

VARIATION IN THYROID HORMONES LEVEL AMONG PEOPLE OF DIFFERENT AGE, GENDER AND SEASONS, PIPARIA, GUJARAT

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ABSTRACT

Background: Thyroid is an endocrine gland located below the larynx. The principal thyroid hormones are thyroxine (T₄), tri-iodothyroxine (T₃). The current study was carried out to investigate the impact of age, gender and seasons on the level of Thyroxine (T₄), Triiodothyronine (T₃) and Thyroid Stimulating Hormone in individuals free of thyroid diseases.

Methods: - Serum levels of T₃, T₄ and TSH in 198 individuals attending Dhiraj General Hospital in different seasons were examined. Hormonal assay was done by using AIA 360 immunoassay.

Results: - Levels of T₃, T₄ and TSH ranged from 0.98-4.8ng/dl, 0.56-3-25ng/dl and 0.01-5.3μIU/L. There is significant change in thyroid hormone levels in both genders of different age group in different seasons.

Conclusion:- It is concluded that the age, gender and seasons have an appreciable effects on the levels T₃, T₄ and TSH.

Keyword: Thyroxine, Triiodothyronine, Thyroid Stimulating Hormones

INTRODUCTION

Thyroid is an endocrine gland, located immediately below the larynx on either side of and anterior to the trachea.¹ The principal hormones of thyroid gland are Thyroxine (T₄) and Triiodothyronine (T₃) and their concentrations are 93% and 7% respectively. The normal total plasma T₄ level is approximately 8 μg/dL (103 nmol/L), and the plasma T₃ level is 0.15 μg/dL (2.30 nmol/L). The free T₄ in plasma is important in the metabolic control of human body and therefore free T₄ is believed to be a direct indicator of thyroid status in an individual. Free T₃ like free T₄ measurement also reflects the thyroid status of individual accurately.²

These hormones increase the basal metabolic rate and body heat production. Complete lack of these hormones, cause the BMR to fall 40- 50% below normal.² These hormones promote the growth and development of the brain. T₃ and T₄ are synthesized in the thyroid gland and the gland needs iodine depends on growth, body weight, age, sex, and nutritional status

of the individual. Climate and disease conditions also affect the requirement of iodine.³ The Thyroid Stimulating Hormone (TSH) also known as thyrotropin is an anterior pituitary hormone. The thyroid function is controlled by TSH, whose secretion is controlled by hypothalamus.⁴

In normal individuals the range of thyroid hormones and TSH in the blood is as follows⁴:

Free Thyroxine (T₄) - 0.89–1.76ng/dl

Free Triiodothyronine (T₃) – 2.3-4.2ng/dl

Thyroid Stimulating Hormone (TSH) – 0.5-5.0 μIU/mL

Age has an effect on the concentration of T₃, T₄ and TSH. It is studied that gradual increase in autonomous tissue with age makes individual more susceptible to thyroid problems. Higher frequencies of thyroid problems are noted in people above 40yrs of age.⁵

Sex has also an effect on the concentration of thyroid hormones.⁶ Asian women have more economic and domestic responsibilities than men. Poor and illiterate

women and their children are more prone to nutritional problems such as goiter, anemia and other disorders. The concentration of hormones decreases with age in both sexes but the drop is more in female than males.⁷ The effect of season on T3, T4 and TSH has also been noted. Higher levels of T3 and T4 are noted in autumn and winter than in spring and summer.⁸ The effects of age, sex and seasons on the levels of thyroid hormones had been scarcely researched in western part of India. So, this study was done to further explore the previous researches on these aspects of thyroid hormones.

MATERIALS AND METHODS

Study setting: A cross sectional study was done in patients attended 1000 bedded multispecialty Dhiraj general Hospital, Piparia, Vadodara, for one year from September 2010 to September 2011. Total 198 patients had attended the hospital for thyroid hormone test were included in the study. Secondary data on age, gender, TSH, T3 and T4 level were analyzed. Ethical permission was taken from institutional ethical committee of the hospital. Data of individual patient was not published.

Collection of blood sample: Blood samples were obtained from anti-cubital vein of subjects who attended hospital for various problems other than the thyroid or related diseases. Serum was separated by centrifugating at 2000 rpm for 5 mins.

Determination of hormones: - The samples were analyzed for T3, T4 and TSH by AIA-360 FLOUREMETRIC ENZYMATIC IMMUNOASSAY by using ST AIA pack T3, ST AIA pack T4 and ST AIA pack TSH supplied by TOSOH manufactures in central laboratory of DGH and in Thyrocare laboratory of Baroda city.

Statistical analysis: - Analysis was done by applying chi square test through the SPSS software version 15.

RESULTS

In the present study the Mean±SD for TSH was 1.97±1.5µIU/L with range of 0.01-5.3 µIU /L. The Mean±SD for T3 was 2.6±0.72ng/dl with range of 0.98-4.8ng/dl and for T4 it was found to be 1.40±0.49ng/dl with range of 0.56-3.25ng/dl. It was aimed to see the impact of age, gender and season on T3, T4 and TSH levels.

Table 1: T3, T4, TSH in Male and Female

Gender	TSH µU/L	T3 ng/dl	T4 ng/dl
Male	1.63±1.3	2.7±1.06	1.48±0.56
Female	2.10±1.57	2.54±0.5	1.36±0.45

The normal hormonal levels are different for different genders⁷. The gender impact observed in the current study is shown in (TABLE 1). Males were found to be

28.79% and females were 71.21% respectively. The mean value of TSH is elevated in females than males while T4 is slightly higher in males and T3 remained almost same in both genders.

Table 2: Age and Sex wise distribution of hormone

Sex	Age in Years	TSH (µU/L)	T3 (ng/dl)	T4 (ng/dl)
Male	<20	1.15±0.34	1.94±0.54	1.67±0.56
	20-40	2.38±1.27	3.07±0.94	1.40±0.48
	41-60	1.71±1.51	2.35±0.69	1.49±0.45
	>60	0.46±0.59	2.94±1.66	1.40±0.95
Female	<20	0.43±0.00	1.90±0.00	2.14±0.00
	20-40	2.43±1.38	2.51±0.40	1.25±0.27
	41-60	1.71±1.84	2.42±0.47	1.59±0.63
	>60	2.27±1.85	2.54±0.47	1.14±0.26

While comparing the hormonal levels, the study population was classified on the basis of gender into different age groups. The serum thyroid hormones and TSH levels for male of different age groups (TABLE 2), shows that TSH level is highest in second group and lowest in fourth group, while in first and third group, it is almost similar. The T3 were observed lowest in first group and highest in second group. In third and fourth group it remained nearly stable. The T4 value is highest in first group which remained nearly stable in other groups.

In females, thyroid hormones level in different age group as shown in TABLE 2 reveals the serum TSH value is lowest in first group and highest in second group. It is low in third group and again increases in fourth group. Also it is revealed from the table 3 that serum T3 level is lowest in first groups and remained near stable in second, third and fourth groups. While T4 value is highest in first group and lowest in third group but remained near stable in second and third groups.

Table 3: Seasonal variation in T3, T4 & TSH

Seasons	TSH µU/L	T3 (ng/dl)	T4 (ng/dl)
Summer	2.16±2.12	2.49±0.55	1.45±0.62
Winter	2.97±1.48	2.64±0.78	1.15±0.26
Monsoon	1.71±1.25	2.54±0.74	1.40±0.47
Autumn	2.39±1.25	2.36±0.40	1.29±0.30

The effect of seasons on the concentration of T3, T4 and TSH shown is in TABLE 3. The data indicated that serum TSH level is lowest in monsoon while highest in winter. In summer and autumn the TSH level is nearly equal but slightly higher in autumn than in summer. The concentration of serum T3 is stable in all the seasons, but highest in winter and lowest in autumn. The serum T4 level is also nearly equal in all seasons, slightly lower in winter while highest in summer.

DISCUSSION

The variations in the mean values of the concerned hormones with gender (TABLE 1) suggests that a small change within a normal range can be seen in serum T4 level, in both genders with a slightly higher level in males than females. The T3 level in both genders are almost similar while TSH is slightly lower in males than females within normal limit. This observation is in accordance with previous work by Razzak et al⁷, Muslim and Khalil et al⁹ and Franklyn et al¹⁰, that in males the value of sex hormones increases the circulating level of thyroxine binding globulin (TBG), which directly leads to increase in circulating level of T4.⁷ However, some contradictory results were reported that the level of T4 was higher in females than males while, T3 and TSH levels are not influenced by gender.^{7, 9, 10}

The level of thyroid hormones and TSH both in males and females of different age groups are depicted in TABLE 2. In females (TABLE 2), the value of TSH is lowest in first group and highest in second group. But previous studies by Razzak⁷, Muslim and Khalil⁹ shows decreased value of TSH in last decade. While in males, TSH is lowest in fourth decade and highest in second group. This is in accordance with studies of Razzak⁷, Muslim and Khalil⁹ and Franklyn¹⁰. In case of T3, the value is lowest in first group in both the genders which increases and remained almost constant in other groups in case of females, but in males, the value is highest in second group while remained almost stable in third and fourth groups. The serum T4 level in both genders is highest in first group and remained almost constant in second, third and fourth groups. While in previous work by Razzak⁷, Muslim and Khalil⁹, Franklyn¹⁰ and Westgren¹¹ revealed lower level of T4 in first decade and increased T4 level as age advances.

The effect of seasons on concentration of T3, T4 and TSH is given in TABLE 3, which shows higher level of TSH in winter and autumn than in summer and monsoon, while T3 is almost similar in all seasons but slightly higher in winter and slightly lower in autumn. In case of T4 also, it is similar in all seasons but slightly lower in winter and slightly high in summer. Seasons

also have effect on T3, T4 and TSH which is in accordance with study done by Khan et al.¹²

CONCLUSION

From the present study it can be concluded that the age, gender and seasons have an appreciable effects on the level of T3, T4 and TSH.

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