

A CORRELATION BETWEEN THYROID STIMULATING HORMONE AND BODY MASS INDEX IN WOMEN WITH SUBCLINICAL HYPOTHYROIDISM

GAURAV GUPTA¹, PREETI SHARMA¹, PRADEEP KUMAR¹, M ITAGAPPA¹, RACHNA SHARMA²

¹Department of Biochemistry, Santosh Medical College & Hospital (Santosh University), Ghaziabad, Uttar Pradesh, India. ²Department of Biochemistry, TSM Hospital & Medical College, Lucknow, Uttar Pradesh, India. Email: prcdri2003@yahoo.co.in

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ABSTRACT

Objective: Weight gain is a characteristic feature of hypothyroidism. People with subclinical hypothyroidism (SCH) are also characterized by the same is still unclear.

Methods: Height and weight were calculated of SCH women as well as normal healthy adult women. Body mass index (BMI) was calculated as per WHO guidelines. The thyroid stimulating hormone (TSH), FT₄, and T₃ were measured by Enzyme-Linked Immunosorbent Assay technique.

Results: Thyroid profile (TSH and T₃) was significantly (<0.05) different between subclinical hypothyroidism women and normal women. Women with subclinical hypothyroidism were having higher TSH (13.01±4.41 vs. 2.61±0.79) compared with normal healthy control group along with different T₃ (0.94±0.17±1.09±0.26) between the groups. The serum concentration of FT₄ was not significant between the groups. The body mass index, higher (28.81±3.47 vs. 22.62±1.57) in subclinical hypothyroidism women, was highly significant (<0.001). BMI was positively correlated with TSH in SCH (0.36) group as well as normal control (0.50) group. The correlation was significant (<0.05) in both the groups.

Conclusion: People with subclinical hypothyroidism were characterized by increased weight gain. Thereby it is concluded that Thyroid Stimulating Hormone affects the Body Mass Index in SCH women. Our result suggests that estimation of thyroid profile, also within the normal range, could be one of several factors acting in concert to determine body weight. However, this parallel increase in BMI due to weight gain along with increase in TSH may further leads to overt hypothyroidism if left untreated. Obesity itself could produce various metabolic disorders in coming future.

Keywords: Subclinical hypothyroidism, Body mass index, Thyroid stimulating hormone.

INTRODUCTION

Subclinical hypothyroidism (SCH) is the most common endocrine disorder which varies worldwide and has been most frequently found in women rather than males [1]. In India, its prevalence varies from 9% to 12% [2]. Biochemical presentation of thyroid profile of an individual defines that the level of thyroid stimulating hormone (TSH) is higher above the reference range along with the normal serum concentration of T₃ and FT₄ [3]. Thyroid hormones lead to increase the basal metabolic rate in the body by inducing metabolic activities in most tissues [4]. It is well-known that people with hypothyroidism are characterized by increased body weight [5]. Frequent Increase in weight can be the cause of various diseases and also lead to obesity, which can affect the metabolism of the body. Several other diseases, e.g., cardiovascular risk, diabetes, etc. associated with obesity may be developed in later years [6]. Effects of hypothyroidism and hyperthyroidism on body weight have been clearly demonstrated. Though there is no sufficient data available on the relationship between the body mass index (BMI) and minor differences within the normal range of thyroid function. Therefore, this study aims to investigate the fluctuations of the TSH and thyroid hormones with respect to BMI in euthyroid subjects.

Increased BMI is known to play an important role in developing the hypothyroidism. However, in case of SCH uncertainty still lies due to the presentation of characteristics, from few symptoms to various symptoms. Hence, the people with SCH are associated with increased BMI is not well defined due to the blurred presentation of symptoms. SCH peoples are characterized by higher BMI is a topic of discussion and still debatable.

METHODS

Materials

This cross-sectional study was conducted in Santosh Medical College Ghaziabad. 20-45 years of age total 90 women with newly diagnosed

SCH were enrolled for the study and were compared with 62 normal healthy adult women with same age group.

Exclusion criteria

Women having any medical history of disease related to thyroid, pregnancy, cardiovascular risk, hypertension, menopause, diabetes and family history of thyroid disorder were excluded from the study.

Inclusion criteria

Only newly diagnosed SCH women along with normal healthy euthyroid women were included.

Methods

- Height: Height of an individual, participant of the study was measured, by stadiometer without having shoes [6].
- Weight: Weight of the participant was measured by digital weight machine [6].
- BMI: BMI of a person is defined by the weight of a person in kg is divided by the square of the height in meter. BMI in the range (18.5-24.99 kg/m²) defined as normal BMI. People ≥25 kg/m² referred overweight [7].
- Thyroid function test: TSH, FT₄ and T₃ were estimated by (Avantor Performance Materials, India) using Enzyme Linked Immune sorbent Assay. Normal range of thyroid tests was TSH - 0.39-6.16 (μIU/ml), free T₄ - 0.8-2.0 (ng/dl) and T₃ - 0.52-1.85 (ng/ml). Patients with TSH levels >6.2 (μIU/ml) with normal FT₄ and T₃ values were accepted to have SCH [4].

Statistical analysis

Baseline characteristics of SCH women as well normal group were expressed in mean ± standard deviation. Unpaired Student t-test was used to differentiate the parameters between the groups. A Pearson

correlation coefficient was used to correlate between TSH and BMI in both groups.

Observation

Thyroid stimulated hormone was positively correlated with body mass index in subclinical hypothyroidism women (Fig. 1) as well as in normal women (Fig. 2). This correlation was statistically significant (<0.05) in both the groups. (Table 1).

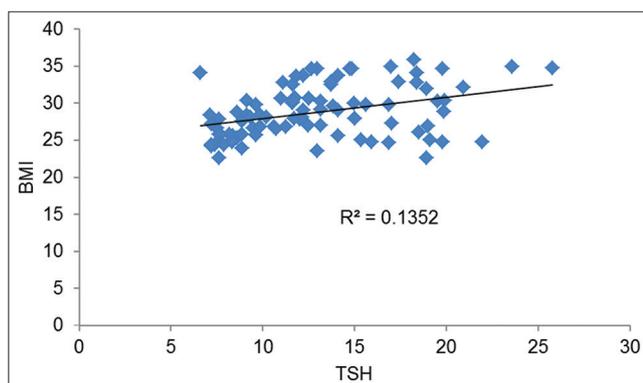


Fig. 1: A positive correlation between body mass index and thyroid stimulating hormone in subclinical hypothyroidism women

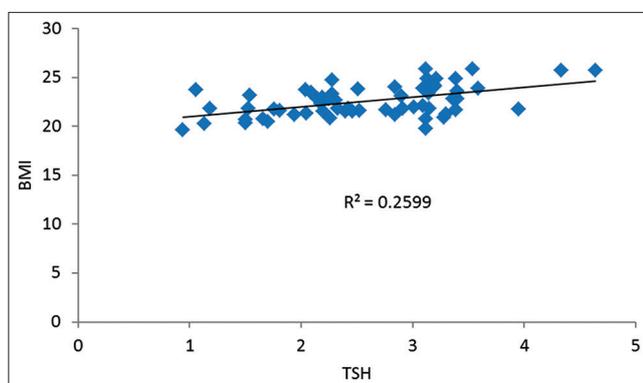


Fig. 2: A positive correlation between body mass index and thyroid stimulating hormone in normal women

Table 1: Correlation between TSH and BMI in SCH and normal women

Parameters	r value	p value
TSH-BMI (SCH)	0.36	<0.05
TSH-BMI (Normal)	0.50	<0.05

SCH: Subclinical hypothyroidism, BMI: Body mass index, TSH: Thyroid stimulating hormone

Table 2: Different parameters expressed in mean \pm SD

Parameters	SCH	Control
Height (cm)	154.79 \pm 2.83	155.21 \pm 2.86
Weight (kg)	69.21 \pm 9.10*	54.51 \pm 4.32
BMI (kg/m ²)	28.81 \pm 3.47*	22.62 \pm 1.57
TSH (μ U/ml)	13.01 \pm 4.41*	2.61 \pm 0.79
FT4 (ng/dl)	1.2 \pm 0.26	1.16 \pm 0.22
T3 (ng/ml)	0.94 \pm 0.17*	1.09 \pm 0.26

* <0.05 is statistically significant. SD: Standard deviation, SCH: Subclinical hypothyroidism, BMI: Body mass index, TSH: Thyroid stimulating hormone

RESULTS

Women with SCH had a significantly higher TSH level (13.01 \pm 4.41 vs. 2.61 \pm 0.79) compared with control group. T3 (0.94 \pm 0.17 vs. 1.09 \pm 0.26) was significantly different between the groups instead of FT4 (1.2 \pm 0.26 vs. 1.16 \pm 0.22). BMI (28.81 \pm 3.47 vs. 22.62 \pm 1.57) and weight (69.21 \pm 9.10 vs. 54.51 \pm 4.32) was significantly different in SCH women compared to normal healthy women except their height (154.79 \pm 2.83 vs. 155.21 \pm 2.86). (Table 2)

DISCUSSION

This study reported that women with SCH are characterized by higher BMI due to their increased body weight. A positive correlation was found between TSH and BMI in SCH women as well as a control group. Milionis and Milionis investigated that thyroid disorder associated with influence of various environmental factors can increase body weight and leads to obesity [8]. Zhang *et al.* described that the risk of obesity is quite higher in patients with SCH in Chinese adolescents [9].

Velivala *et al.* supported this study by finding that prevalence of SCH is higher in females and increased with BMI [10]. On the other hand Karthick *et al.* found that patients with SCH represent lower BMI when compared to euthyroid control group [11]. While Solanki *et al.* reported that the level of TSH is quite higher in obese patients and it increases as BMI increases as described by this study [12].

This study emphasizes that SCH peoples are also characterized by increased body weight. TSH affects the BMI as TSH increases, BMI increased. More study with large sample size on men as well as children should be conducted to analyze this fact.

Limitation

There was limitation related to this study that thyroid peroxidase antibodies (TPO antibodies) was not determined. Furthermore, this study was carried out among the women only and sample size of the study population.

CONCLUSION

We have shown that variations of TSH are accompanied by differences in BMI perhaps due to the changes in the basal metabolic rate. The high incidence of the pathological disorders in thyroid function with associated various environmental factors (diet, exercise, etc.) cause weight gain with an unknown biological mechanism and lead to obesity. Further multicentric and large studies are required for a general assumption of the correlation between obesity and variations of normal thyroid function with more focused approach on the mechanistic aspects.

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