Prevalence of overt and subclinical thyroid disease in patients tested for thyroid profile in CIMS Bilaspur (C.G.)

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Abstract

Background: Thyroid diseases are common worldwide. In India too, there is a significant burden of thyroid diseases. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases. Thyroid dysfunction has varied impact on pregnancy outcome. Thyroid disorders are amongst the most common endocrine diseases in India. The prevalence and pattern of thyroid disorders depends on sex, age, ethnic and geographical factors and especially on iodine intake. A high iodine intake is associated with lower prevalence of goitre and higher prevalence of hypothyroidism. This study was designed to address this question. We undertook this study to provide reference data for TSH, T4 and T3 in women of this region and evaluate their status of thyroid function.

Material and Methods: The study was carried out at Department of Biochemistry, Chhattishgarh Institute of medical sciences, Bilaspur (C.G.). The study was conducted on 1100 subjects of age group 15- 65. The thyrotropin, TSH levels of serum samples were analysed using kits (Diagnostic Product Corporation (DPC), LosAngeles, USA) on the I^{25} GAMA Counter. Serum T3 and T4 were performed using competitive RIA technique and serum TSH was performed using IRMA technique.

Result and Discussion: Of the 1100 total subjects in the age range 15–65 years, 24.1% had thyroid dysfunction and 75.9% were euthyroid. The prevalence of thyroid dysfunction in group I, 19% hypothyroid, 5% hyperthyroidism 75.9% euthyroid and in group II, 16% hypothyroidism, 4% hyperthyroid and 79.5 were euthyroid. The finding that a large number of women unknowingly have laboratory evidence of thyroid dysfunction supports the usefulness of screening for early detection. We hope to extend the study to a larger cross section of men and women in this region keeping in mind environmental and etiopathological factors like auto immunity, drugs, Iodine and non-thyroidal illness.

Keyword: Subclinical hypothyroidism, Prevalence, Thyroid stimulating hormone, Radioimmuno Assay, Thyroid dysfunction.

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Introduction

Thyroid diseases are common worldwide. In India too, there is a significant burden of thyroid diseases. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases[1].

Thyroid disorders are amongst the most common endocrine diseases in India[2]. The prevalence and pattern of thyroid disorders depends on sex, age, ethnic and geographical factors and especially on iodine intake[3]. A high iodine intake is associated with lower prevalence of goitre and higher prevalence of hypothyroidism. Low intake is associated with a higher prevalence of hyperthyroidism[4]. The total burden of thyroid disorders in India is 42 million. This projection was based on recent state wide studies on thyroid disorders among adolescents young and adults' women without history of thyroid disorder and with previous history of thyroid disorder. Subclinical and clinical forms of Hyperthyroidism and Hypothyroidism can contribute to morbidity from Osteoporosis Hyperlipidemia, Hypercholesterolemia, Hyperhomocysteinemia, Cardiovascular and Neuropsychiatry disease specially in the older population[5,6]. This article will focus on selected thyroid diseases (subclinical and clinical form of hypothyroidism and hyperthyroidism, goitre/iodine deficiency disorders,) and will offer an insight into studies on their prevalence.

Screening is "the application of a test to detect a potential disease or condition in a person who has no known signs or symptoms of that condition at the time the test is done"[1]. Screening with thyroid function tests can identify clinically unapparent subclinical thyroid dysfunction. Subclinical hypothyroidism is diagnosed when a patient has an elevated thyroid-stimulating hormone (TSH) level as determined by a sensitive TSH test and a normal thyroxin level. Subclinical hyperthyroidism is diagnosed when a patient has an undetectable TSH level and a normal thyroxin level. Screening also detects overt thyroid dysfunction, which is diagnosed when a patient has an elevated TSH level and a low thyroxin level (overt hypothyroidism) or an undetectable TSH level and Subclinical hypothyroidism (also called mild thyroid failure) may be associated with nonspecific symptoms, hypercholesterolemia, and

progression to overt hypothyroidism. Studies performed since 1990 have added to the ability to estimate the risk for these complications in relation to age, sex, and TSH level. However, screening remains controversial because the results of randomized trials of treatment in symptomatic patients have been inconclusive and because asymptomatic persons have not been shown to benefit from treatment[7]. Thyroid dysfunction has varied impact on pregnancy outcome. The risk of miscarriage is increased in autoimmune thyroid disease. Severe maternal hypothyroidism can result in irreversible neurological deficit in the offspring. Graves' disease (GD) can lead to pregnancy loss as well as fatal thyroid dysfunction[8].

This study aimed to delineate the prevalence of clinical and sub clinical thyroid disorder among the subjects of Bilaspur region of Chhattisgarh and also put an effort to reflect a thought on the clinician, diagnostic and prognostic prescription to inculcate thyroid test in the age group of 15-65 years of women.

Materials and Methods

The study was carried out at Department of Biochemistry, Chhattishgarh Institute of medical sciences (CIMS), Bilaspur (C.G.), the subject were advised for thyroid test, who are visited to CIMS hospital OPD from different district of Bilaspur division for their checkup, with and without symptoms of thyroid dysfunction. The study was conducted on 1100 subjects of age group 15- 65 (female subjects). The subjects further divided into two group, Group I (120 subjects) having previous history of thyroid dysfunction or taking medication and group II (980 subjects) there is no previous history of thyroid dysfunction but having some complication, were not taken history of any other diseases like HTN, Diabetes, Heart disease, obesity etc. We collected 3 ml fasting venous blood sample and allowed to coagulated and centrifuge the blood and collect the serum and kept at 2-8 °C then performed Thyroid function test.

Laboratory Methods: Thyroid function tests

The thyrotropin, TSH levels of serum samples were analysed using kits (Diagnostic Product Corporation (DPC), LosAngeles, USA) on the I^{25} GAMA Counter. Serum T3 and T4 were performed using competitive RIA technique and serum TSH was performed using IRMA technique. The normal ranges for TSH, T4 and T3 values were 0.3–5.0 µIu/ml, 4.5–12.5 µg/dl, and 86–187 ng/ml respectively. (The intra- and inter-assay coefficients of variation (CV) for TSH, T4 and T3 were 5 and6, 3 and 3.7, 5.4 and 6 respectively).

Data Analysis: Hypothyroidism was classified as clinical if TSH was ≥ 5.0 µIU/ml (*0.3 – 5.0 µIU/ml) and T4 was ≤4.5µg/dl(4.5 – 12.5 µg/dl) and subclinical if TSH was ≥ 8.0 µIU/ml and T4 and T3 were normal. Hyperthyroidism was classified as clinical if TSH was ≤0.15 µIU/ml and T4 ≥12.5 µg/dl and subclinical if TSH was ≤0.15 µIU/ml and Total Thyroxin and T3 were in normal range. The subjects were classified euthyroid if the range varies within normal range as our laboratory range.[(24)]

Statistical analysis

Statistical analysis was carried out using SPSS 16for windows 7 software (SPSS Inc., Chicago, IL, USA) and Microsoft Excel. Values were reported as mean ± standard error of mean.

Results

Of the 1100 total subjects in the age range 15–65 years, 24.1% had thyroid dysfunction and 75.9% were euthyroid (Table 1), when we compare the prevalence of thyroid dysfunction in both group I, group II and total subjects, 19% were hypothyroid(8.6% clinical, 10.5% subclinical) and 5% had hyperthyroidism (4.1% clinical and 1% subclinical) and 75.9% ethyroid and in group II the prevalence of hypothyroid were 16% (7.6% clinical, 8.6% subclinical) and 4% hyperthyroid (3.3% clinical and 1% subclinical) and 79.5 were ethyroid, 41.6% were hypothyroid (16.6% clinical and 25% subclinical) and 15% hyperthyroid (10% clinical and 4.5% subclinical) and 45.3% were euthyroid(Table 2).

The mean TSH(µIU/ml) level and Total Thyroxin (µg/dl) in total subjects, Group I and Group II were 2.4±5.2, 1.9±1.5 and 12.5±2.4 and 7.5±2.4, 7.3±1.8 and 6.2±2.4 respectively (Table 3).

Total subjects were divide into five categories, 15-25, 26-35, 36-45, 46-55, 56-65 and their percentage were 23.6% (260), 32.9% (362), 22% (243), 12.5% (138), 8.8% (97) respectively, (in which the higher and lower % of subjects were age group 26 -35 (32.9%) and 56-65 (8.8%) respectively) and the prevalence of thyroid disorder in different age group were 4.3%, 7.0%, 7%, 3%, 3%, 2.5% respectively. (7% prevalence of thyroid dysfunction in age group 26-35 and 36-45 which is higher than other groups and 2.5% prevalence in age group 56-65 which lower than other groups)(Table 4).

2.2%, 3.2%, 3.2%, 1.2%, 0.6% prevalence of subclinical hypothyroidism, 1.2%, 2.7%, 2.5%, 1.2%, 1% of clinical hypothyroidism, 0.8%, 1%, 1.2%, 0.5%, 0.7%, of clinical hyperthyroidism, 0.1%, 0.2%, 0.1%, 0.2%, 0.2% of subclinical hyperthyroidism were found in age group, 15-25, 26-35, 36-45, 46-55, 56-65 respectively, (3.2% prevalence of subclinical hypothyroidism in age group 26-35 and 36-45 which is higher than other groups and 0.6% prevalence in age group 56-65 which lower than other groups)(Table 5).

The mean TSH value 11.5±3.3 for subclinical hypothyroidism and for euthyroid was 2.6±1.8, mean Total thyroxin value 6.8±2.1, mean T3 value 112.8±14.8 and mean Total Thyroxin value 7.5±2.3, mean T3 value 100.5±24.2 were found for subclinical

hypothyroidism and euthyroid subjects respectively. The mean TSH value for subclinical hypothyroid 11.0±3.4, 12.7±5.4, 13.4±5.4, 9.6±0.8, 11.0±1.5 and Euthyroid 2.3±1.4, 2.5±1.5, 2.4±1.5, 2.7±1.7, 3.2±2.9 were found in age group 15-25, 26-35, 36-45, 46-55, 56-65 respectively. The higher TSH Mean value 13.4± 5.4 was found in age group 36-45 when compare with other groups for subclinical hypothyroids (Table 6).

Table 1: Characteristics of Thyroid Dysfunction among the all subjects

	Total subjects		Group I		Group II	
	1100	%	120	%	980	%
Euthyroid	835	75	55	45.8	780	79
Hypothyroid	210	19	50	41.6	160	16
Hyperthyroid	55	5	15	12.5	40	4

Table 2: Status of both clinical, subclinical form of Hypothyroidism and Hyperthyroidism in Total subjects, Group I and Group II

		Hypothyroid (n=210)				Hyperthyroid (n=55)				Euthyroid	
		Clinical		Sub clinical		Clinical		Subclinical		N	%
		N	%	N	%	N	%	N	%		
Total	1100	95	8.6	115	10.4	46	4.1	9	1.0	835	75.9
Group I	980	75	7.6	85	8.6	33	3.3	7	1.0	780	79.5
Group II	120	20	16.6	30	25	12	10	3	2.5	55	45

Table 3: Serum Levels T3, T4 and TSH of Total, Disease free and Reference subjects

		Age (Yrs)	T3 (ng/ml)	T4 (µg/dl)	TSH (µIu/ml)
N		mean±SD	mean±SD	mean±SD	mean±SD
Total Subjects	1100	36.1±12.6	99.7±27.5	7.5±2.4	2.4±5.2
Group I	835	39.6±10.5	101.5±18.1	7.3±1.8	1.9±1.5
Group II	265	38.5±11.4	89.5±18.1	6.2±2.4	12.5±2.4

Table 4: Prevalence of thyroid disorder in total subjects by age

Age	Total subjects (1100)	Euthyroid	%	Thyroid dysfunction	%
15-25	243	195	17.7	48	4.3
26-35	362	284	25.8	78	7.0
36-45	260	183	16.3	77	7
46-55	138	104	9.4	34	3
56- 65	97	69	6.2	28	2.5

Table 5: Prevalence of subclinical Hypothyroidism, Hypothyroidism subclinical hyperthyroidism and hyperthyroidism in total subjects by age

Age (Yrs)	Total subjects	Euthyroid		Hypothyroid		Subclinical Hypothyroidism		Hyperthyroid		Subclinical Hyperthyroidism	
	1100	n	%	n	%	n	%	n	%	n	%
15-25	243	195	17.7	13	1.2	25	2.2	9	0.8	1	0.1
26-35	362	284	15.8	30	2.7	35	3.2	11	1	2	0.2
36-45	260	183	16.6	28	2.5	35	3.2	13	1.2	1	0.1
46-55	138	104	9.4	13	1.2	13	1.2	6	0.5	2	0.2
56-65	97	69	6.2	11	1	7	0.6	8	0.7	2	0.2

Table 6: Comparison of T3, Total Thyroxin (T4) and TSH (mean ± SD) between euthyroid and subclinical thyroid subjects by age

Total subjects		Different Age group (mean ± SD)				
		15-25	26-35	36-45	46-55	56-65
Ethyroid Subjects	T3(ng/ml)	107.2±27.1	97.1±28.4	99.8±25.7	99.1±19.4	99.5±20.5
	T4(µg/dl)	7.6±2.3	7.4±2.4	7.5±2.3	7.3±2.3	7.5±2.4
	TSH(µIu/ml)	2.3±1.4	2.5±1.5	2.4±1.5	2.7±1.7	3.2±2.9
	Age (Yrs)	21±2.7	31.1±2.3	40.6±3.0	50.6±2.7	62.3±3.5
Subclinical Hypothyroidsm	T3(ng/ml)	112±14.8	119.5±15.9	105.4±23.1	114.7±10.3	112.4±10.0
	T4(µg/dl)	7.6±1.8	7.8±2.8	6.3±2.5	6.7±1.7	5.4±1.3
	TSH(µIu/ml)	11.0±3.4	12.7±5.4	13.4±5.4	9.6±0.8	11.0±1.5
	Age (Yrs)	19.2±3.0	29.7±2.4	40.8±3.6	49.5±2.9	61.8±3.9

Discussion

Chhattisgarh is one of the newly formed States. The state is one of the sparsely populated with very remote and difficult to reach terrain with almost half of its land covered with dense forests. The prevalence of goitre or other thyroid disorders is higher for women than for men age 15-49 (563 per 100,000 women, compared with 358 per 100,000 men)[9].

Our study demonstrate that the prevalence of thyroid dysfunction in women of Chhattisgarh population in patients tested for Thyroid Profile in CIMS Bilaspur (C.G.). Our study revealed that the prevalence of thyroid dysfunction was alarming among the females age group between 26 -35 years of Chhattisgarh population. Our data gives a prevalence of thyroid dysfunction in subjects attending a tertiary care centre in Western India which can be generalized to population in the same setting in other parts of India. One limitation of our study was that we were taken subjects from hospital OPD not from random places and we were not including other disorder with thyroid dysfunction.

Goitre is usually caused by an iodine deficiency and it leads to an enlargement of the Thyroid gland. In many cases, there are no symptoms apart from the appearance of a swelling in the neck. NFHS-3 included testing of household salt for iodine content. In NFHS-3, women age 15-49 and men age 15-54 were asked whether they have goitre or any other thyroid disorder. The prevalence of goitre is 2.5 times higher among women than men (949 per 100,000 women compared to 383 per 100,000 men)[10]. The number with goitre or other thyroid disorders increases with age, especially among women. In general, women exhibit greater differentials in prevalence of goitre across background characteristics than do men. While men do not exhibit a large urban-rural differential. Prevalence of goitre is almost twice as high among urban women as it is among rural women. Men exhibit no clear pattern of prevalence of thyroid disorders by education, but women exhibit increasing prevalence with increasing education. More educated women (12 or more years of completed education) are nearly three times as likely to have a thyroid disorder as women with no education. Differentials in prevalence are especially large by religion, especially among women.

This is the first study conducted on women from this region of Chhattishgarh, central east India, with respect to thyroid disorders. This study demonstrate that Hypothyroidism mainly subclinical hypothyroidism was alarmingly high in this region. The percentage of women with elevated TSH was particularly high in the 25-55 years age group. This indicates that thyroid disease should be considered during routine evaluation of this susceptible group and should be followed by appropriate detection and treatment. The finding that a large number of women unknowingly have laboratory evidence of thyroid dysfunction supports the usefulness of screening for early detection. In the elderly and women of premenopausal age where TSH levels were elevated, further research may determine whether treatment of subclinical hypothyroidism will benefit in preventing adverse health outcomes such as Osteoporosis, Cardiovascular diseases and Hyperlipidemia. We hope to extend this study to a larger cross section of men and women in this region keeping in mind environmental and etiological factors like auto immunity, drugs, Iodine and non thyroidal illness.

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