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A CROSS SECTIONAL STUDY OF PREVALENCE OF HYPOTHYROIDISM IN ADULT POPULATION OF UDAIPUR DISTRICT

Rakesh Dhadhal[1], Vishal Mulchandani[1], Richa Parakh[1], Ashish Joshee[1], Ketan Mangukiya[2,] Nihari Bathwar[3]

[1]Department of Pathology, Geetanjali Medical College & Hospital, Udaipur, Rajasthan
[2]Department of Biochemistry, Geetanjali Medical College & Hospital, Udaipur, Rajasthan
[3]Department of Oral medicine & radiology, Pacific Dental College & Hospital, Udaipur, Rajasthan

ABSTRACT

A cross-sectional study was conducted in patients referred to central lab in Geetanjali Medical College & Hospital, Udaipur, Rajasthan to study the prevalence of hypothyroidism. Thyroid abnormalities were diagnosed on the basis of thyroid function test results (serum T3, T4 and TSH levels). Patients with history of hypothyroidism or those with serum T4 <5 ng/ml and TSH>5.50 µU/ml, were categorized as hypothyroid. The prevalence of subclinical hypothyroidism and anti-thyroid peroxidase (anti-TPO) antibody positivity was also assessed. A total of 300 adult patients ≥20 years of age were evaluated (mean age: 41 years; 88% females). The overall prevalence of hypothyroidism was 9.33% (n=28) of which 5.66% (n=17) patients self-reported the condition, whereas 3.67% (n=11) were previously undetected. A significantly higher proportion of females (89.28%) vs. males were diagnosed with hypothyroidism. Additionally, 4% (n=12) patients were diagnosed to have subclinical hypothyroidism (normal serum T4 and TSH>5.50 µIU/ml). Anti–TPO antibodies suggesting autoimmunity were detected in 56 patients (18.66%). The prevalence of hypothyroidism was common, affecting approximately one in 11persons in present study. Female patients and middle aged adults had significant association with hypothyroidism. Subclinical hypothyroidism and anti-TPO antibody positivity were the other common observations.

KEY WORDS: Thyroid disorder, abnormalities, Udaipur district

INTRODUCTION

Hypothyroidism is characterized by a broad clinical spectrum ranging from an overt state of myxedema, end-organ effects and multisystem failure to an asymptomatic or subclinical condition with normal levels of thyroxine and triiodothyronine and mildly elevated levels of serum thyrotropin[1-4].The prevalence of hypothyroidism in the developed world is about 4-5%[5,6]. The prevalence of subclinical hypothyroidism in the developed world is about 4-15% [5,7]. In a developing and densely populated country like India, communicable diseases are priority health concerns due to their large contribution to the national disease burden[8]. In India, hypothyroidism was usually categorized under the cluster of iodine deficient disorders (IDDs), which were represented in terms of total goiter rates and urinary iodine concentrations, typically assessed in school-aged children[9-11]. Ever since India adopted the universal salt iodization program in 1983 [12] there has been a decline in goiter prevalence in several parts of the country, which were previously endemic [13-15]. In 2004, a WHO assessment of global iodine status classified India as having 'optimal' iodine nutrition[16,17] with a majority of households (83.2% urban and 66.1% rural) now consuming adequate iodized salt[18,19]. India is supposedly undergoing a transition from iodine deficiency to sufficiency state. A recent review of studies conducted in the post-iodization phase gives some indication of the corresponding change in the thyroid status of the Indian population[20]. However, most of these studies are limited to certain geographical areas or cities, and undertaken in children with modest sample sizes[21-24].There have been no nationwide studies on the prevalence of hypothyroidism from India, either in the pre- or post-iodization periods. A large, cross-sectional, comprehensive study was required to provide a true picture of the evolving profile of thyroid disorders across the whole country, especially as the country is in the post-iodization era.

MATERIALS & METHODS

Study design

This was a cross-sectional, epidemiological study conducted in Udaipur district, Rajasthan at Geetanjali medical college & hospital. This study includes retrospective and prospective data from January 2010 to December 2014. A total 300 cases of thyroid abnormality were found during this study period. The data was collected from patients that referred to central laboratory of our hospital for thyroid function tests and retrospective data collected from department records.

Enrollment criteria

All male or female patients referred to central lab for thyroid function tests were included in this study.

Participants were excluded if they were pregnant, or had any acute or chronic systemic illnesses; or if they were receiving drugs (like lithium or steroids) that could interfere with thyroid function tests.

Study procedure

All patients referred to our department underwent medical history assessment, a general physical examination

(including thyroid gland examination) and laboratory investigations including hematological and biochemical investigations.

Assays for thyroid hormone (T3, T4 and TSH) were performed by the Electrochemiluminescence (ECL) technology using Immunoassay Analyzer Roche Cobas e411. Anti-TPO antibodies were also measured by the same analyzer.

Based on previous thyroid history and current thyroid function test results, participants were classified using following definitions:

Hypothyroid: Serum thyroxine (T4) <5 ng/ml and thyroid stimulation hormone (TSH) >5.50µU/mL,

Hyperthyroid: Serum T4>14 ng/ml and TSH<0.35 µIU/mL,

Subclinicalhypothyroidism: Normal serum T4 and TSH>5.50 µIU/mL.

Subclinical hyperthyroidism: Normal serum T4 and TSH<0.35 µIU/ml,

Anti-TPO antibody positive: Presence of anti-TPO antibodies above 35 IU/ml.

Statistical analysis

The prevalence of hypothyroidism and other thyroid disorders was summarized as counts and percentages. A Chi-square test was used to assess the trends in the prevalence of hypothyroidism, among different age groups and gender categories. Similar analyses were performed for SCH (subclinical hypothyroid) and anti-TPO antibody positivity.

RESULTS

300 patients were enrolled from Udaipur rural and urban in Rajasthan from January 2010 to December 2014. Out of the 300subjects, 264(88%) were females [Table 1]. The mean age of the study subjects was 41 with a range of 18to 88years. A majority (90.66%; *n*=272) of the study population (*n*=300) was reportedly consuming iodized salt.

TABLE 1: Age wise distribution of study group

Age group	No. of Subjects (n)	% (percentage)
20-39 years	130	43.33
40-64 years	138	46
65 and above	32	10.67

Hypothyroidism

The prevalence of hypothyroidism in the overall study population was 9.33% (*n*=28) of which 5.66% (*n*=17) were self-reported cases and 3.67% (*n*=11) were previously undetected. Udaipur urban (n=18; 64.29%) recorded more prevalence of hypothyroidism than Udaipur rural (n=10, 35.71%) [Table 2]. As compared to young adults (aged 20-39 years), middle aged adults had slightly greater chances of being diagnosed of hypothyroidism (aged 40-65 years). The prevalence of hypothyroidism was the highest in the age-group of 40 to 49 years (24.33%). The prevalence of hypothyroidism is very low in older adults (aged 65 years & above; 10.67%).

A larger proportion of females (n=25; 89.28%) than males (n=25; 89.28%) were found to be affected by hypothyroidism. Females were also more likely to be detected with hypothyroidism than males.

TABLE 2: Distribution of patients based on history of thyroid disease

History	No.of Subjects	%(percentage)
Goitre	116	65.33
Thyroiditis	44	14.67
Thyroid malignancy	17	5.67

Subclinical hypothyroidism

Subclinical hypothyroidism (SCH) was observed in 12 patients (4%). Frequency of SCH was highest (58.33%) in the age group of 40-64 years and lowest in older adults, though no significant association was found with age. A significantly higher number of females (83.33%) than males (16.67%) were detected to have SCH.

Anti-TPO antibodies

A total of 56 (18.66%) subjects tested positive for anti-TPO antibody. The anti-TPO positivity was consistently high in urban (n=41; 73.21%) Females showed a greater prevalence (n=51; 91.07%) than males (n=5; 8.83%), *P*<0.05.

Hyperthyroidism& Subclinical hyperthyroidism

A total of 16 (5.33%) participants including 11 females (3.66%) were diagnosed with hyperthyroidism. There was no association (*P*>0.05) between hyperthyroidism and age or gender. Subclinical hyperthyroidism was seen in 13 (4.34%) patients.

TABLE 3: Prevalence of thyroid disorders in Udaipur district

Thyroid disorder	No. of Subjects	% (percentage)
Hypothyroid	28	9.33
Subclinical hypothyroidism	12	4
Hyperthyroid	16	5.33
Subclinical hyperthyroidism	13	4.34
Anti-TPO positivity	56	18.66

DISCUSSION

In the present study, we assessed the prevalence of thyroid disorders, particularly hypothyroidism, in population residing in Udaipur district of Rajasthan. Hypothyroidism was found to be a common form of thyroid dysfunction affecting 9.33% of the study population. The prevalence of undetected hypothyroidism was 3.67% this suggests that a significant proportion of patient population may go undetected and untreated even as it continues to impair the daily quality of life, work performance and economic productivity of an individual. On the other hand, among the subjects who self-reported themselves to be hypothyroid, a significant proportion (28%) still had a high TSH value. This calls for a review of current practices in the management of thyroid disorders, including active screening of endocrine function among patients at greater risks and an emphasis on regular monitoring of the thyroid status and dose adjustments to provide effective therapy in those with established diagnosis. In general, India is now considered to be in the post-iodization phase[17]. Our results suggest that, nationwide, the prevalence of hypothyroidism in adults is very high in this era. Unfortunately, no prevalence data exist on the occurrence of hypothyroidism among adults in the pre-iodization phase. The slight, but statistically signify cant increased prevalence of hypothyroidism among the inland vs. coastal cities in our study leads us to speculate whether iodine deficiency may continue to play a role in hypothyroidism in India.

The emergence of Kolkata as the worst affected city was unanticipated, particularly as the city was established to be iodine replete over a decade back[25]. However, in a comparable geographical area of Gangetic basin in West Bengal, the prevalence of hypothyroidism in 3814 subjects from all age groups was even higher (29%)[26]. The high prevalence figures in Kolkata have ascertained that thyroid disorders in India are not confined to the conventional iodine-deficient sub-Himalayan zone but also extended to the plain fertile lands. A possible etiological role of cyanogenic foods acting as goitrogens to interfere with iodine nutrition has been previously suggested for, but not limited to this area[27,28]. Increasing exposure to thyroid disruptors including industrial and agricultural contaminants has been identified as a growing health concern throughout India[29]. There was a predominance of thyroid dysfunction in women in our study, and is consistent with worldwide reports, especially those in midlife (46-54 years). Given the association between thyroid disorders and cardiovascular risk factors such as hypertension and dyslipidemia[30] ,the prevalence figures noted for women in this study draw attention to the growing health needs of this important segment of the Indian population. Another significant observation was that approximately one fifth of the study population had anti-TPO positivity, which is an established marker of autoimmune thyroid disease [31]. There seems to be a steady rise in the prevalence of anti-TPO positive in India. In a study conducted from2007 to 2010 in Delhi, the percentage of adults testing TPO antibody positive was 13.3% [32] the figure was 22.01% in the current study. A similar increase was apparently observed in the southern part of India. Earlier, Kerala saw a 16.7% [33] prevalence of anti-TPO positivity in adults, and the rate in a neighboring state (represented by Chennai) reported in the current study is 25.81%. Our study has important limitations: Firstly, it was done in urban India, and the prevalence of hypothyroidism in rural India remains unknown. Secondly, from the consumption of iodized salt, the study presumed that the target population was iodine sufficient, without testing for reliable markers such as iodine content in salt samples or urinary iodine excretion. Thus, with regard to the cause of hypothyroidism, there may be etiological factors other than the iodization status. To summarize the present study is to first provide nationwide data on the prevalence of hypothyroidism in the adult population. The study shows a high prevalence of hypothyroidism and positivity to anti-TPO antibodies. This poses a public health concern and an important challenge to the policy makers and health professionals.

CONCLUSION

Hypothyroidism is a commonly prevailing disorder in adult Indian population. Older overweight females seem to be more prone. Autoimmune mechanisms appear to play an etiological role in a significant proportion of patients. Iodine intake ceases to be the sole etiological contender for thyroid disorders in urban areas. Identification of multiple risk factors and plausible underlying mechanisms is warranted.

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