

Assessment of Thyroid Stimulating Hormones (TSH) Levels In Patients with goiter, A Clinicopathological Study

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¹Conception, synthesis, planning of research and writing of manuscript, Proof reading

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Article Info

Received: Aug 2, 2017

Accepted: Dec 19, 2017

Funding Source: Nil

Conflict of Interest: Nil

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ABSTRACT

Objective: To determine the blood level of TSH in individuals with goiter being clinically Euthyroid & having a normal blood level of T3 & T4.

Duration & Place of study: January 2015 to June 2015 at PIMS & NORI, Islamabad

Study Design: Descriptive study.

Methodology: One hundred and eighty-two subjects were studied to assess the role of TSH in the development of goiter in the euthyroid goitrous population of Islamabad and Rawalpindi area. The euthyroid goitrous subjects were selected by clinical examination. Radioisotope uptake scan was done to confirm the clinical assessment of the status of the thyroid gland. The estimation of the serum levels of the thyroid hormones and TSH was done by RIA.

Results: There were 19 (10.4%) males and 163 (89.6%) females between 8 years and 70 years of age. Mean age was 33.76 + 13.77 years. There were 16 individuals who revealed deranged TSH with 8 showing increased & 8 decreased TSH. The mean age in these individuals was 37.63 + 12.52 years. The goiter type was diffuse in 8, Diffuse Nodular (DN) in 3 and multinodular goiter (MNG) in 5 individuals. In patients with normal TSH the goiter type was Diffuse in 72, DN in 60 and MNG in 50 individuals. The means and SD of T3/T4 ratio was 12.86 + 2.38 ($p=0.5596$) and for TSH serum level in Euthyroid goiter was 1.37 + 1.41 mIU/l. ($p=0.6915$)

Conclusion: Patients with goiterous enlargement may or may not have normal TSH levels

Key Words: Goitre, thyroid function test, Hyperthyroidism, Hypothyroidism.

Introduction

Goitre is the cardinal symptom of most thyroid diseases. It develops as a result of stimulation of thyroid gland by TSH in response to a low level of circulating thyroid hormones. The goitre prevalence in iodine-deficient regions is up to 25%-54%. The mountain regions in the north-west of Pakistan & Kashmir are probably the worst affected areas in the World.¹ These areas are labeled as goitre belt due to the high incidence of the disease in the area.²

Clinically patient can be euthyroid, hyperthyroid or hypothyroid. Hormonal production of the thyroid gland is constituted by thyroxine or T4 (80%) and triiodothyronine or T3 (20%). In the circulation, whole T4 originates from

thyroid secretion but most of T3 (80%) is produced extra-thyroid from conversion of T4 to T3 and may be influenced by various conditions. Circulating T3 is a less reliable reflection of thyroid hormone production than T4. In serum most of T4 and T3 is bound to binding proteins and only 0.02% of T4 and 0.3% of T3 is free. Because of their higher diagnostic performance, free T4 (FT4) and free T3 (FT3) measurements have superseded total (free + bound) hormone determination.³⁻⁵

The cause of nonmalignant goiter in most of the situation is due to overactivity of TSH. This hormone usually increases as a decrease in T4 & T3 level. That is why chances of development of goiter are more in cases of

hypothyroidism than hyperthyroidism. However, role of TSH in development of goiter in individuals when T4 & T3 levels are within normal limits and clinically there is no symptom of hypothyroidism or hyperthyroidism is not clear. We planned to know whether Euthyroid individuals with goiter have TSH as a factor for the development of goiter in urban population of Rawalpindi-Islamabad.

Methodology

The individuals with goitre who residents of Islamabad and Rawalpindi areas for were, at least 5 years before the development of goiter were included in the study. They all reported outpatient's departments of Pakistan Institute of Medical Sciences (PIMS) and Nuclear Medicine, Oncology and Radiation Institute (N.O.R.I). They included cases with multinodular goiter (MNG), Diffuse or Diffuse nodular (DN) Goiter with 1-2 nodules. The sampling was consecutive and purposive. All of them were examined clinically by consultants and if found Euthyroid clinically were selected for confirmation through laboratory tests & radioisotope studies. Radioisotope

uptake scan of the thyroid of each patient was done to confirm the enlargement of the thyroid gland to eliminate the possibility of mistaking extra-thyroid masses as goiter using Technecium as radioisotope. All radionuclide studies were performed on Gamma Cameras- Sentronix and Sophy. High resolution general collimator was used. The use of scan results were interpreted by the specialist in nuclear medicine and confirmed by the senior consultants. Venous blood of the study was taken and their sera were immediately separated after the clotting was complete for measurement of TSH, T3 and T4 levels by the radioimmunoassay technique (RIA) using commercial kits (Immunotech-Beckman coulter-company) with 16 channel OAK FIELD Gamma Counter.

The sera of all study subjects and controls were frozen after estimation of T3, T4 and TSH levels each day.

Commercial caliber human sera (SOQ test system Dia Sorin) were used for constructing a calibration curve for calculation of results.

Data was entered and analyzed in SPSS (version 21.0). Descriptive statistics were calculated for both qualitative and quantitative variables. Mean and SD was calculated for a quantitative variable like age, T3, T4 and TSH levels.

Results

There were 182 individuals who were included in the study and among them 19 (10.44%) were males and 163 (89.56%) females between 8 years and 70 years of age. Median age was 32.5 years (Table I). However, mean age + SD was 33.76 + 13.77 years. There were 16 (8.79%) individuals who revealed deranged TSH with 8 showing increased & 8 decreased TSH. The age range was 21-58 years and median age was 36.50 years (Table II). However, the mean age in these individuals was 37.63 + 12.52 years. The goiter type was diffuse in 8, DN in 3 and MNG in 5 individuals. The goiter type was Diffuse in 72 (39.56%), DN in 60 (32.97%) and MNG in 50 (27.47%) individuals.

The median, range and 95% CI of T3, T4, T3/T4 ratio and TSH serum level in Euthyroid goiter are shown in table I.

Discussion

The specificity of thyroid stimulating hormone is very high, in establishing laboratory diagnosis. Guidelines recommend serum thyroid stimulating hormone (TSH) as the single most reliable test to diagnose all common forms of hypothyroidism and hyperthyroidism.^(6,7) On the contrary, few studies showed that when the thyroidal status is unstable (first months of a thyroid treatment,

Table I: Hormonal profile of Euthyroid patients with goiter (n=182)

| | Age (years) | T3 level (nmol/l) | T4 level (pmol/l) | T3/T4 X100 | TSH (mIU/l) |
|--------|-------------|-------------------|-------------------|-------------|-------------|
| Median | 32.5 | 2.00 | 15.45 | 13.0 | 1.00 |
| Range | 8-70 | 1.00-3.00 | 1.50-22.80 | 10-19 | 0.01-10.60 |
| 95% CI | 31.66-35.66 | 1.95-2.06 | 15.43-16.33 | 12.52-13.21 | 1.17-1.58 |

Table II: Hormonal profile of Euthyroid patients with goiter & having abnormal TSH level (n=16)

| | Age(years) | T3 level (nmol/l) | T4 level (pmol/l) | T3/T4 X100 | TSH (mIU/l) |
|--------|------------|-------------------|-------------------|------------|-------------|
| Median | 36.50 | 2.15 | 17.55 | 13.00 | 2.35. |
| Range | 21-58 | 1.70-2.70 | 11.80-21.60 | 10-16 | 0.01-10.60 |

altered L-T4 dose, sub-acute thyroiditis or when the hypothalamic-pituitary function is disturbed i.e. central hypothyroidism), TSH determination is diagnostically misleading and only free hormone measurements are reliable for thyroid function assessment.⁸

In the present study, the subjects with elevated serum TSH levels and the subjects of the studies referred above, the stimulus for the goitrogenesis is clearly TSH. The difference in the percentages of the subjects with elevated serum TSH levels may be due to the differences in the severity of iodine deficiency, adaptation of the thyroid gland to iodine deficiency, the selection of the subjects or the total number of the subjects studied. The explanation is not simple as multiple factors may be involved at general population or individual levels. This, however, does not affect the corroborations of the phenomenon of the elevation of the serum TSH levels in iodine deficiency. Presently there are a sufficient number of sensitive and specific tests of thyroid function available to establish a diagnosis of thyroid disease with a high degree of precision.

In the present study 48 (73.85%) subjects, out of the 65 with iodine deficiency had their serum TSH levels within, and 7 subjects (10.77%) below the normal range. A variety of clinical situations, however, including but not limited to thyroid hormone resistance states, alterations in thyroid-binding proteins and nonthyroidal illness, challenge the clinicians to evaluate the thyroid status of the patient beyond that which can be done with routine laboratory tests.⁹

Studies reveal that accuracy is high in clinical assessment of thyroid functioning as compared to assess the size and nodularity.^{10, 11} Ultrasound is helpful where a solitary nodule will prove to be otherwise multiple.^{12, 13}

Some dietary component may contribute to goitrogenesis as revealed in the studies conducted in Central Asia. In the present study, there does not seem to be a possibility of consumption of specific dietary component involved in goitrogenesis, as these subjects did not come from one of family of tribe with particular dietary habits nor could be present of specific hobbies of consuming known goitrogenic components, be elucidated in the clinical history of the study subjects. The patient may present with other symptoms of thyroid disease. These include

weight loss, anxiety or nervousness, increased sweating, tremulousness, diarrhea, palpitations, muscular weakness, heat intolerance, or history of treatment of an "overactive" thyroid.^{12, 13}

Conclusion

Patients with goiterous enlargement may or may not have normal TSH levels. The role of TSH in the development of goiter in the euthyroid population of Islamabad/Rawalpindi area is not significant.

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