ASSESSING THE CORRELATION BETWEEN THYROID PROFILE AND CLINICAL DIAGNOSIS IN SUBJECTS WITH MULTINODULAR GOITER

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ABSTRACT

Background: In endocrinology, the most commonly prevalent and undiagnosed condition encountered is thyroid dysfunction having a high burden on the healthcare sector in India. In addition, Iodine is an essential micronutrient for mental and physical growth in humans, its deficiency remains highly prevalent globally. Thyroid enlargement is commonly associated with thyroid deficiency clinically with decreased iron and selenium levels, and an increase in smoking, natural goitrogen, and TSH levels. Goiter representing enlargement of the entire thyroid gland is seen associated with raised levels of TSH, hyperthyroidism, or hypothyroidism.

Aim: The present clinical study was conducted to assess the association of thyroid hormone levels and goiter by assessing the thyroid profile in subjects with goiter.

Methods:The present cross-sectional study included 200 subjects comprising of 100 subjects with goiter and 100 normal healthy subjects in the age range of 18-35 years. For all the included subjects, thyroid hormone profile and thyroid function tests were assessed.

Results:The study results showed a significant difference between healthy subjects and subjects with goiter in hyperthyroid and hypothyroid subjects. The prevalence of goiter was largely influenced by lower and higher concentrations of TSH.

Conclusion:The present study concludes that the prevalence of goiter largely depends on abnormal and normal levels of Thyroid Stimulating Hormone (TSH) depicting hormonal dysfunction. TSH levels, thyroid nodules, and female gender were found to be the possible predictor for goiter, whereas, thyroid volume, TSH levels, and female gender were found to be predictors for thyroid nodules. Assessment of epidemiological profile is needed to obtain the definitive conclusion.

Keywords:BMI, IDD,Hyperthyroid, Hypothyroid, Thyroid-Stimulating Hormone (TSH)

INTRODUCTION

One of the most common endocrine disorders seen globally is thyroid diseases with a high prevalence in India posing a high burden on the health care sector. It is reported that nearly 42 million Indian subjects have thyroid disorders based on different studies conducted previously in the literature. Thyroid diseases are different from the other disorders encountered in the endocrinology field owing to the visibility of even minor swelling in the thyroid region, medical treatment accessibility, andtheir easy diagnosis. The mainstay for treatment of thyroid disorders is early detection and management.[1]

A prominent and most common thyroid disorder, Goiter, is usually seen as a consequence of endogenous influences, environmental, and genetic factors. One of the primary and vital factors affecting goiter prevalence is Iodine with goiter affecting nearly 16% of the general population globally, Majority of the subjects having goiter do not present with the goiter or thyroid nodules, however, both clinical conditions can be associated with disorders includingmetabolic abnormalities, change in body structure, an autoimmune disorder affecting the

thyroid gland, and/or endocrine deregulation. Thyroid hormones also play a significant role in the coordination of thermogenesis and BMR (basal metabolic rate).[2]

Globally, iodine deficiency remains the most prevalent micronutrient deficiency. IDD (iodine deficiency disorders) have been found and established to be responsible for various diseases including mental retardation, increased infant mortality, reduced fertility rate, cretinism,hypothyroidism, and goiter.[3]With nearly 16% goiter prevalence globally, the highest prevalence of approximately 28% is described in Africa, and the lowest prevalence of nearly 5% is reported in America.The incidence in South East Asia is estimated to be 15% with goiter being responsible for 2.72% of all the diseases seen due to deficiency of Iodine making goiter number 32 in the most prevalent sequel of human diseases. 54 million subjects in India alone are reported to have goiter with 90 thousand neonatal deaths and stillbirths and 2.2 million from the cretinism.[4]

Thyroid disorders are more prevalent in female subjects including thyroid nodules and goiter, however, some data in the previous literature failed to establish a link between goiter and gender. Previous literature data also assessed the link between morphological and functional changes seen in thyroid disorders and risk factors associated. Few studies had established a vital link between increased thyroid volume and smoking to goiter prevalence in areas of iodine deficiency.[5]Thepresent clinical study was conducted to assess the association of thyroid hormone levels and goiter by assessing the thyroid profile in subjects with goiter.

MATERIALS AND METHODS

The present cross-sectional clinical study was conducted to assess the association of thyroid hormone levels and goiter by assessing the thyroid profile in subjects with goiter. The study was conducted after obtaining clearance from the concerned Ethical committee. The study population was comprised of the subjects visiting the Outpatient department of the Institute. The study included a total of 200 subjects from both genders within the age range of 18-35 years and was divided into two groups of 100 subjects each making control and study groups. After explaining the detailed study design, informed consent was taken from all the study subjects.

The inclusion criteria were subjects in the age range of 18-35 years and suspected thyroid dysfunction. The exclusion criteria were subjects with other systemic diseases or medications affecting thyroid function, pregnant females, malignancy, tuberculosis, liver dysfunctions, and subjects not willing to participate. For all the included subjects detailed history was recorded and a thorough clinical examination was done. The parameters recorded were age, family history, gender, marital status, pregnancy, thyroid medication, and iodinated salt intake.

After inclusion of the subjects, the control group was comprised of the subjects without goiter, whereas, subjects with goiter constituted the study group/experimental group. 3ml of fasting blood sample from all included subjects was collected to perform TFT (thyroid function test) under strict aseptic and sterile conditions. From the collected blood sample, serum was separated to estimate TSH (μIU/ml), T3 (nmol/l), T4 (nmol/l), FT3 (pmol/l), and FT4 (pmol/l) with the automated immunoassay analyzer.After laboratory analysis, subjects with normal TFT values were reported to be normal, and subjects having non-normal TFT values were considered abnormal.

The subjects reported to be abnormal were classified further based on the levels of TSH as either hypothyroid or hyperthyroid. Further analysis accurately diagnosed subjects to have either hyperthyroidism if they have low concentrations of TSH (thyroid-stimulating hormone) or hypothyroidism if they have high concentrations of TSH. The Control group were subjects without goiter. Goiter in the study subjects was diagnosed based on the clinical and physical examination of the subjects. Concerning thyroid function tests, standard TSH concentrations of 0.27 to 4.2μIU/ml were taken as the normal range criteria to diagnose thyroid dysfunction.

The collected data were subjected to the statistical evaluation using SPSS software version 21 (Chicago, IL, USA) and one-way ANOVA and t-test for results formulation. The data were expressed in percentage and number, and mean and standard deviation. The level of significance was kept at $p<0.05$.

RESULTS

The present cross-sectional clinical study was conducted to assess the association of thyroid hormone levels and goiter by assessing the thyroid profile in subjects with goiter. The study included a total of 200 subjects from both genders within the age range of 18-35 years and was divided into two groups of 100 subjects each making control and study groups. TSH (μIU/ml), T3 (nmol/l), T4 (nmol/l), FT3 (pmol/l), and FT4 (pmol/l) were analyzed in the study subjects with the automated immunoassay analyzer. After laboratory analysis, subjects

with normal TFT values were reported to be normal, and subjects having abnormal TFT values were considered abnormal.

On assessing the thyroid profile characteristics in the study subjects, it was seen that all the thyroid parameters were showed statistically significant and higher values for the study group compared to the control groups. FT4 values for control and study groups were 0.14±0.07 and 0.19±0.11 pmol respectively with p=0.0002, respective FT3 values were 0.52±0.16 and 0.73±0.18 pmol with a p-value of <0.001, and TSH values for control and study groups were 0.83±0.17 and 1.3±0.21 μIU/ml respectively with p<0.001. For T4 the values for control and study groups were 0.67±0.44 and 0.87±0.06 nmol, whereas, for T3 these respective values were 0.82±0.15 and 0.93±0.17 nmol. Both values were statistically significant with p<0.001 as shown in Table 1.

Concerning the difference in normal TSH, hyperthyroidism, and hypothyroidism subjects versus controls in the study subjects, there were 21% (n=42) subjects having low TSH values where 71.42% (n=30) subjects were females and 28.57% (n=12) subjects were males. There were 29% (n=58) subjects with high TSH values having 68.96% (n=20) males and 65.51% (n=38) females. Among 100 subjects having abnormal TSH values, there were a greater number of females compared to males with 48% males and 52% females, whereas, among subjects with normal TSH, there were 49 males and 51 females as depicted in Table 2.

DISCUSSION

On the evaluation of the thyroid profile characteristics in the study subjects, it was seen that all the thyroid parameters were showed statistically significant and higher values for the study group compared to the control groups. FT4 values for control and study groups were 0.14±0.07 and 0.19±0.11 pmol respectively with p=0.0002, respective FT3 values were 0.52±0.16 and 0.73±0.18 pmol with a p-value of <0.001, and TSH values for control and study groups were 0.83±0.17 and 1.3±0.21 μIU/ml respectively with p<0.001. For T4 the values for control and study groups were 0.67±0.44 and 0.87±0.06 nmol, whereas, for T3 these respective values were 0.82±0.15 and 0.93±0.17 nmol. Both values were statistically significant with p<0.001. These results were consistent with the results of the studies by Abdullaeva M et al[6] in 2020 and Fiore E et al[7] in 2012 where authors reported comparable clinical profiles in their study population as in the present study.

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CONCLUSION

Within its limitations, the present study concludes that the prevalence of goiter largely depends on abnormal and normal levels of Thyroid Stimulating Hormone (TSH) depicting hormonal dysfunction. TSH levels, thyroid nodules, and female gender were found to be the possible predictor for goiter, whereas, thyroid volume, TSH levels, and female gender were found to be predictors for thyroid nodules. Assessment of epidemiological profile is needed to obtain the definitive conclusion. However, the present study had a few limitations including small sample size, cross-sectional nature, and geographical area biases. Hence, more longitudinal studies with larger sample size and longer monitoring period will help reach a definitive conclusion.

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Tables

Thyroid parameters	Control Group(n=100)	Study Group (n=100)	p-value
FT4 (pmol)	0.14±0.07	0.19±0.11	0.0002
FT3 (pmol)	0.52±0.16	0.73±0.18	<0.001
TSH (µIU/ml)	0.83±0.17	1.3±0.21	<0.001
T4 (nmol)	0.67±0.44	0.87±0.06	<0.001
T3 (nmol)	0.82±0.15	0.93±0.17	<0.001

Table 1: Thyroid profile characteristics in the study subjects

TSH concentration	Total %(n=200)	Females % (n)	Males % (n)
Low	21 (42)	71.42 (30)	28.57 (12)
High	29 (58)	68.96 (20)	65.51 (38)
Abnormal	50 (100)	48 (48)	52 (52)
Normal	50 (100)	49 (49)	51 (51)

Table 2: Difference in normal TSH, hyperthyroidism, and hypothyroidism subjects versus controls in the study subjects