



PREVALENCE OF THYROID DISORDERS IN PATIENTS VISITING A TERTIARY CARE CENTER IN NEW DELHI: A THREE -YEAR STUDY

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"We have strived to provide baseline orientation regarding the prevalence of thyroid disorders in the representative north Indian population. To the best of our knowledge, this is the first study that has attempted to evaluate the epidemiology of this disease in the north Indian Population"

ABSTRACT

Background: Thyroid disorders constitute the most prevalent endocrine disorder in our country. Thyroid disorders are classified broadly as hyperthyroidism and hypothyroidism depending on the functional capacity of the thyroid gland. These two entities are further segregated as sub clinical and overt dysfunction. The present study attempts to evaluate the prevalence of thyroid disorders in north Indian population which is more prone to hypothyroidism due to iodine deficiency observed in the Himalayan belt.

Materials and Methods: A total of 7474 patients presenting to the department of Biochemistry, G B Pant hospital, Delhi, were enrolled in the study. The patients were examined and asked to report after overnight fast for sample collection on a prescribed date. Thyroid hormone estimation was done with commercially available ELISA kits supplied by Cal biotech, USA. Statistical Analysis was done using Microsoft Office "Excel" with Windows 2007 Operating System and multiple comparisons were made using SPSS 12.0 statistical software package.

Results: The majority of the patients (approximately 85%) were Euthyroid. Only 1.22% of the total number of referred patients turned out to be hyperthyroid. Hypothyroidism was more prevalent with the number of patients diagnosed with both sub clinical and overt hypothyroidism being 987 (13.2%).

Conclusions: We have strived to provide a baseline orientation regarding the prevalence of thyroid disorders in the representative north Indian population in the post iodine fortification era.

Key words: Euthyroid, Hypothyroidism, Hyperthyroidism

INTRODUCTION

The prevalence of abnormal thyroid function continues to be debated. Numerous studies from various countries differ in their prevalence estimates for both hypothyroidism and hyperthyroidism. Thyroid disorders constitute the most prevalent endocrine disorder in our country. The total burden of thyroid disorders has been estimated to be approximately 42 million. This has been calculated on the basis of nationwide studies in the post iodization phase¹. Thyroid disorders are classified broadly as hyperthyroidism and hypothyroidism depending on the functional capacity of the thyroid gland². These two entities are further segregated as subclinical and overt dysfunction³. Both these disorders are more prevalent in females as compared to males⁴.

Subclinical thyroid dysfunction is a biochemical diagnosis, and patients have few, if any, clinical signs or symptoms of thyroid dysfunction. Subclinical hypothyroidism is defined by the finding of an elevated serum TSH concentration with serum free T₄ and T₃ concentration being within the reference range⁵, whereas subclinical hyperthyroidism is defined by a low serum TSH with serum free T₄ and free T₃ concentrations being within the reference range⁶. In overt hypothyroidism the levels of T₃ and T₄ are also reduced along with elevated TSH levels; whereas in overt hyperthyroidism, the T₃ and T₄ levels are elevated along with decreased TSH.

The present study attempts to evaluate the prevalence of thyroid disorders in north Indian population which is more prone to hypothyroidism due to iodine deficiency observed in the Himalayan belt.

MATERIALS AND METHODS

Participants and settings

The study population was selected from the patients referred to the department of

Biochemistry, G. B. Pant Hospital, New Delhi, for evaluation of thyroid status. G B Pant hospital is a super-specialty 600 bedded hospital. It is a referral centre for cardiology, cardiothoracic surgery, gastroenterology, gastro intestinal surgery, neurology, neurosurgery and psychiatry.

A total of 7474 patients presenting to the department for the evaluation of thyroid status during 2005-08 were enrolled in the study. These patients were referred to us from the various wards and outpatient departments due to the clinical suspicion of thyroid disorder. Patients were included only once in the study at the time of their first presentation during this time frame. A detailed history regarding the symptoms, intake of drugs known to affect thyroid functioning and concurrent disease was recorded. The exclusion criterion that we adopted was any thyroid surgery in the preceding one year. All major current medical diagnoses and current drug therapies were recorded based on patient reporting. Diagnoses were then categorized in line with recognized major disease groupings. Similarly, drug therapies previously identified as influencing tests of thyroid function or being indicative of significant medical diagnoses were categorized.

Sample collection

The patients were examined and asked to report after overnight fast for sample collection on a prescribed date. About 5 ml of blood was collected in a plain vacutainer under aseptic conditions. The serum was separated and stored at -70 °C till further analysis.

Thyroid function tests

Thyroid hormone estimation was done with commercially available ELISA kits supplied by Cal biotech, USA. Serum TSH had a laboratory reference range of 0.39-6.16 μ IU/ml with an interassay coefficient of variation of 5.9 %. The

Thyroid hormone estimation was done with commercially available ELISA kits supplied by Cal biotech, USA. Serum TSH had a laboratory reference range of 0.39-6.16 μ IU/ml with an interassay coefficient of variation of 5.9 %. The manufacturer's quoted mean functional sensitivity was 0.05 μ IU/ml.

Serum total T₃ had a laboratory reference range of 0.52-1.58 ng/ml with an interassay coefficient of variation of 6.7 %. The manufacturer's quoted mean functional sensitivity was 0.04 ng/ml.

Serum total T₄ had a laboratory reference range of 4.8-11.6 μ g/dl with an interassay coefficient of variation of 3.7 %. The manufacturer's quoted mean functional sensitivity was 0.4 μ g/dl.

Subjects were categorized according to measurements of serum TSH and total thyroid hormone concentrations as follows:

Overt hyperthyroidism [serum TSH < 0.4 μ IU/ml with raised total T₄ and total T₃ or raised total T₃ alone (T₃-toxicosis)]

Subclinical hyperthyroidism (serum TSH < 0.4 μ IU/ml with normal total T₄ and total T₃)

Euthyroid (serum TSH 0.4–6.6 μ IU/ml with normal T₃ and T₄)

Subclinical hypothyroidism (serum TSH >6.6 μ IU/ml with normal total T₄ and T₃)

Overt hypothyroidism (serum TSH > 6.6 μ IU/ml with low total T₄ and T₃).

Statistical methods

Statistical Analysis was done using Microsoft Office "Excel" with Windows 2007 Operating System. For TSH, FT₃ and FT₄ we calculated the mean and standard deviation and standard error. Multiple comparisons were analyzed with the SPSS 12.0 statistical software package (SPSS Inc).

RESULTS

A total of seven thousand four hundred and seventy four patients were enrolled in the study. A female preponderance was observed with a female

to male ratio as 2.86(females-5541 vs. males - 1933). Table no 1 gives the age wise distribution of the study population. The maximum number of patients (%) belonged to the age bracket of 21- 40 years. As our hospital does not have a dedicated pediatric medicine department, hence the number of patients in the age bracket of 0-20 years is low. A female preponderance can be observed in all the age groups.

Table 1: Age wise distribution of the study population.

Age Groups(yrs)	M/F	n	%
0-10	38/88	126	1.68%
11-20	200/401	601	8.04%
21-40	862/3200	4062	54.35%
41-60	721/1629	2350	31.44%
> 60	112/223	335	4.49%

Table no 2 depicts the number of patients referred to our thyroid laboratory from different specialties. Psychiatry, neurology and cardiology contributed almost 77% of the total number of patients who underwent thyroid function evaluation. Gastroenterology department referred 1080 patients to our laboratory. This comprised approximately 14% of the total number of patients referred to us. The patient load from the departments of neurosurgery, gastrointestinal surgery and cardiothoracic vascular surgery departments was 5.26%, 1.52% and 1.48% respectively. A female preponderance can be observed in all the groups.

Table 2: Distribution of patients according to the referral clinic

Referral Clinic	M/F	n	%
Cardiology	494/1499	1993	26.66%
Neurology	547/1436	1983	26.53%
Gastroenterology	280/800	1080	14.45%
Gastro intestinal Surgery	30/84	114	1.52%
Psychiatry	446/1354	1800	24.08%
Neurosurgery	105/288	393	5.26%
Cardiothoracic Vascular Surgery	31/80	111	1.48%

The prevalence of thyroid disorders in these 7474 subjects is illustrated in table no 3a.

Table no 3a: Distribution of thyroid functional status in the study population

Thyroid status		M/F	n	%
Euthyroid	TSH (0.39-6.6μU/ml)	1693/4703	6396	85.58%
Hyperthyroid	TSH (<0.39 μU/ml)	9/82	91	1.22%
Sub clinical hypothyroid	TSH (6–10 μU/ml)	111/387	498	6.66%
	TSH (10-20μU/ml)	48/186	234	3.13%
	TSH (>20 μU/ml)	12/45	57	0.76%
Overt hypothyroid	TSH (>40 μU/ml)	60/138	198	2.65%

The majority of the patients (approximately 85%) were Euthyroid. Only 1.22% of the total number of referred patients turned out to be hyperthyroid. Hypothyroidism was more prevalent with the number of patients diagnosed with both sub clinical and overt hypothyroidism being 987 (13.2%). Almost 80% of the total number of hypothyroid patients presented with sub clinical hypothyroidism. Most of the sub clinical hypothyroid patients (n=498; 6.6%) had TSH levels between 6-10 μU/ml. Serum TSH levels in the range of 11-20 and > 20 μU/ml were observed in 3.13% and 0.76% of the subjects respectively.

A similar pattern was observed on comparing the thyroid status in both the sexes. Among the male subjects, 87.6% were euthyroid while 8.8%, 3.1% and 0.46% were diagnosed with sub clinical hypothyroidism, overt hypothyroidism and

hyperthyroidism respectively. Euthyroid status was elicited in 84.9% of the female patients which is comparable with the figure obtained for the male subjects. Overt hypothyroid status was observed in 2.5% while sub clinical hypothyroidism was prevalent in 11.1% of the total number of female patients included in our analysis. Approximately 1.5% of the females were found to be hyperthyroid. Table 3b portrays the prevalence of thyroid disorders in the study population classified according to their age groups. Majority of the patients in all the groups were euthyroid as established biochemically. Sub clinical hypothyroidism with serum TSH levels between 6–10 μU/ml was the second most common disorder with a prevalence of 7.1%, 6.5%, 6.35% and 7.9% in the age group bands of 0-10 yrs, 11-20 yrs, 21-40 yrs and 41-60 yrs respectively. However, sub clinical hypothyroidism with serum TSH levels between 11-20 μU/ml was the second most common pathology with a prevalence of 3.5% in the subjects with age > 60 years.

The prevalence of hypothyroidism and hyperthyroidism in the patients referred from different clinics is depicted in table 3c. A similar pattern as discussed above, was observed, with 79.9% of the patients from cardiology, 86.5% from neurology, 89.7% from gastroenterology, 71% from gastrointestinal surgery, 86.3% from neurosurgery, 72.9% from cardiothoracic vascular surgery and 89% from psychiatry were euthyroid. Sub clinical hypothyroidism was the commonest thyroid disorder observed in all the groups. Among the subjects diagnosed with sub clinical hypothyroidism, serum TSH levels as 6-10 μU/ml was the most common biochemical finding with a prevalence of 65%, 57.1%, 78%, 83.3% and 62% in the cardiology, neurology, gastroenterology, gastrointestinal surgery and psychiatry patients respectively. However, an equal preponderance of

Table no 3b: Distribution of thyroid functional status in the different age groups

Thyroid status		0-10 yrs (n=126)	11-20yrs (n=601)	21-40yrs (n=4062)	41-60yrs (n=2350)	>60yrs (n=335)
Euthyroid	TSH (0.39-6.6 μ IU/ml)	108 (85.71%)	538 (89.51%)	3478 (85.62%)	1972 (83.91%)	300 (89.55%)
Sub clinical hypothyroid	TSH (6-10 μ IU/ml)	9 (7.14%)	39 (6.49%)	258 (6.35%)	183 (7.78%)	9 (2.69%)
	TSH (10-20 μ IU/ml)	9 (7.14%)	15 (2.5%)	129 (3.17%)	69 (2.93%)	12 (3.58%)
	TSH (>20 μ IU/ml)	0 (0%)	0 (0%)	24 (0.59%)	30 (1.27%)	3 (0.89%)
Overt hypothyroid	TSH (>40 μ IU/ml)	0 (0%)	9 (1.5%)	132 (3.25%)	51 (2.17%)	6 (1.79%)
Hyperthyroid	TSH (<0.39 μ IU/ml)	0 (0%)	0 (0%)	41 (1%)	45 (1.91%)	5 (1.49%)

Table no 3c: Distribution of thyroid functional status in the patients referred from different departments

Thyroid status		C	N	G	GIS	NS	P	CTVS
Euthyroid	TSH (0.39-6.16 μ IU/ml)	1593 (79.9%)	1716 (86.5%)	969 (89.7%)	81 (71%)	342 (87%)	1605 (89%)	81 (73%)
Sub clinical hypothyroid	TSH (6-10 μ IU/ml)	178 (8.9%)	116 (5.8%)	66 (6.1%)	15 (13.1%)	15 (3.8%)	99 (5.5%)	9 (8%)
	TSH(10-20 μ IU/ml)	81 (4%)	78 (3.9%)	9 (0.8%)	0 (0%)	9 (2.3%)	51 (2.8%)	6 (5.4%)
	TSH >20 μ IU/ml)	15 (0.75%)	9 (0.45%)	9 (0.8%)	3 (2.6%)	6 (1.5%)	9 (0.5%)	6 (5.4%)
Overt hypothyroid	TSH >40 μ IU/ml)	74 (3.7%)	52 (2.62%)	18 (1.6%)	9 (7.9%)	15 (3.8%)	30 (1.6%)	9 (8.1%)
Hyperthyroid	TSH<0.39 μ IU/ml)	52 (2.6%)	12 (0.6%)	9 (0.8%)	6 (5.3%)	6 (1.5%)	6 (0.3%)	0 (0%)

C cardiology; N neurology; G gastroenterology; GIS gastrointestinal surgery; NS neurosurgery; P psychiatry; CTVS cardiothoracic vascular surgery.

sub clinical and overt hypothyroidism was noticed in the patients referred from neurosurgery and cardiothoracic vascular surgery with a prevalence of 3.7% and 8.1% respectively among the total number of patients referred from these two departments. Another interesting finding was a comparatively higher prevalence of hyperthyroidism in the patients referred from the gastrointestinal surgery and cardiology department. Approximately 5.2% 2.6% of the patients from the abovementioned department were hyperthyroid as compared to 1.5%, 0.6%, 0.8% and 0.3% neurosurgery, neurology, gastroenterology, and psychiatry patients respectively. None of the patients referred from cardiothoracic vascular surgery department were hyperthyroid. Relevant drug intake information is shown in table no 4.

Table no 4: Significant history of drug intake known to influence thyroid function in the study population

Drug	n	%
Hypothyroid patient on Eltroxin	1008	13.49%
Lithium intake for manic depressive psychosis	33	0.44%

A positive history of eltroxin intake was found in 1008 subjects. This comprises 13.49% of the study population. Lithium therapy was being given to 33 patients referred by the psychiatry department. Lithium therapy is responsible for drug induced hypothyroidism. Table no 5 depicts the response to eltroxin therapy in the known cases of hypothyroidism. The samples were taken only once when the patient first presented to us. The cases of hypothyroidism were assessed to determine response to medication, compliance and improvement in thyroid profile if any, determined biochemically. Approximately 70% of the patients became euthyroid as a result of eltroxin therapy. The frequency of hypothyroidism and hyperthyroidism in this sub group was 26.8% and

3% respectively.

Table no 5: Response to Eltroxin therapy in the known cases of hypothyroidism.

Patient description	M/F	n	%
No. of known hypothyroid patients on Eltroxin therapy	296/887	1008	
No. of patients who were Euthyroid with therapy	197/511	708	70.2%
No. of patients who remained hypothyroid	71/199	270	26.8%
No of patients who became hyperthyroid.	9/21	30	3%

Table no 6: Effect of lithium therapy on thyroid status

Thyroid status		n	%
Euthyroid	TSH (0.39-6.16 μ IU/ml)	24	72.7%
Sub clinical hypothyroid	TSH (6-10 μ IU/ml)	6	18.2%
	TSH(10-20 μ IU/ml)	0	-
	TSH(>20 μ IU/ml)	0	-
Overt hypothyroid	TSH>40 μ IU/ml	3	9.1%
Hyperthyroid	TSH<0.39 μ IU/ml	0	-

Effect of lithium therapy on thyroid function is delineated in table no 6. A total of 33 patients gave a history of lithium ingestion. Majority of them had preserved thyroid function (24/33). Sub clinical hypothyroidism with serum TSH levels in the range of 6-10 μ IU/ml and overt hypothyroidism was detected in 6 and 3 patients respectively.

DISCUSSIONS

Thyroid dysfunction usually presents with a myriad of signs and symptoms that involve the nervous system, cardiovascular system, gastrointestinal system among others (7). This disorder usually inflicts the females more than the males. Iodine deficiency further aggravates the problem (8). We conducted this study to assess the prevalence of thyroid dysfunction among the patients attending a tertiary care hospital in New Delhi, India. The endemicity of iodine deficiency in the Himalayan belt makes this study highly relevant in assessing the thyroid status post iodine fortification programme.

We have evaluated the clinico- biochemical profile of 7474 patients who underwent thyroid functional analysis in our endocrine laboratory over a period of 3 years. A female preponderance was observed with the number of female subjects more than double the number of male subjects. Approximately 85% of the subjects were euthyroid. Hypothyroidism was observed in 13.2% of the patients. Among these hypothyroid subjects, 80% presented with a sub clinical picture. A similar pattern was observed for the male and the female subjects. A recent study conducted by Abraham et al confirmed a prevalence of 11% for hypothyroidism in the female patients attending a clinic in Pudducherry (9). Our value of 13% is in concordance with the above study. Our figure of 13.2% is however, higher than 9.5% reported by the Colorado Thyroid Study which evaluated the prevalence of thyroid disorders in the general population (10). Similarly, the Nijmegen Biomedical Study found sub clinical hypothyroidism in 4% of the 9371 individuals included in the study (11). The corresponding figure from our study is 10.5% (males-8.85%, females-11.15%). Vanderpump concluded from his study assessing the epidemiology of thyroid disorders that hypothyroidism is prevalent in 1-2% of the population and is more common in women (12). There may be two plausible explanations for the higher prevalence of hypothyroidism in our study

cohort. One, the iodine deficient diet due to low soil iodine levels in the north Indian population may precipitate hypothyroidism. Secondly, extrapolation of our findings to the general population is not advisable due to the inherent bias of hospital based study.

Hypothyroidism is a common clinical entity which can be easily detected in the laboratory and efficiently managed pharmacologically but may present with serious complications if untreated. Hypothyroidism may be classified as (1) Primary (thyroid failure), (2) secondary (due to pituitary TSH deficit), tertiary (due to hypothalamic deficiency of TRH) or may be due to (4) peripheral resistance to the action of thyroid hormones. It has been established that sub clinical hypothyroidism inflicts females more frequently than men. The Whickham survey (British survey of adults of all ages) demonstrated a relatively constant (2-5%) prevalence of hypothyroidism in males as compared to an age dependent increase observed in females (13). Hypothyroidism presents with non specific neuropsychiatric complaints, weight gain, constipation, menstrual irregularities, fatigue, cold intolerance or specific hypercholesterolaemia, hyponatraemia or hyperprolactinaemia. Severe untreated hypothyroidism can lead to coronary artery disease, heart failure, psychosis, and coma (14, 15). Hypothyroidism was a frequent discovery in the patients referred to us from cardiology, neurology and psychiatry. The most common reason for referral from psychiatry was depression which is a common finding in hypothyroid patients. Weight gain and dyslipidemia were the two common signs observed in the patients referred by the cardiologists. Tremors and neurological sequelae of cardiac events prompted thyroid functional analysis in the patients presenting to the neurology department. Thyroxine replacement therapy is an effective intervention for reversing hypothyroidism.

Approximately, 70% of the hypothyroid patients who were on eltroxin therapy became euthyroid. However, unsupervised therapy may cause overcorrection causing the reversal of the initial pathology leading to hyperthyroidism. This was observed in 3% of the on treatment hypothyroid patients in our study.

Hyper functioning of the thyroid gland-hyperthyroidism is relatively less frequent as compared to hypothyroidism. A female preponderance is noticed for this disorder as well (16). We demonstrated a prevalence of only 1.22% for this thyroid disorder in the study population. Approximately 0.5% of the males were found to be hyper secreting. The prevalence for the same was three times in females at 1.5%. Our findings are in accordance with the results of Abraham et al (1.8%) (3), Colorado Thyroid Study (2.2%) (4), Whickham survey (1.6%) (6) and the NHANES III study (1.3%) (17). Kochupillai N (1) concluded from his studies on hyperthyroidism prevalence and etiology in India, that it is widely prevalent thyroid disorder in north India.

The symptoms of hyperthyroidism are weight loss, palpitations, menstrual irregularities, heat intolerance, diarrhoea and restlessness. Atrial fibrillation occurs in 10-15% of patients with hyperthyroidism (18,19). The signs that are commonly observed in these patients are rapid pulse and eye changes. This characteristic symptomology prompted thyroid profile tests and a comparatively higher prevalence of hyperthyroidism in the patients referred from the gastrointestinal surgery and cardiology departments.

Many drugs are known to affect thyroid functioning. These include lithium, amiodarone, dopamine, glucocorticoids, furosemide etc (20). As our hospital is a referral center for psychiatry, around 33 patients on lithium therapy were referred to us. Majority of them were euthyroid (72%) whereas the adverse effect of lithium therapy- hypothyroidism was

is a referral center for psychiatry, around 33 patients on lithium therapy were referred to us. Majority of them were euthyroid (72%) whereas the adverse effect of lithium therapy- hypothyroidism was reported in approximately 27% of these patients. Lithium is concentrated by the thyroid and inhibits thyroidal iodine uptake. It has also been shown to inhibit iodotyrosine coupling, alter thyroglobulin structure, and inhibit thyroid hormone secretion (21). Our results are in accordance with the findings of Ozpoyraz et al, who reported hypothyroidism in only 14% of the subjects on lithium therapy (22).

We have strived to provide baseline orientation regarding the prevalence of thyroid disorders in the representative north Indian population. To the best of our knowledge, this is the first study that has attempted to evaluate the epidemiology of this disease in the north Indian population. Similar studies have been carried out in Goa (23), Pudducherry by different researchers. However, true picture can be ascertained only after population based studies which can predict the true incidence and prevalence rates.

CONCLUSION

Hypothyroidism is a common clinical entity which can be easily detected in the laboratory and efficiently managed pharmacologically but may present with serious complications if untreated. This disorder usually inflicts the females more than the males. Severe untreated hypothyroidism can lead to heart failure, psychosis, and coma. Hypothyroidism is a predisposing factor for coronary artery disease, infertility, metabolic syndrome, hyperlipoproteinemias among other pathologies. Similarly hyperthyroidism ushers atrial fibrillation, ophthalmopathies and various other metabolic disturbances. Hence, it is of paramount importance to detect these disorders at the pre clinical stage and manage them to dete-

-ct these disorders at the pre clinical stage and manage them accordingly. This requires a keen eye of suspicion which is possible only with familiarity of the disease epidemiology in that particular geographical location. Our study discerns with the prevalence rates in a tertiary care hospital, which may present with skewed statistics due to the specific genre of the patients presenting to the center. It nevertheless, acquaints us with baseline cognition of the magnitude of the problem in north India. However, true picture can be ascertained only after population based studies which can predict the true incidence and prevalence rates.

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