for analysis to find out the difference in prevalence of thyroid disorders based on age (18-25, 26-35, 36-45 and ≥ 45 years).

Study procedure and statistics

All female patients who underwent blood sampling for estimation of TFTs on their initial visit to the hospital from 2018 to 2019 were included in the study. The triiodothyronine (T3), tetraiodothyronine (T4) and thyroid stimulating hormone (TSH) were analyzed by chemiluminescence assay. Normal range for T4, T3 and TSH were 5.93-13.29 µg/dL, 0.87-1.78 ng/ml and 0.38 to 5.33 µIU/mL respectively.

The thyroid dysfunctions were categorized into subclinical or overt, hypo- or hyperthyroidism. Subjects were classified using following definitions:

- **Primary hypothyroidism**: TSH > 5.33 µIU/mL, T4 < 5.93 µg/dL and T3< 0.87 ng/ml.
- **Subclinical hypothyroidism**: TSH > 5.33 µIU/mL and normal T4, normal T3.
- **Secondary hypothyroidism**: T4 < 5.93 µg/dL and T3< 0.87 ng/ml and a TSH level that is not appropriately elevated.
- **Primary Hyperthyroidism**: TSH < 0.38 µIU/mL, T4 >13.29 µg/dL and T3 > 1.78 ng/ml
- **Subclinical hyperthyroidism**: TSH < 0.38 µIU/mL and normal T4, normal T3.
- **Secondary hyperthyroidism**: T4 > 13.29 µg/dL or T3 > 1.78 ng/ml and a TSH level that is not appropriately suppressed.

For screening hypothyroidism in pregnant patients on their first visit, 2.5 µIU/mL value of TSH was taken as significant.

Statistical analysis was performed using Epi Info 7 software.

Observations

A total of 1766 female subjects who underwent estimation of TFTs from 2018 to 2019 were included in the study. Among these women, 1511 were referred by Anti Natal clinic and 255 were from rest of the Hospital. The mean age of ANC patients was 26.57 and of Non ANC was 33.41 (Table 1).

Table 1: Categorization of patient's age for screening.

Category	Frequency	Percent	Mean age	Std. Deviation
ANC	1511	85.6	26.57	4.006
Non ANC	255	14.4	33.41	7.850
Total	1766	100.0	27.56	5.327

From ANC patients, all patients have their TSH, while only 1248 females were only advised full TFT. Similarly, in Non ANC patients TSH estimation was done in all 255 patients and 242 were advised were advised full TFT (Table 2).

Table 2: Categorization of patient's TFT for screening.

	Category	Number	Mean	Std. Deviation	P
T3	ANC	1248	1.06	0.15	<0.001
	Non ANC	242	1.11	0.13	
T4	ANC	1248	7.76	1.10	0.015
	Non ANC	242	8.22	2.05	
TSH	ANC	1511	2.74	2.82	0.029
	Non ANC	255	5.62	20.91	

Out of the 1766 subjects, age wise distribution is: 18 to 25 (40.2%), 26-35 (51.5%), 36-45 (7.5%) and >45 years (0.8%) (Table 3).

Table 3: Age wise distribution in the study population.

Age groups	Frequency	Percent
18-25	710	40.2
26-35	911	51.6
36-45	131	7.4
>45	14	0.8
Total	1766	100.0

Thyroid disorders were classified as Hypo and Hyperthyroidism depending upon criteria as shown in Table 4. Generally, for screening patients in ANC group, TSH value 2.5 µIU/mL is taken as significant to diagnose hypothyroidism and patient is watched closely on next visits. However, some studies [13] recommend same value for diagnosis of hypothyroidism in both pregnant and non-pregnant female patients.

According to this hypothesis, number of hypothyroid patients is: 18 to 25 (5.35%), 26-35 (7.79%), 36-45 (19.85%) and >45 years (28.58%) and overall prevalence is 7.88%. Similarly for hyperthyroidism, no of patient is 18 to 25 (1.83%), 26-35 (3.62%), 36-45 (3.81%) and >45 years (14.28%) and overall prevalence is 3%.

Table 4: Prevalence rate of thyroid dysfunction and its variation according to age groups.

Age groups	No of Patients	Hypothyroidism TSH > 2.5 µIU/mL	Hypothyroidism TSH > 5.33 µIU/mL	Hyperthyroidism	Thyroid Disorder in Group
18-25	710	286 (40.28%)	38 (5.35%)	13 (1.83%)	299 (42.11%), 51 (7.18%)
26-35	911	383 (42.04%)	71 (7.79%)	33 (3.62%)	416 (45.66%), 104 (11.41%)
36-45	131	26 (19.85%)	26 (19.85%)	05 (3.81%)	31 (23.66%)
>45	14	04 (28.58%)	04 (28.58%)	02 (14.28%)	06 (42.86%)
Total	1766	699 (39.58%)	139 (7.88%)	53 (3%)	752 (42.58%), 192 (10.88%)

Hypothyroid patients were further subdivided into primary, subclinical and secondary subgroups as per criteria discussed and result is shown in Table 5.

Similarly, hyperthyroid patients were further subdivided into primary, subclinical and secondary subgroups as per criteria discussed and result is shown in Table 6. Ther are total 53 (3%) cases which were diagnosed as hyperthyroid patients and as per above subgroups, numbers are: 15 (28.3%), 22 (41.5%) and 16 (30.2%).

Table 5: Prevalence rate of hypothyroidism according to age groups.

Age groups	Hypothyroidism	No of Patients TSH > 2.5/5.33 µIU/mL	Percentage of Patients
18-25 (286/38)	Primary	282/34	98.6%/89.5%
	Subclinical	02	0.7%/5.25%
	Secondary	02	0.7%/5.25%
26-35 (383/71)	Primary	375/63	97.9%/88.7%
	Subclinical	06	1.6%/8.5%
	Secondary	02	0.5%/2.8%
36-45 (26)	Primary	08	30.7%
	Subclinical	14	53.9%
	Secondary	04	15.4%
>45 (04)	Primary	03	75%
	Subclinical	01	25%
	Secondary	00	--
Total (699/139)	Primary	668/108	95.6%/77.7%
	Subclinical	23	3.3%16.6%
	Secondary	08	1.1%/5.7%

Table 6: Prevalence rate of hypthyroidism according to age groups.

Age groups	Hyperthyroidism	No of Patients	Percentage of Patients
18-25 (13)	Primary	04	30.7%
	Subclinical	03	23.1%
	Secondary	06	46.2%
26-35 (33)	Primary	10	30.3%
	Subclinical	13	39.4%
	Secondary	10	30.3%
36-45 (05)	Primary	01	20%
	Subclinical	04	80%
	Secondary	--	--
>45 (02)	Primary	--	--
	Subclinical	02	100%
	Secondary	--	--
Total (53)	Primary	15	28.3%
	Subclinical	22	41.5%
	Secondary	16	30.2%

Discussion

The measurement of plasma TSH is the commonly accepted and most sensitive screening test for primary thyroid disorders, which are the most frequent diseases related to the endocrine glands [9].

Similarly, Gietka-Czernel., *et al*. [10] has observed that the sensitivity of TSH measurement in is estimated to be higher than 95%, and the specificity – approximately 90%, while its daily fluctuations are very small and are of no importance for the interpretation of results. In our study also, many patients were advised only TSH estimation (Table 2).

The American Thyroid Association (ATA) guideline 2011 [11] recommended the trimester- specifc criteria of TSH concentration for the diagnosis of hypothyroidism and generally it is taken as any value of 2.5 µIU/mL or more in first trimester. In our study which screens patients for thyroid disorder, all the patients were taken as presenting in first trimester as case registration for ANC is near total here. Moreover, Marwaha RK., *et al*. [12] have observed in their study of pregnant females that analysis of mean, median values for TSH between each trimester showed no significant difference in values.

Kalra S., *et al*. [13] has recommended in their study of Indian population have suggested that cut off value for TSH in pregnant women should be 3.0 µIU/mL. While Kannan S., *et al*. [14] discouraged the strict criteria of 2.5 µIU/mL as advised by ATA 2011 for pregnant ladies after pooling data from selected eight Indian studies. They recommended that TSH cutoff of should be similar to pre pregnancy stage even in the first trimester of pregnancy.

We have calculated data as per both these criteria (Table 4) and if we analyze hypothyroidism data while using same criteria for both pregnant and non-pregnant females, it is established that thyroid disorder (both hypo and hyper) prevalence increases with age. Our values are similar to those described by Yejin Kim., *et al*. [2] for hypothyroidism, however they didn't find such relation in case of hyperthyroidism unlike us.

Prevalence rate of hyperthyroidism, in our study is similar to the results of Usha Menon., *et al*. [8].

Ajmani SN., *et al*. [15] in their study, has reported the prevalence of hypothyroidism in India to be 12%, whereas hyperthyroidism is seen in 1.25% in pregnant women. They have recommended universal screening of TSH in pregnancy.

In our study, overall prevalence of thyroid function disorders in females is 10.88% on screening and hypothyroidism (7.88%) being more common than hyperthyroidism (3%).

Lara MC., *et al*. [16] have observed that with 2.5 µIU/mL TSH cutoff point, the prevalence of sub clinical hypothyroidism rises to 37%. In 2017 ATA has recommended cutoff point of 4 µIU/mL, on applying this cut off, the prevalence of SCH becomes 9.6%. The prevalence of sub clinical hypothyroidism drops to 5% when their own derived cutoff value of 4.7 was used. They have advocated that cutoff value for TSH should be as per local criteria.

Furthermore, high TSH levels in pregnant women have been associated with increased risk of neurocognitive deficits in offspring [17]. Alexander EK., *et al*. [18] have recommended that for women who are first time diagnosed with SCH during pregnancy, a low dose of 50 mg of levothyroxine can be started and titrated as necessary. In our study, we have grouped all pregnant female patients as primary hypothyroidism cases because they require treatment for successful pregnancy outcome.

In general, the practical approach to treat sub clinical hypothyroidism is to recommend routine levothyroxine therapy for patients with a persistent serum TSH of more than 10.0 µIU/mL [19].

According to Coopcí KS [20], serum TSH and circulating thyroid hormone levels have a log-linear relationship (a 2-fold change in free thyroxine will produce a 100-fold change in TSH). Thus, serum TSH measurement is the main test to diagnose mild thyroid failure when the peripheral thyroid hormone levels are within normal laboratory range. Hence in our data calculation for pregnant females, TSH value was used to divide them into subgroups of thyroid function disorders which will help to exactly find the load on health services for betterment of policies to be formulated.

Conclusions

The thyroid function abnormalities are common in females and the prevalence increases with age (Table 4). The prevalence rates of thyroid function disorders on the basis of uniform criteria for both pregnant and non-pregnant females are 7.18%, 11.41%, 23.66% and 42.86% in age groups of 18-25, 26-35, 36-45 and ≥ 45 years respectively. Overall prevalence of thyroid function disorders in females is 10.88% on screening and hypothyroidism (7.88%) being more common than hyperthyroidism (3%). The primary hypothyroidism (77.7%) is the commonest abnormality, followed by subclinical hypothyroidism (16.6%), secondary hyperthyroidism (5.7%) in the hypothyroid patients. While in hyperthyroid group of patients, the pattern is: subclinical (41.5%), followed by secondary (30.2%) and primary (30.2%).

If we use 2.5 µIU/mL TSH as cutoff point, the prevalence rates of thyroid function disorders for pregnant females increase to 42.11%, 45.66%, 23.66% and 42.86% in age groups of 18-25, 26-35, 36-45 and ≥ 45 years. While overall prevalence of thyroid function disorders in females becomes 42.58% on screening and hypothyroidism (39.58%) being more common than hyperthyroidism (3%).

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