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THYROID HORMONE AND METABOLIC SYNDROME COMPONENTS

Chaitanya Patel*[1], Praveen Kumar Vodala[2], Stephanie Ogbonda[3], Jawarya Safdar[4] and Suprada S. Vinyak[5]

[1]Extern, Jacksonpark Hospital.
[2]Civil Assistant Surgeon, ESI Hospital, Nacharam.
[3]Graduate, Lugansk State Medical University
[4]Graduate, Nishtar Medical University.
[5]Graduate, Sri Siddhartha Medical College.

***Corresponding Author: Chaitanya Patel**
Extern, Jacksonpark Hospital.

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ABSTRACT

Background: Many studies have showed that there is a strong relation between obesity, insulin resistance, physical inactivity, advanced age, hormonal disturbances and the development of metabolic syndrome. Thyroid dysfunction can cause obesity and this can lead to metabolic syndrome. In this study, we tried to find a correlation between the effect of thyroid function on the components of metabolic syndrome. **Methods:** We took a total of 70 patients. Blood pressure, waist circumferences, HDL cholesterol and triglycerides were measured in all patients. TSH was measured in all the patients and the patients were divided in three groups: euthyroid, hypothyroid and subclinical hypothyroid. **Results:** There were 38 females and 32 males. Mean BMI was 27.51±3.13 kg/m2. The mean systolic blood pressure was 139.04±26.67 mm Hg and the diastolic pressure was 88.32±14.95 mm Hg. Mean waist circumference was 102±10.1 cm & mean waist: hip ratio was 0.97±0.094. HDL <50 in males and <40 in females in Euthyroid showed statistical significance (p value 0.05). Other components did not gain a statically significance. Comparing gender wise Subclinical hypothyroidism patients with Euthyroid patients, females having subclinical hypothyroidism are more likely to have metabolic syndrome (p value =0.023). This was not so in case of males. **Conclusions:** Female patients having subclinical hypothyroidism have higher chances of have metabolic syndrome as compared to males. Euthyroid patients with metabolic syndrome had low HDL cholesterol. Other components of metabolic syndrome had no statically significance with thyroid function.

KEYWORDS:

INTRODUCTION

Metabolic syndrome (MetS) is generally characterized as a clustering of the abnormal levels of blood lipids (low HDL and high triglycerides), impaired fasting glucose, elevated blood pressure, and excess abdominal obesity.[1]

Insulin resistance is supposed to be the central pathophysiological Phenomenon underlying this clustering.[2] Obesity, insulin resistance, physical inactivity, advanced age and hormonal imbalance have been suggested as the underlying risk factors for the development of this syndrome.[3] Metabolic syndrome (MetS) affects approximately one quarter of the population in developed countries. People with metabolic syndrome are at an increased risk of atherosclerotic cardiovascular disease and type 2 diabetes. The prevalence of cardiovascular disease is 2–3 times higher in individuals with metabolic syndrome than in age matched controls.[4] Regarding lipid abnormality in hypothyroidism, there will be reduction in synthesis, mobilization and metabolism of lipids. Lipogenic enzyme activity decreases, serum lipid levels tend to rise. In some cases hyperlipidaemia may be the only feature of hypothyroidism. Serum cholesterol and triglycerides have been measured in many patients with subclinical or overt hypothyroidism before and during thyroid hormone replacement therapy. Serum total and LDL cholesterol levels are high in overt hypothyroidism; but are normal or only slightly high in sub clinical hypothyroidism. Serum triglyceride and VLDL levels are high, whereas HDL cholesterol and free fatty acids are usually normal. Serum leptin levels are usually normal. Our study is an effort to look for association between thyroid function & metabolic syndrome, to identify the factors that increase the risk of this association.

Aims

1. To evaluate presence of Subclinical Hypothyroidism in the study population of the patients with metabolic syndrome.
2. To find out relation between Thyroid function and different parameters of metabolic syndrome.

METHODS

A total of 70 adult patients were selected, based on the inclusion criteria of (3 out of 5 criteria positive namely).
1) Blood pressure > or = 130/85 mm hg or on antihypertensive medications.
2) Fasting plasma glucose > 100 mg/dl or on anti-diabetic medications.
3) Fasting triglycerides > 150 mg/dl.
4) HDL < 40 mg/dl in males and <50 mg/dl in females.
5) Waist circumference > 102 cms in men and 88 cms in women).

Patients with liver disorders, renal disorders, congestive cardiac failure, pregnant women, and patients on oral contraceptive pills, statins and other medications that alter thyroid functions (e.g. lithium, amiodarone or γ-interferon) were excluded from the study. Patients who are already diagnosed as having hyperthyroidism, sub-clinical hyperthyroidism and those who are under treatment for any thyroid related disorder were excluded from the study. All candidates were explained about the purpose and nature of the study. Written and informed consent was taken.

Patients' personal data was enquired into. Following which a detailed clinical history was elicited to assess inclusion and exclusion criteria. In the Past, family and Personal history patients were asked in detail about history of hypertension, type 2 diabetes mellitus, ischemic heart disease, dyslipidemia and thyroid dysfunction. Smoking and alcohol intake were inquired. Measurements were taken as per the WHO guidelines in the WHO Monica Project. Fasting blood samples were obtained (venous blood samples taken after overnight fast of a minimum of 8 hrs.); glucose, total cholesterol, HDL cholesterol and triglyceride levels were determined. The analytical sensitivity of TSH was 0.005 µIU/ml and for FT4 was 0.023 ng/dl. Normal range for TSH was 0.35-5.5 µIU/ml, for FT4 was 0.89–1.76 ng/dl and for FT3 was 2.3-4.2 pg/dl.

A high serum TSH level (range between 5.5 µIU/ml to 10 µIU/ml) and a normal free thyroxine (FT4) level were required for the diagnosis of sub-clinical hypothyroidism (SCH). Patients with high TSH (> 10 µIU/ml) and low FT4 levels (< 0.89 ng/dl) were classified as being overt hypothyroid. A high sensitivity CRP (hsCRP) was measured in each patient who detect concentrations down to 0.3 mg/L. An electro cardiogram as well as a renal profile was obtained for each candidate. Data obtained were analyzed statistically. Chi-square test was used to analyze the association between metabolic syndrome and hypothyroidism (overt and sub-clinical). Associations between patient characteristics (age, gender, mean systolic blood pressure, mean diastolic blood pressure, waist circumference, total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, fasting blood sugar,) and hypothyroidism (overt and sub-clinical) in the study group were analysed using multiple logistic regression. P-value of < 0.05 was considered statistically significant.

Table 1: Metabolic syndrome and thyroid function components.

Metabolic Components	Euthyroid (N=45)	Hypothyroid (N=7)	Subclinical Hypothyroidism (N=18)	P value
BP >130/85mm Hg	27	4	10	0.14
TG >150mg/dl	11	0	6	0.27
HDL <50	16	4	8	0.023
Waist circumference >88cm or >120 cm	38	2	7	0.44

RESULTS

Based on clinical opinion and correlating the clinical evidence with laboratory investigations (Thyroid function tests and hsCRP), 70 patients of metabolic syndrome were divided into three groups; subclinical hypothyroid, euthyroid and overt hypothyroid. Of total 70 patients taken for current study, the mean age was 47.5±11.9 years. The study population consisted of 38 (54.2%) females and 32(45.71%) males. The mean BMI was 27.51±3.13 kg/m2. The mean systolic blood pressure was 139.04±26.67 mm Hg and the diastolic pressure was 88.32±14.95 mm Hg. Mean waist circumference was 102±10.1 cm & mean waist: hip ratio was 0.97±0.094.

As per Table 1, BP ≥ 130/85 mm Hg, TG > 150 mg/d, Waist circumference >88cm/>120cm, FBG > 100 mg/dl had no relation with thyroid function. (P value is not less than 0.05, hence statistically insignificant). HDL <50 in males and <40 in females in Euthyroid showed statistical significance (p value 0.05).

DISCUSSION

Metabolic syndrome is a cluster of cardio metabolic risk factors and it is characterized by inflammation. Our study revealed that the prevalence of thyroid dysfunction was more among the females with metabolic syndrome. Subclinical hypothyroidism was present in 25.71% of the cases and overt hypothyroidism was present in 10% of the patients. Among 25.71% of total cases of subclinical hypothyroidism 82% were females and 18% were males. In our study, out of 15 females of subclinical hypothyroidism 9 were more than 35 years of age. Female patients having subclinical hypothyroidism have higher chances to have metabolic syndrome as compared to males. Hence it will be worthwhile to screen female metabolic syndrome patients for thyroid function abnormality. Abnormal blood pressure, triglycerides and

increased waist circumferences were not associated with thyroid function. However, in metabolic syndrome patients with euthyroidism, low HDL cholesterol levels was statistically significant (p value=0.05). Hence, euthyorid patients with low HDL cholesterol levels have high chances of developing metabolic syndrome.

CONCLUSION

Subclinical Hypothyroidism was present in 25.71% of study population and more so in females having metabolic syndrome. Abnormal blood pressure, triglycerides and increased waist circumferences were not associated with thyroid function. However, Euthyroid patients with metabolic syndrome had low HDL levels. Female patients having subclinical hypothyroidism have higher chances to have metabolic syndrome as compared to males. Hence it will be worthwhile to screen female metabolic syndrome patients for thyroid function abnormality.

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