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Study the correlation of iodine nutrition and autoimmunity among Euthyroid goiter patient in a tertiary care hospital in Tamil Nadu

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ABSTRACT

Background: Iodine is an essential micronutrient for the thyroid hormone synthesis. It is crucial for the growth and development of human life. Deficient or excessive iodine intake may affect thyroid gland size and functions. Despite the intake of iodized salt, the increasing occurrence of thyroid disorders in India. **Aims and Objectives:** The aim of the present study is to analyze the nutritional status of iodine among Euthyroid goiter patients by measuring urinary excretion and correlate with thyroid hormone and autoantibodies. **Materials and Methods:** One hundred and fifty Euthyroid goiter patients and one hundred and fifty age-matched normal adult were included in this study. Urinary Iodine level and serum TSH, freeT4, freeT3, AMA, and ATG were estimated both case and control groups. **Results:** The mean urinary iodine excretion concentration in Euthyroid goiter patient was 244.39µg/L and excess urinary iodine excretion was found in 48%. There were elevated serum AMA levels in Euthyroid goiter patient and that positive correlated with excess iodine. **Conclusion:** In this study,we found that excess urinary iodine excretion among patients. This study we observed iodine excess associated complications, viz., benign goiter (49%), thyroiditis (24%), cancer of thyroid (21%), and thyrotoxicosis (6%).

Key words: Goiter; Iodine excess; Thyroititis; Urinary iodine excretion; World Health Organization

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INTRODUCTION

Iodine is an essential micronutrient for the thyroid hormone synthesis. It is crucial for the growth and development of human life.[1] Iodine is mostly concentrated in the thyroid gland and about 70–80% is stored in the thyroid gland.[2] Daily physiological requirement of Iodine in adult life is 150 micrograms[3] and recommended daily intake for different age groups is given by the World Health Organization (WHO) (Table 1).[4] Thyroid gland plays animportant role in the metabolism of iodine. Deficient or excessive iodine intake may affect thyroid gland size and functions.[5] Iodine deficiency affects two billion people worldwide approximately.[6]

Iodine deficiency disorders (IDD), including stunted physical growth, squint, abortion, stillbirths, deafness, neonatal cretinism, impaired mental abilities, hypothyroidism, and its complications.[7] Eradicate the IDD, Universal salt iodination program was implemented.[8] Since iodine is released from the body through urine, the WHO recommended Urinary iodine measurement is a good marker of dietary iodine intake.[9]

USI program has eliminated iodine deficiency from goiter endemic areas but goiter prevalence has not been eliminated. The past decade study reports say that the occurrence of thyroid-related disorders with iodine excess

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have shown a steady upward trend.[10,11] The data from the Department of Endocrine Surgery, of a tertiary care hospital in South India shown steady upward trend graph of increasing occurrence of thyroid disorders (Figure1).[11]

Excess intake has been found to be associated with iodine-induced hyperthyroidism, iodine-induced hypothyroidism, and iodine-induced goiter. It prompted us to investigate the iodine status among Euthyroid goiter patients and to correlate with the thyroid function.

Aims and objectives

The aim of the present study is to analyze the nutritional status of iodine among Euthyroid goiter patient by measuring urinary excretion and correlate with thyroid hormone and autoantibodies.

MATERIALS AND METHODS

In this study, the samples were collected from the patients of the Department of Endocrine Surgery, Madras Medical College and Rajiv Gandhi Government General Hospital Chennai. This study was pre-approved by the Institutional Ethics Committee. 150 Euthyroid goiter patients and 150 age-matched normal adults were included in the study. Urinary Iodine estimation[12] and serum Thyroid Stimulating Hormone, free thyroxin fT4, free triiodothyronine, anti-microsomal antibody (AMA), and anti-thyroglobulin antibody, were estimated for case and control groups. Grading of goiterwas determined according to the criteria recommended by the joint WHO/UNICEF/ICCIDD[13] for all the goiterpatients. All the patients with goiter underwent fine-needle aspiration cytology to diagnose the pathology of the goiter.

Table 1: WHO recommendations for daily dietary intake of iodine

Age or population group	Iodine intake in micrograms per day (μg/day)
Children 0–5 years	90
Children 6–12 years	120
Adults>12 years	150
Pregnancy	250
Lactation	250

WHO: World Health Organization

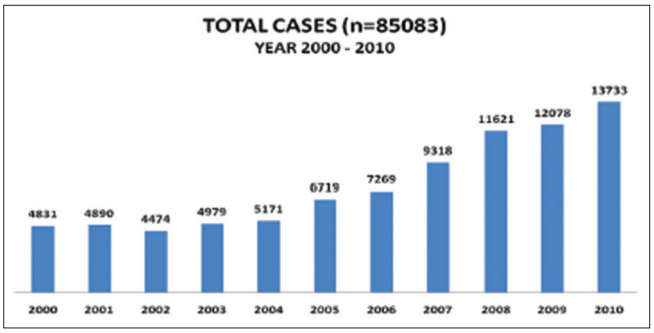

Figure 1: Patient statistics of department of endocrine surgery of a tertiary care hospital in South India (11)

Statistical analysis

The data processing and analysis were done by STATA 13 version software. The quantitative data of case and control were presented as mean and standard deviation and comparison of means was done by student t-test. Chi-square (χ^2) test were used to analyze the categorical data. The nonparametric data were expressed as median and inter-quarter range and comparisons among the groups were done using the Kruskal-Wallis test. The Pearson's correlation test was used to find associations between analytes.

RESULTS

The Euthyroid goiter patient mean age was 41.08±9.31years while the controls adult had 35.11±9.49 years. The mean urinary iodine excretion patients group was 244.39±140.80 μg/L while the controls had 153.45±35.86 (Table 2). There was statistical significant difference found in the Urinary iodine excretion of Euthyroid goiter patient and control (P<0.001). The result shows that excess urinary iodine excretion among the Euthyroid goiter patients. Grading of goiter was determined according to the criteria recommended by the WHO/UNICEF/ICCIDD.[13] The following types of goiter based on palpation were identified among the Euthyroid patients: GradeI-7 %, GradeII-68%, GradeIII -25%.

Based on the results obtained, the patients were classified into 2 types:

Type I: Urinary iodine excretion

Based on the urinary iodine level, the Euthyroid goiter patients were classified into four groups (Figure 2). Using the WHO criteria, iodine nutrition, as assessed by the mean urinary iodine excretion of Euthyroid goiter patients, is described in (Figure 2). Only 15% of the Euthyroid patients had iodine deficiency, while 54% had more than adequate iodine nutrition and among that 34 % had very high excretion of iodine (>300μg/L) and normal iodine status was 31%.

Type II: Pathophysiological classification

Based on the thyroid hormone profile, and antibody titters, the 150 Euthyroid goiter patients were classified into four groups, Benign tumor (49%), thyroititis (n=24%), thyrotoxicosis subjects (n=6) and cancer of thyroid (n=21) (Figure 3).

The comparison was done among Benign, thyroiditis, cancer of thyroid and thyrotoxicosis goiter patient's

Table 2: Case control thyroid profile for adult group

Variable	Case (n=150)	Control (n=150)	P-value
Age (Years)	41.08±9.31	35.11±9.49	<0.001**
UIE(µg/L)	244.39±140.80	153.45±35.86	<0.001**
Ref. Range (100–200)			
TSH (micro IU/ml)	2.02±1.12	1.86±0.87	0.1936
Ref. Range (0.35–5.0)			
FT4 (ng/dl)	1.63±0.98	1.62±0.29	0.3192
Ref. Range (0.8–2.0)			
FT3 (pg/dl)	2.63±0.57	2.69±0.66	0.3406
Ref. Range (2.0–4.4)			

*P<0.05 Statistically significant, **P<0.01 Statistically significant. UIE: Urinary iodine excretion, TSH: Thyroid stimulating hormone, FT_4: Free thyroxin, FT_3: Free triiodothyronine

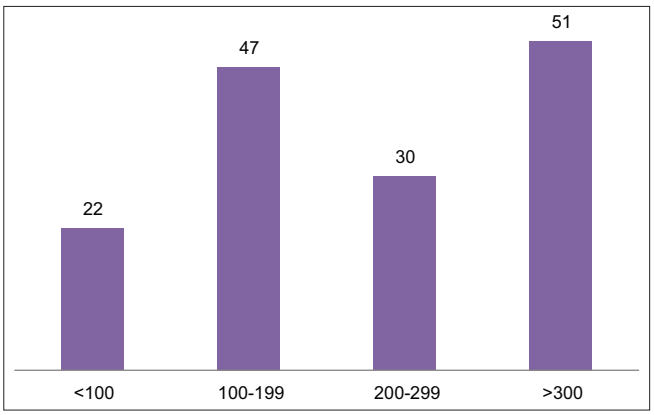

Figure 2: Classification based on Urinary Iodine excretion

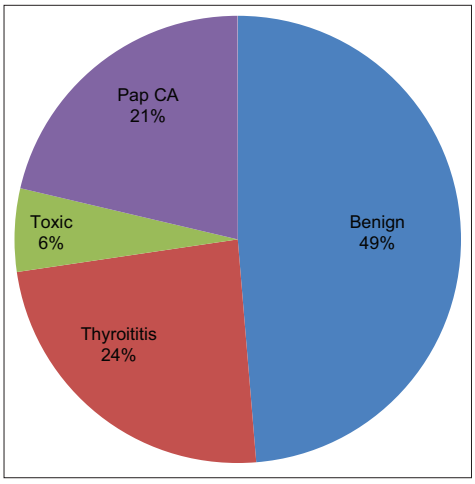

Figure 3: Pathophysiological classification of goiter

subjects, median value of urinary iodine were 242(350–135), 205(300–150), 207.5 (350–126), and 320 (380–85), respectively and there was high median urinary iodine excretion across these groups (Table 3).

Pearson's correlation was used to find the correlation and association between analysts.

There was a significant positive correlation between UI and AMA (r=0.0012) (Pvalue 0.01) in Euthyroid patient's subjects (Figure 4). Furthermore, a significant positive correlation between UI and ATG (r= 0.002) (P value 0.01) was found in those subjects (Figure 5).

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DISCUSSION

Iodine excess is the hall mark that is observed among our patients in this study. These results showed that there is no iodine deficiency among the patients and the USI program has also eliminated the iodine deficiency as reported by many studies. The mean urinary iodine excretion patients group was 244.39±140.80 µg/L while the controls had 153.45±35.86 (Table 2), P<0.001).Only 15% of the Euthyroid patients had iodine deficiency, while 54% had more than adequate iodine nutrition and among that very high excretion of iodine (>300µg/L) was 34 %, while normal iodine excretion status was 31%.

Our study result shows that there were excess urinary iodine excretionsin Euthyroid goiter patients. We have been observed excess iodine complications, viz., benign goiter (49%), thyroiditis (24%), thyrotoxicosis (6%) and cancer of the thyroid (21%) in this study.

The mechanism behind the pathophysiology of endemic goitercaused by excessive iodine intake may involve adamagedthyroidparenchyma.[14] Autoimmune growth factors such as thyroid growth-stimulatingimmunoglobulin's may play a primary role in the pathogenesis of thyroid growth in this condition.[15] Iodine supplementation was found to be accompanied by a change in the epidemiological pattern of thyroid cancer with an increased prevalence of papillary cancer discovered at autopsy.[16]

Table 3: Physiological classification of Euthyroid disorder

Variable	THYROIDITIS Median±IQR N=36	TOXIC Median±IQR N=9	BENIGN Median±IQR N=73	PAP CA Median±IQR N=32
UI	205 (300–150)	320 (380–85)	242 (350–135)	207.5 (350–126)
TSH	1.9 (3.3–1.3)	1.3 (2.2–0.8)	1.5 (2.5–0.9)	1.9 (2.9–1.2)
FT3	2.8 (2.9–2.5)	2.8 (3.1–2.5)	2.8 (2.9–2.4)	2.7 (2.9–2.4)
FT4	1.1 (1.9–0.9)	1.3 (2.5–1.3)	1.3 (2.2–1.1)	1.2 (1.6–1.0)
AMA	91.4 (97.6–79.1)	97.6 (100–88.6)	97.6 (97.6–85.2)	94.3 (97.6–81.1)
ATG	776 (1009–238)	456 (879–164)	879 (1048–181)	776 (1045–456)

IQR: Inter quarter range, TSH: Thyroid stimulating hormone, FT_4: Free thyroxin, FT_3: Free triiodothyronine, AMA: Anti-microsomal antibody, ATG: Anti-thyroglobulin antibody

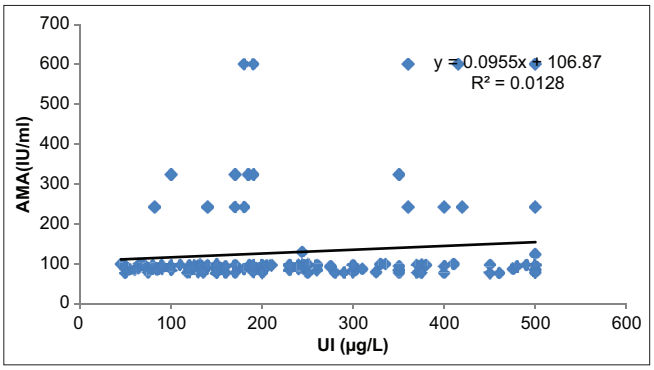

Figure 4: UI versus AMA

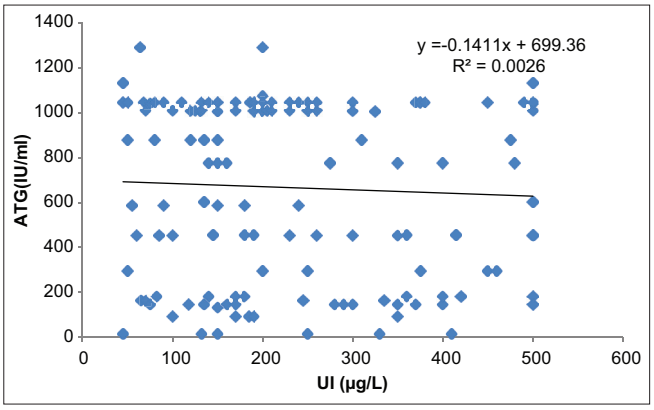

Figure 5: UI versus ATG

The result shows that excess urinary iodine excretion among the Euthyroid goiter patients. There was a significant positive correlation between UI and AMA (r=0.0012) (P value 0.01) in Euthyroid patient's subjects. Furthermore, a significant positive correlation between UI and ATG (r=0.002) (P value 0.01) was found in those subjects (Figures 4 and 5).

Excess iodization is a known cause to produce destruction of the thyroid follicles resulting in thyroiditis. Excess iodine stimulates the immune system that alters the immunological status finally resulting in the production of antibodies which gradually destroys the thyroid glandular tissue.[17]

Limitations of the study

This study has some limitations and it is a hospital-based study and sample size is small. Large sample required community-based assessment.

CONCLUSION

Iodine is adequately available in the coastal regions of our country and Tamil Nadu with a large coastal area, the chances of iodine deficiency are much less. Universal salt iodination program has also eliminated the iodine deficiency as reported by many studies. In this study we observed excess iodine excretion is the hall mark among our study patients. Excess iodine associated complications, viz., benign goiter (49%), thyroiditis (24%), cancer of thyroid (21%) and thyrotoxicosis (6%) have been observed in this study.

Chronic exposure of excess iodine,may create a generation of thyroid cripples, should be prevented by regular follow-up of iodine supplementation with careful monitoring. This small hospital-based study for urinary iodine concentration in Euthyroid goiter patient may not be representative of community iodine nutrition and similar large number of sample required for community settings to find the iodine nutrition in Euthyroid goiter patient.

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Authors Contribution:
SP- Concept and design of the study, prepared first draft of manuscript; **SJ**- Reviewed the literature and manuscript preparation; **JP**- Concept, coordination, statistical analysis; **RK**- Manuscript editing, revision of the manuscript

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