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Original Article

Prevalence of Thyroid Disorders in Rohtas district of Bihar: A Hospital Based Study

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Abstract
Background: *Thyroid disorders are among the commonest endocrine disorders in India as well as across the world. It has been estimated that about 42 million people in India suffer from thyroid diseases. The prevalence and pattern of thyroid disorders depends on sex, age, ethnic and geographical factors and especially on iodine intake. Thyroid disease is being increasingly diagnosed with greater awareness and is one of the chronic non communicable disease affecting women more, though male population is not spared of the ailment. Studies from various research workers discuss the proportion of thyroid disorder among Indian states like Delhi, Mumbai, Kolkata, Bangalore, Chennai, Goa etc but there is paucity of data from the rural areas. The present study was conducted to find out the prevalence of thyroid disorders among the people of Rohtas district of Bihar.*
Material and Methods: *This is the observational, retrospective study conducted in department of Biochemistry Narayan Medical College & Hospital, Sasaram, Bihar. In total, 2178 patients visiting to hospital and suspecting of thyroid disorders were screened for thyroid function. Thyrotrophin (TSH), triiodothyronine (T3), and tetraiodothyronine (T4) in human serum were quantitatively estimated. Statistical analysis was performed by SPSS version 20 software.*
Results: *Of the 2178 total subjects in the age range 1 to 80 years, 31.0% had thyroid dysfunction and 69.0% had euthyroidism; 17.0% had subclinical hypothyroidism, 8.3% had overt hypothyroidism; 4.1% had overt hyperthyroidism while 1.6% had subclinical hyperthyroidism.*
Conclusion: *Our study suggests that the prevalence of thyroid disorders in our study population is high with female preponderance and subclinical hypothyroidism is the commonest abnormality, followed by overt hypothyroidism, overt hyperthyroidism and subclinical hyperthyroidism. The study is the first effort from Bihar towards the proportion of thyroid disorder. Being iodine deficient area as well, proper awareness is required for the control of disease so that its prevention and associated diseases can be minimized.*
Keywords: *Hypothyroidism, Hyperthyroidism, Subclinical Hypothyroidism, Subclinical Hyperthyroidism.*

Introduction

Thyroid disorders are among the commonest endocrine disorders in India as well as across the world. 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[1]. The prevalence and pattern of thyroid disorders depends on sex, age, ethnic and geographical factors and especially on iodine intake[2]. 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[3].

Thyroid hormones have an indispensable role in metabolic processes in human body, and numerous physiological and pathological stimuli are known to influence thyroid metabolism[4]. The level of thyroid hormone above or below the normal reference range may result in thyroid disorder. The scope of thyroid disorder span from underneath hypothyroidism to more active hyperthyroidism. In majority of the studies the proportion of hypothyroidism is found to be more as compared to others being mostly among females. The abnormal thyroid is associated with many diseases and complications. 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[5- 6].

After successful salt iodinisation 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[7]. Hypothyroidism is 10 times more common in women than in men[8]. The prevalence of hyperthyroidism is also reported as more common in women than men[9]. Studies from various research workers have shown that the proportion of thyroid disorder has been done for different states of India[10-13] but it appears that there has been no study carried out at Bihar. In view of above a study has been made to find out the prevalence of thyroid disorders among the people of Rohtas district of Bihar.

Materials and Methods

The hospital based retrospective study was carried out at Department of Biochemistry, Narayan Medical College & Hospital, Sasaram, Bihar from March 2016 to December 2017 comprising of 2178 subjects. The present study was started after obtaining ethical clearance from the institutional ethical committee. The data was collected from patients that referred to central laboratory of our hospital for thyroid function tests. Total of 2178 patients were selected for the study. The study population includes 294 (13.5%) males and 1884 (86.5%) females. Patients with incomplete thyroid function test and patients with any acute and chronic illness like renal diseases, hepatic diseases and cardiac diseases were excluded from the study.

Blood Sample Collection: Overnight fasting venous blood sample was taken from antecubital vein of the patients taking aseptic precautions after tying tourniquet in the arm. Blood was collected in plain vials without any additives. It was allowed to clot for 30 minutes. After clot formation the blood was centrifuged at 3000 rpm for 10 minutes. Serum was separated from cells and collected in a separate aliquot vial and labelled carefully.

Thyroid function tests: Serum samples were assayed for levels of thyroid-stimulating hormone (TSH), triiodothyronine (T3), and thyroxine (T4). Assays of hormones were performed by Erba LISASCAN EM automated microplate analyzer using commercially available enzyme-linked

immunosorbent assay (ELISA) kit Bene Sphera™ (Avantor) by enzyme immunoassay quantitative method. The assay procedures followed were as per kit inserts of the manufacturer. The biological reference ranges for TSH, T3, and T4 are as follows (as per kit insert):

SerumT_4: 4.8–11.6µg/dl

SerumT_3: 0.52–1.8ng/ml

Serum TSH: 0.27–4.2 µIU/ml

Thyroid status was defined as:

- Euthyroid (T3, T4 and TSH levels are in normal reference range)
- Hypothyroidism (T3 or T4 levels are low and TSH level is high)
- Subclinical Hypothyroidism (T3 and T4 levels are in normal range and TSH level is high)
- Hyperthyroidism (T3 or T4 levels are high and TSH level is low)
- Subclinical Hyperthyroidism (T3 and T4 levels are in normal range and TSH level is low)

Statistical analysis: The data was analyzed by using the SPSS software package, version 20.0 (SPSS Inc., Chicago, IL, USA) for windows. The data were expressed as mean ± SD. A student's t-test was used to determine the effect of gender and age in thyroid disorder. Chi square tests were used for comparison when appropriate. Pearson correlation was used to determine the association between the variables. P-value of <0.05 was considered to be statistically significant.

Results

The present study was a retrospective hospital based study, carried out from March 2016 to December 2017 comprising of 2178 subjects (294 males and 1884 females) with suspicion of thyroid disorder who were subjected to thyroid function assay. The proportion of thyroid disorder has been calculated among total population, females and males. The highest number was in the 31- 40 age group (30.07 %) and lowest number in the elderly group (>70 years 0.14%). Out of 2178 with suspected thyroid disorder, 69.0% (n=1504; 1293 F and 211 M) were categorized as euthyroid. The distribution of various thyroid disorders is depicted in figure 1. The presence of either subclinical or overt, hypo- or hyperthyroidism was used to define thyroid dysfunction.

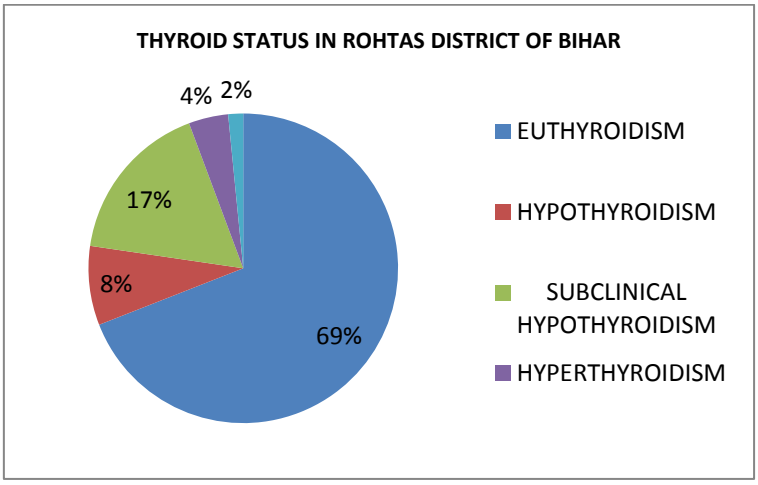

Figure 1: Thyroid status in Rohtas district of Bihar.

Among the total population studied the burden of thyroid disorder is 31 %, comprising of 27 % in females and 4 % in males. In our study the subclinical hypothyroidism (SCH) was the commonest thyroid function abnormality affecting 17 % of subjects (n=370; 319F and 51M). 8.3% (n=180; 155F and 25M) individuals were overt hypothyroid with elevated levels of TSH and low levels of total T3 and total T4 in serum.

Table 1: Proportion of Thyroid Disorders in total Population according to Gender

THYROID STATUS	ALL (N=2178)		FEMALES(N=1884)		MALES(N=294)	
	N	%	N	%	N	%
EUTHYROIDISM	1504	69	1293	59.4	211	9.6
HYPOTHYROIDISM	180	8.3	155	7.1	25	1.1
SUBCLINICAL HYPOTHYROIDISM	370	17	319	14.6	51	2.4
HYPERTHYROIDISM	90	4.1	84	3.8	6	0.3
SUBCLINICAL HYPERTHYROIDISM	34	1.6	33	1.5	1	0.1

4.1% (n=90; 84F and 6M) cases had hyperthyroidism and the laboratory findings of thyroid profile showed significant elevation of total T3, total T4 in serum and low levels of TSH. Subclinical hyperthyroidism was detected in 1.6% (n=34; 33F and 1M) A higher prevalence of thyroid disorder was seen in patients who are in their fourth decade of life with a female preponderance. [table1]

From table 2, the proportion of thyroid disorder (95% confidence interval) in different age groups can be observed. Among age group of 1-20, the proportion of euthyroidism is 9.0 %, hypo is 0.7%, hyper is 0.5 %, subclinical hypothyroidism is 2.5 %, subclinical hyperthyroidism is 0.1 %. Majority of patients belong to 21-50 age group and the proportion of subclinical hypothyroidism is 12.3 %, hypothyroidism 6.2 %, 3.2 % hyperthyroidism, 1.3% subclinical hyperthyroidism, and 51.4 % euthyroidism among age group of 21-50.

Table 2: Proportion of Thyroid Disorders in total Population according to age

AGE IN YEARS	EUTHYROIDISM	HYPOTHYROIDISM	SUBCLINICAL HYPOTHYROIDISM	HYPERTHYROIDISM	SUBCLINICAL HYPERTHYROIDISM	TOTAL
1-10	32	2	13	2	0	**49**
11-20	163	13	41	8	2	**227**
21-30	399	51	97	24	7	**578**
31-40	453	51	110	29	12	**655**
41-50	268	34	60	16	10	**388**
51-60	141	24	37	10	2	**214**
61-70	47	5	10	1	1	**64**
>70	1	0	2	0	0	**3**

In elderly (age group 51-70), the proportion of euthyroidism is 8.6 %, hypothyroidism is 1.3 %, hyperthyroidism is 0.5 %, Subclinical hypothyroidism is 2.2 %, and Subclinical hyperthyroidism is 0.1 %. Among very old age group, 71 onwards, the proportion of different thyroid disorder is almost negligible. This might be due to the fact the pool size is very small among very old age group.

Table 3: Proportion of Thyroid Disorders among males

AGE IN YEARS	EUTHYROIDISM	HYPOTHYROIDISM	SUBCLINICAL HYPOTHYROIDISM	HYPERTHYROIDISM	SUBCLINICAL HYPERTHYROIDISM	TOTAL
1-10	18	0	5	2	0	**25**
11-20	19	1	4	1	0	**25**
21-30	36	5	6	0	0	**47**
31-40	63	10	16	3	1	**93**
41-50	45	4	8	0	0	**57**
51-60	23	4	11	0	0	**38**
61-70	7	1	1	0	0	**9**

Table 4: Proportion of Thyroid Disorders among females

AGE IN YEARS	EUTHYROIDISM	HYPOTHYROIDISM	SUBCLINICAL HYPOTHYROIDISM	HYPERTHYROIDISM	SUBCLINICAL HYPERTHYROIDISM	TOTAL
1-10	14	2	8	0	0	**24**
11-20	144	12	37	7	2	**202**
21-30	363	46	91	24	7	**531**
31-40	390	41	94	26	11	**562**
41-50	223	30	52	16	10	**331**
51-60	118	20	26	10	2	**176**
61-70	40	4	9	1	1	**55**
>70	1	0	2	0	0	**3**

The number of females is more as compared to number of males. Among females and males (see table 3 and 4) it was observed that the proportion of thyroid disorder is highest in age group of 21-50 as compared to other decades of life. The proportion of hypothyroidism, subclinical hypothyroidism, hyperthyroidism and subclinical hyperthyroidism is high among females as compared to males being 7.1%, 14.6%, 3.8% and1.5% as compared to that of males being 1.2 %, 2.4 %, 0.3% and 0.1 % respectively.

Discussion

Thyroid disorders are amongst the most common endocrine diseases in India. Despite the coverage of National iodine deficiency diseases control Programme (NIDDCP) in India, iodine deficiency is still prevalent in many parts of India. There are still many districts in India where we are unaware of incidence of thyroid disorders. One such district in Bihar is Rohtas. Thus, the present study was conducted to know the prevalence of thyroid disorders in Rohtas district of Bihar. This retrospective hospital based study was carried out from March 2016 to December 2017 comprising of 2178 subjects (294 males and 1884 females) with suspicion of thyroid disorder who were subjected to thyroid function assay. Their ages ranged from 1- 80 years.

In the present study we found 31% subjects had thyroid dysfunction. Studies from various research workers have shown different proportion of thyroid disorder from different states of India. Dhok et al[14] reported prevalence of 35.7 % of thyroid dysfunction in a study conducted on 1905 subjects in Wardha district of Maharashtra which resemble with our finding whereas in a similar study Rebecca et al[15] reported prevalence of 15.8 % of thyroid dysfunction in women of Pondicherry and Arindam Bose et al[16] found prevalence of 15.35% in central India in their study. The strikingly larger percentage of subjects with thyroid dysfunctions in our study is most likely based on the subjects' high iodine and goitrogen ingestion. Also, it has been observed that residents of Rohtas region consume more goitrogenic foods than in many other regions.

In our study the subclinical hypothyroidism (SCH) was the commonest thyroid function abnormality affecting 17 % of subjects, more common in females (14.6 %) than males (2.4%). SCH as the commonest thyroid abnormality has been reported in cross sectional studies from Cochin (9.4%) [10] and Delhi (19.3 %) [17.] In the above studies the SCH was more common in females than males similar to our study. We also found high prevalence of subclinical hypothyroidism and lower prevalence of clinical hypothyroidism in our study. These findings suggest that thyroid function test should be done in the people of Rohtas region to exclude the diagnosis of hypothyroidism as they will not experience the signs and symptoms of it. Also in recent years, prevalence of infertility has increased manifold and subclinical hypothyroidism is its one of the important aetiological factors.

Hypothyroidism was the second commonest thyroid abnormality seen in 8.3% of the subjects. We found that the prevalence of hypothyroidism

was higher amongst the female population. A high prevalence of hypothyroidism was observed in the age group of 21–50 years which are in accordance with the study conducted in Meerut, Uttar Pradesh by Ahmad et al. which shows a higher prevalence of hypothyroidism within the patients who are in their third decades of life[18]. However, the reported prevalence rate of hypothyroidism varies from 8.88 to 21.67 % based on the place of study [19]. The high prevalence figures in Cochin and Kolkata have ascertained that thyroid disorders in India are not confined to the conventional iodine deficient sub-Himalayan zone but extending to the plain fertile lands as well as areas reporting majority of population consuming iodized salt. A possible etiological role by goitrogenic foods, industrial and agricultural contaminants acting as thyroid disruptors and deficiencies of micronutrients (iron, selenium and zinc) which can interfere with thyroid function may be considered in subjects consuming iodized salt. The prevalence rate of hypothyroidism was more in females than males, irrespective of age group of subjects. The prevalence of hypothyroidism was also shown to increase with age in our study supported by a similar study in Malappuram, Kerala[20].

Hyperthyroidism was the third commonest thyroid abnormality affecting 4.2 % of subjects in our study. The prevalence rate of hyperthyroidism was more in females than males in all age groups. The hyperthyroidism was more common in age of 21-50 years than those of ≥ 51 and 1-20 years. Our finding is supported by similar study by Prasad et al in neighbour state Jharkhand[21], and study by Gupta et al in Bilaspur[22] the prevalence of hyperthyroidism was 2.7% and 5% respectively in their studies.

The subclinical hyperthyroidism was found in 1.5% subjects in the present study. The subclinical hyperthyroidism was common in age group of 21-50 years similar to overt hyperthyroidism. Earlier studies have reported a prevalence rate of subclinical hyperthyroidism from 0.6-1.6 % similar to our study[10].

The important limitation of the study was that normal reference range used for the hormonal assay were provided by the manufactures of the kit as we did not have specific reference range for our state, Secondly antithyroperoxidase antibody were not assayed and third among very old age group the sample size was very small. We hope to extend the study to a larger cross-section of men and women in this region keeping in mind environmental and etiological factors such as auto immunity, drugs, iodine, and non thyroidal illness

Conclusions

Thyroid disorders are common in Rohtas district of Bihar similar to rest of the Country. Thyroid dysfunction is more common in females than males in all age groups. Thyroid disorders are common in age of 21-50 years than 1-20 and ≥ 51 years categories. Subclinical hypothyroidism is the commonest disorder of thyroid followed by hypothyroidism. There is gender specific response to thyroid hormone profile with ageing. Being iodine deficient area as well, proper awareness and understanding is required for the control of disease so that its prevention and associated diseases can be minimized.

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