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Research Article

Does thyroid function have any relation with components of metabolic syndrome?

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ABSTRACT

Background: Obesity, insulin resistance, physical inactivity, advanced age and hormonal disturbances have been suggested to be the underlying risk factors for the development of metabolic syndrome. Thyroid dysfunction can cause obesity, and can in turn lead to metabolic syndrome and can also be a cause of lipid abnormalities. Hence we tried to study the effect of thyroid function on the components of metabolic syndrome.
Methods: Blood pressure, waist circumferences, HDL cholesterol and triglycerides were measured in all patients. TSH was measured and on its basis patients were divided in three groups: euthyroid, hypothyroid and subclinical hypothyroid.
Results: There were 28 females and 22 males. Mean BMI was 31.51±5.21 kg/m^2. 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 =0.03). This is 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 cholesterol. Other components of metabolic syndrome had no statically significance with thyroid function.

Keywords: Metabolic syndrome, Subclinical hypothyroidism, Euthyroid, Overt hypothyroid

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 controls4. 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

The study was conducted in medical wards and OPD of SSG Hospital between the months of September 2011 and August 2012. The Sir Sayajirao General Hospital, Baroda is a tertiary care hospital in central Gujarat with referral of patients from Baroda district as well as surrounding districts of Gujarat, Rajasthan and Madhya Pradesh. Total of 50 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.

RESULTS

Based on clinical opinion and correlating the clinical evidence with laboratory investigations (Thyroid function tests and hsCRP), 50 patients of metabolic syndrome were divided into three groups; subclinical hypothyroid, euthyroid and overt hypothyroid. Of total 50 patients taken for current study, the mean age was 47.5±11.9 years. The study population consisted of 28 (56%) females and 22(44%) males. The mean BMI was 31.51±5.21 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). Thus Euthyroid function with low HDL increases chances of development of metabolic syndrome.

AS per Figure 1, comparing gender wise Subclinical hypothyroidism patients with Euthyroid patients, females having subclinical hypothyroidism are more likely to have metabolic syndrome (p value =0.03). This is not so in case of males.

Table 1: Co-relation of metabolic syndrome and hypothyroidism.

MetS Components	Euthyroid (n = 36)	Hypothyroid (n = 3)	Sub clinical hypothyroid(n = 11)	P value
BP ≥ 130/85 mm Hg	24 (64.9%)	3 (8.1%)	10 (27%)	0.15
TG > 150 mg/d	14 (70%)	0	6 (30%)	0.22
HDL <50 OR 40	12 (57.1%)	3 (14.3%)	6 (28.6%)	0.05
Waist circumference >88cm/>120cm	34 (73.9%)	3 (6.5%)	9 (19.6%)	0.35
	25 (78.1%)	1 (3.1%)	6 (18.8%)	0.35

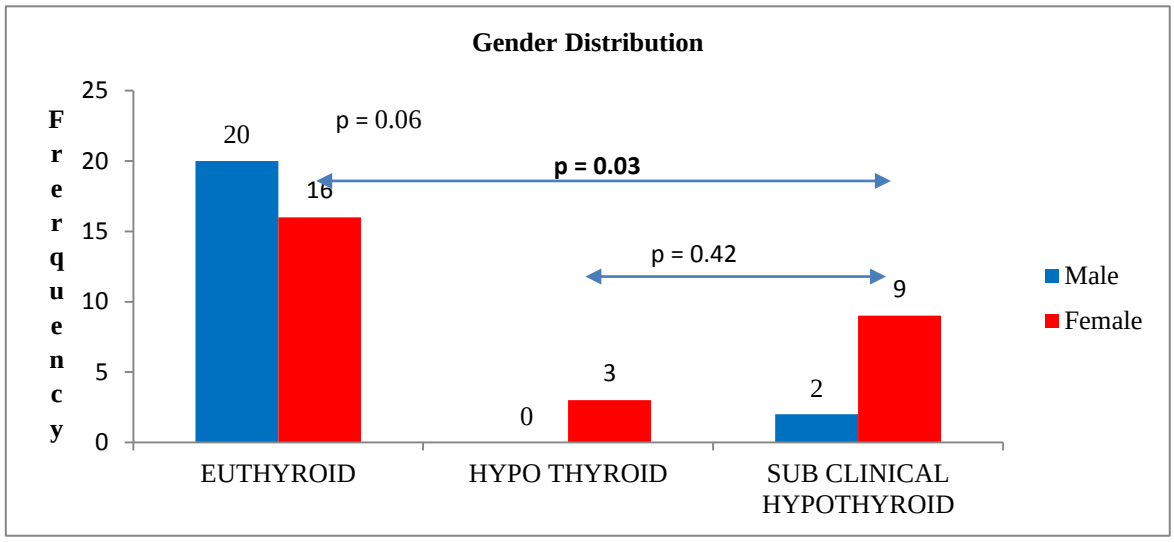

Figure 1: Gender wise distribution of metabolic syndrome as per thyroid function.

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 22% of the cases and overt hypothyroidism was present in 6% of the patients. Among 22% of total cases of subclinical hypothyroidism 82% were females and 18% were males. In our study, out of 9 females of subclinical hypothyroidism 7 were more than 35 years of age, & both males were >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 22% of study population and more so in females having metabolic syndrome (32%). 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.

External validity:

This study has limited external validity because this study enrolled only 50 patients. A study on a larger scale needs to be done to get a more accurate picture. The study was

a cross sectional study. A follow-up study would help unravel the natural history of the subclinical hypothyroidism, including its progression to overt hypothyroidism if not treated. A follow up to the present study could also correlate the emerging evidence that subclinical hypothyroidism acts as an independent risk factor for coronary and cerebrovascular disease.

A certain amount of selection bias could not be avoided, as the study center was a tertiary center and the majority of the population belonged to lower socioeconomic group. Age and sex matched controls (having no features of metabolic syndrome) were not made for comparison with study group.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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