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A correlation between thyroid hormone profile and physical parameters in normal person

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Abstract

Introduction: The aim of the study was to correlate the thyroid hormone profile with the age, height, weight, body mass index (BMI), with body fat percentage (BF%) in apparently healthy person.

Materials and Method: 84 normal subjects were included in the present study. In thyroid hormone profile S. TSH, Total S. T3, and Total S. T4 were estimated by lumax chemiluminescence immunoassay strip reader in the laboratory. Height, weight and BMI were recorded by standard method and BF% was calculated by the formula. Analysis was done by SPSS software.

Result: Of 84 subjects, 39 were males and 45 were females. The correlation coefficient of thyroid hormone profile: For S. TSH (r=+0.261, p=0.02), (r=+0.064, p=0.57), (r=+0.330, p=0.00), (r=+0.368, p=0.00), (r=+0.387, p=0.00); For S. T3 (r=-0.299, p=0.01), (r=-0.208, p=0.06), (r=-0.447, p=0.00), (r=-0.377, p=0.00), (r=-0.257, p=0.02); For S. T4 (r=-0.086, p=0.44), (r=-0.174, p=0.11), (r=-0.365, p=0.00), (r=-0.297, p=0.00), (r=-0.072, p=0.52) with age, height, weight, BMI and BF% respectively.

Conclusion: The S. TSH shows significant positive correlation with age, weight, BMI and BF percentage. While S. T3 shows significant negative correlation with age, weight, and BMI and BF percentage and S. T4 shows significant negative correlation with weight and BMI. That suggests the physical parameters also play an important role to determine the thyroid function, as thyroid hormone play an important role in the metabolism of almost all the cell of the body.

Keywords: Thyroid hormone, Physical parameters, Normal subjects

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Introduction

The present study is cross-sectional in design and aimed at understanding the association between thyroid function and physical parameters in apparently healthy euthyroid individuals. Various factors play an important role in the regulation of hormone, physical factors are one of them. Looking at the impact of physical factors on the thyroid hormone level within physiological range is a relatively new approach. To identify the complex interrelationship between thyroid function and physical parameters may help in prevention and treatment of and thyroid dysfunction.

Many factors have been found to affect a person's weight, including lifestyle choices like nutritional behaviour and physical activity, as well as genetics, environmental and endocrinal factors.(1) Thyroid hormone regulates energy metabolism and thermogenesis and plays a critical role in glucose metabolism and lipid metabolism, food intake, and the oxidation of fatty acids.(2)

Most studies that have been done on euthyroid individuals have shown that there is a significant association between body mass index (BMI) and thyroid function.(3) From a clinical point of view, obesity and mild thyroid failure are common diseases. More studies are needed to fully understand the extent of the association and translate the findings into practical use in the clinical setting.

Aims & Objectives

- To correlate the thyroid hormone profile with the age.
- To correlate the thyroid hormone profile with height and weight.
- To correlate the thyroid hormone profile with body mass index (BMI) and with body fat percentage (BF%).

Materials and Method

The current study is a cross-sectional design to determine the relationship between thyroid profile and physical parameters. For selection of study subjects; a detailed history was taken and general physical examination and systemic clinical examination were done. The detailed of subject was recorded in case paper.

Body weight was measured to the nearest 1.0 kg using mechanical weighing machine (Gebruder Soehnle, West Germany) with subjects wearing minimal clothing and without shoes. Height was measured to the nearest 1.0 cm freestanding without shoes using measure tape (Crown, India). BMI was calculated from following formula (kg/m^2). BF% was calculated from formula (Deurenberg P, Weststrate JA, Seidell JC, 1991) BF%=(BMI*1.20)+(Age*0.23)-(Sex*10.8)-5.4 (where BMI in kg/m2; Age in Years; Sex is 1 for male and 0 for female).

After written informed consent of subjects, 5 ml venous Blood samples were obtained by aseptic

precautions after 8-12 hours of fasting. Blood was collected in plain vacutainer. The sample was kept stand still for 30 min to clot and transported in 20 - 25˚C icepack at laboratory and All samples were centrifuge at 2000 rpm for 5 min and supernatant serum was collected then thyroid hormone profile (S. TSH, Total S. T3, and Total S. T4) was estimated by lumax chemiluminescence immunoassay (Acculite CLIA microwells kit) strip reader.

Values are expressed as means ± SD. Microsoft® Office Excel® 2007 (© 2006 Microsoft Corporation, USA) and SPSS Statistics 20.0 (IBM® SPSS® system, IBM Corp. New York) were used for data analysis. Correlation was evaluated by Spearman's rho bivariant correlation. The probability level for significance was set at $p < 0.05$.

Results

84 subjects (39 male and 45 female) were included in the present study and analysis was done. Following observation and result were made from the studied subjects.

Table 1: Descriptive analyses showing the mean and SD, minimum and maximum value of each continues variable among study group (Normal and obese)*; Physical parameters and Thyroid hormone profile

(n=84)	Normal (n=25)			Obese (n=59)		
	Mean	SD	Min-Max	Mean	SD	Min-Max
Age (Year)	32.60	13.03	18-59	43.20	12.95	18-60
Height (Cm)	159.92	9.83	142-181	159.34	7.51	148-180
Weight (Kg)	52.24	6.99	40-65	67.76	9.21	54-90
BMI (kg/m^2)	20.37	1.45	18.51-22.89	26.66	2.91	23.14-34.52
BF %	21.36	6.40	10.21-30.58	31.59	6.97	16.54-49.13
S. TSH (mIU/L)	2.69	1.35	0.50-6.02	3.56	1.39	0.35-6.01
S. T3 (ng/dl)	109.95	32.90	55-182	93.74	22.06	52-162
S. T4 (µg/dl)	8.63	1.21	5.9-10.8	7.91	1.53	4.6-10.8

*In the present study BMI was used for defining the normoweight and obesity in the subjects. As par standard guideline of WHO (2003) for Asian population to defining obesity the cut of value of BMI is 23, which is used in study.[5] For study of thyroid hormone profile in obese, the studied subjects divided in two groups on the basis of BMI. Group I= Normal (BMI: 18.5 to 22.99) Group II= Obese (BMI: ≥ 23) [including both over-weight and obese]

Table 2: Correlation of thyroid hormone profile with age, height, weight, BMI and BF%

(n=84)		Age (Year)	Height (Cm)	weight (Kg)	BMI (kg/m^2)	BF %
S. TSH (mIU/L)	Correlation Coefficient (r)	0.261*	0.064	0.330**	0.368**	0.387**
	p value	0.02	0.57	0.00	0.00	0.00
S. T3 (ng/dl)	Correlation Coefficient (r)	- 0.299**	- 0.208	- 0.447**	- 0.377**	- 0.257*
	p value	0.01	0.06	0.00	0.00	0.02
S. T4 (µg/dl)	Correlation Coefficient (r)	- 0.086	- 0.174	- 0.365**	- 0.297**	- 0.072
	p value	0.44	0.11	0.00	0.01	0.52

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

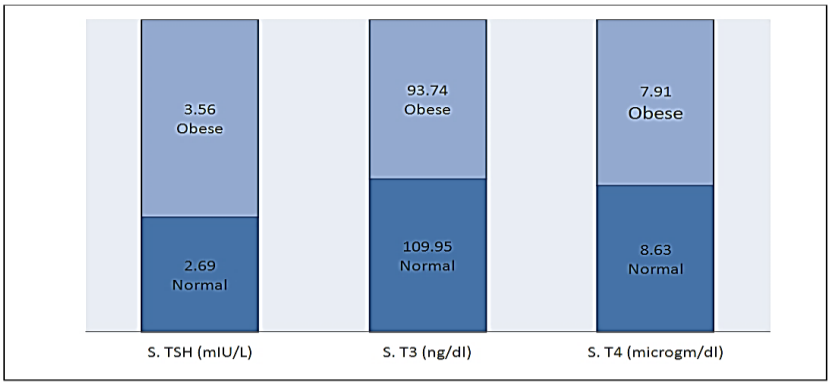

Fig. 1: Thyroid Hormone Profile in Normal and Obese

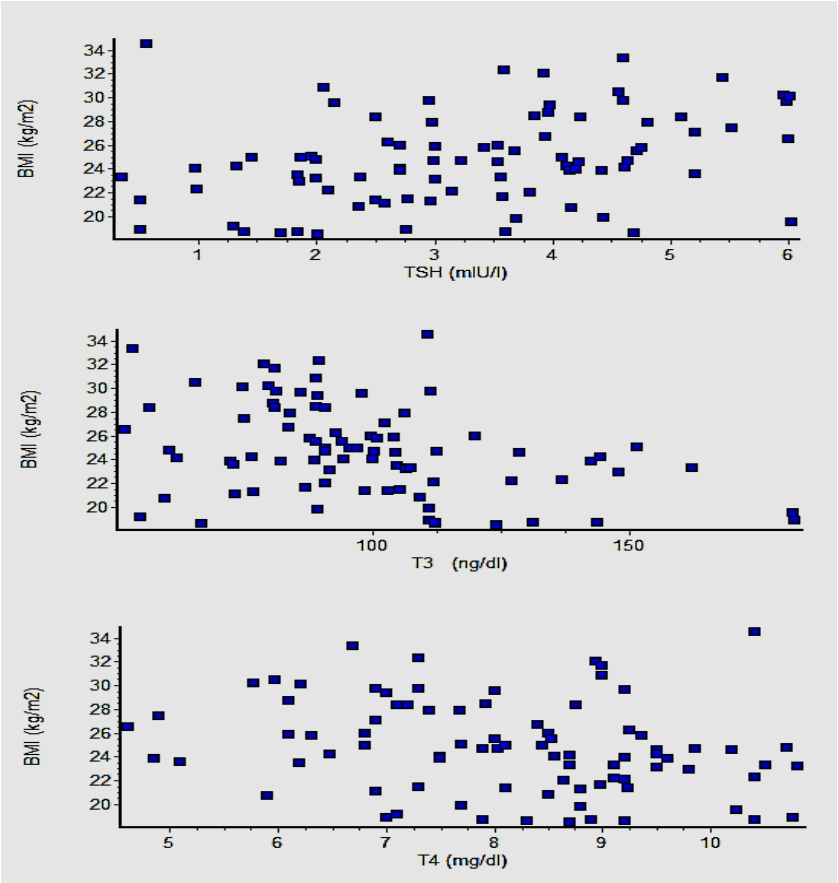

Fig. 2: Correlation of Thyroid Hormone Profile with BMI

Discussion

The current study was a cross-sectional study design and analyzed data for 84 euthyroid participants set out to look at the possible relationship between thyroid function and physical parameters. The extensive research materials are available when issues about thyroid dysfunction and weight are concerned; however, it is limited when looking at euthyroid individuals. It has been well documented that both hypothyroidism and hyperthyroidism affect weight in humans. For study of the relationship between thyroid function and obesity the studied subjects divided into normal and obese groups.

For, study of the thyroid function in obese subjects the comparison was made with normal subjects. The mean and SD of thyroid hormone profile: S. TSH is 2.69 ± 1.35, 3.56 ± 1.39 (p value is 0.01); Total S. T3 is 109.95 ± 32.90, 93.74 ± 22.06 (p value is 0.03); Total S. T4 is 8.63 ± 1.21, 7.91 ± 1.53 (p value is 0.04) in normal and obese respectively. [Table 1] The S. TSH is significantly higher in obese subjects comparing with normal subjects; Total S. T3 and Total S. T4 are significantly lower in obese subjects comparing with normal subjects. [Fig. 1] According to Bastemir et al. (2007); the degree of obesity as measured by BMI was

associated with higher TSH levels.[6] and Myers et al. (2006) found that a negative association between BMI, and T3 and T4 has been reported.[7]

The correlation was made of thyroid hormone profile with Age, Height, Weight, BMI and BF% to determine the relation between thyroid function and physical factors. The Correlation Coefficient of thyroid hormone profile: For S. TSH (r=+0.261, p=0.02), (r=+0.064, p=0.57), (r=+0.330, p=0.00), (r=+0.368, p=0.00), (r=+0.387, p=0.00); For S. T3 (r=-0.299, p=0.01), (r=-0.208, p=0.06), (r=-0.447, p=0.00), (r=-0.377, p=0.00), (r=-0.257, p=0.02); For S. T4 (r=-0.086, p=0.44), (r=-0.174, p=0.11), (r=-0.365, p=0.00), (r=-0.297, p=0.00), (r=-0.072, p=0.52) with age, height, weight, BMI and BF %. [Table 2] The S. TSH shows significant positive correlation with age, weight, BMI and BF percentage. While S. T3 shows significant negative correlation with age, weight, and BMI and BF percentage and S. T4 shows significant negative correlation with weight and BMI. [Fig. 2] These results are accordance to Fox et al. (2008),[8] Iacobellis et al. (2005),[9] Myers et al. (2006),[10] Sari et al. (2003).[11]

According to Knudsen et al. (2005) a significant positive association between TSH levels and BMI was seen. Other investigators have also found positive associations between TSH levels and obesity in their studies.[12]

According to the previous study the age has been shown to affect thyroid function. As people age, thyroid hormone synthesis is impacted. While studies like the one done by Hollowell et al. (2002) have shown that TSH levels increase with age when iodine intake is sufficient in a population.[13]

Conclusion

The S. TSH show significant positive correlation while S. T3 and S. T4 show significant negative correlation with age, weight, BMI and BF%. That suggest the physical parameters also play an important role to determine the thyroid function, as thyroid hormone play an important role in metabolism of almost all the cell of the body.

The identification of change in thyroid function as a risk factor for weight gain might help into the identification, prevention, and treatment of individuals at risk for the development of excess adiposity. The thyroid hormone profile was altered with obesity and other physical parameters, it is important that these factors are taken into consideration during the interpretation of thyroid hormone profile.

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