ASSESSING THYROID PROFILE IN PATIENTS WITH METABOLIC SYNDROME AS PER IDF CRITERIA

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ABSTRACT

BACKGROUND

Thyroid hormones are major regulatory hormones and increase the rate of metabolic functions and may be associated with metabolic syndrome.

The aim and objective of the study is to study thyroid function in patients with metabolic syndrome.

MATERIALS AND METHODS

A facility based cross-sectional study was carried out from JULY 2018 to October 2018 at Sri Devraj Urs Medical College, Kolar. Subjects of Age 18 years to 70 years, who fulfilled the criteria for metabolic syndrome by International Diabetic Federation (IDF) were taken in to the study.

RESULTS

In this study, total of 100 patients with metabolic syndrome were included. Of these 100 patients, 68 were males and 32 were females. Overall, 35% patients were in age group of 41-50 years and 43% in 51-60 years and the least number of patients in 31-40 years (22%).

Of total 100 patients with metabolic syndrome, 19 of them symptoms related to hypothyroidism, 19 had goitre on examination. 11 had diffuse goiter and 2 patients had multinodular goiter. The prevalence of Metabolic Syndrome was more in Thyroid dysfunction.

CONCLUSION

The prevalence of thyroid dysfunction is seen in 46% of the patients with metabolic syndrome studied. Subclinical hypothyroidism was more common than other thyroid dysfunction contributing 29% of the total study population. Present study suggests that hypothyroidism is known to be associated with metabolic syndrome and increases the risk for cardiovascular diseases therefore it should be considered as one of the new component in newly diagnosed metabolic syndrome patients in future.

KEYWORDS

Metabolic syndrome, idf criteria, hypothyroidism, sub clinical hypothyroidism.

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BACKGROUND

Metabolic syndrome has many risk factors like hypertension, atherogenic dyslipidemia, hyperglycemia, prothrombotic and proinflammatory conditions.[1] This cluster of abnormalities is associated with increased risk for cardiovascular disease and type 2 diabetes mellitus.[2] The prevalence of metabolic syndrome is increasing in india. The Metabolic syndrome (Met Syn) is one of the major public health problems of our country. Met Syn is a cluster of metabolic abnormalities commonly found associated with increased risk for development of Diabetes Mellitus (Type 2 DM), cardiovascular disorders and other medical diseases.

The metabolic syndrome has received a great deal of attention in the last few years. Metabolic syndrome is associated with cardiovascular diseases and the risk factors comprised of central obesity, elevated blood pressure, high triglycerides, reduced levels of high-density lipoprotein (HDL) cholesterol and elevated fasting glucose levels. The metabolic syndrome has increased over the last few decades.

Although the term 'metabolic syndrome' was coined and defined in the 1980s, the criteria for diagnosis of the metabolic syndrome have not been accepted universally.

Its definition and diagnostic criteria are slightly different depending on which organization's definition is used. Definitions of the metabolic syndrome have been provided by the World Health Organization (WHO) in 1999,

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the European Group for the Study of Insulin Resistance in 1999, the National Heart, Lung, and Blood Institute acting through the National Cholesterol Education Program Adults Treatment Panel III (NCEP-ATP III) in 2001, and the International Diabetes Federation (IDF) in 2006. The American Heart Association (AHA) in conjunction with the National Heart, Lung and Blood Institute (NHLBI) revised the NCEP-ATP III definition in 2006. [3,4]

NCEP-ATP III defines metabolic syndrome as the presence of three or more of the following five features:

(1) Abdominal obesity (waist circumference >102 cm for men and >88 cm for women).
(2) Raised triglycerides (≥150 mg/dL (1.69 mmol/L)).
(3) Reduced HDL cholesterol (<40 mg/dL (1.04 mmol/L) for men and <50 mg/dL (1.29 mmol/L) for women).
(4) Raised blood pressure (a systolic blood pressure ≥130 mmHg or a diastolic blood pressure ≥85 mmHg); and
(5) Raised fasting glucose (≥110mg/dL (6.1 mmol/L) or previous diagnosis with type 2 diabetes).[5]

In 2006, the IDF proposed a new worldwide definition of the metabolic syndrome. According to the IDF definition, a person with the metabolic syndrome must have central obesity (defined as waist circumference with ethnicity specific values) in addition to any two of the following:

(1) Elevated blood pressure (a systolic blood pressure ≥130 mmHg or a diastolic blood pressure ≥85 mmHg or treatment of previously diagnosed hypertension;
(2) Elevated fasting plasma glucose (≥100 mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes);
(3) Elevated triglycerides (≥150 mg/dL (1.7 mmol/L), or specific treatment for this lipid abnormality); and
(4) Reduced HDL cholesterol (men: <40 mg/dL (1.03 mmol/L); women: < 50 mg/dL (1.29 mmol/L), or specific treatment for this lipid abnormality).

The definition of AHA criteria of metabolic syndrome includes the presence of at least three of the following features:

(1) Elevated central obesity (waist circumference ≥102 cm for men and ≥88 cm for females);
(2) Elevated blood pressure (≥130 mmHg in systolic or ≥85 mmHg in diastolic blood pressure, or taking medication for hypertension);
(3) Elevated fasting glucose: ≥100 mg/dL (5.6 mmol/L) or taking medication for hyperglycemia;
(4) Elevated triglycerides (≥150 mg/dL); and
(5) Reduced HDL cholesterol (< 40 mg/dL for men and <50 mg/dL for women).[6]

All three definitions used by the NCEP-ATP III, IDF and AHA/NHLBI have similar criteria to identify the metabolic syndrome and it can be expected that the majority of people identified as having the metabolic syndrome based on one definition will also be identified as having the metabolic syndrome based on other definitions.

Thyroid hormones perform a wide array of metabolic functions including regulation of lipids, carbohydrates, protein and electrolytes and mineral metabolism.[7] Thyroid dysfunction also affects Met Syn parameters including high density lipoprotein (HDLC), triglycerides (TG) and blood glucose fasting (FBS). It is known that thyroid dysfunction i.e hypothyroidism leads to an increase in total plasma cholesterol levels. Thyroid hormones are major regulatory hormones and increase the rate of metabolic functions and may be associated with metabolic syndrome.[8] There are several reports about higher thyroid stimulating hormone (TSH) level in patients of metabolic syndrome than in control subjects, and high prevalence of metabolic syndrome in subjects with TSH level higher than normal reference range as compared to those with normal TSH level.[9,10] As metabolic syndrome & hypothyroidism are independent risk factors for the same disease process namely cardiovascular disease, it is possible that patients suffering from both these disease entities may have a compounded risk. Hence this study was conducted to explore the association between thyroid dysfunction & components of metabolic syndrome.

Aims and Objectives

1) To study thyroid dysfunction in patients with metabolic syndrome.
2) To find out the association of thyroid dysfunction and metabolic syndrome.

MATERIALS AND METHODS

Study Design and Site- A facility based cross-sectional study was carried out among individuals with metabolic syndrome attending a tertiary care hospital attached to a medical college in rural South India which caters to majority of the population that are dependent on agriculture for their livelihood and belong to lower socio-economic class.

Duration of Study- Study was cried out for a period of 4 months from July 2018 to October 2018.

Study Population- All the in- patients and out -patients under General Medicine at R. L. JALAPPA HOSPITAL who fulfilled the inclusion and exclusion criteria were included in the study.

Inclusion Criteria

1. Subjects of Age 18 years to 70 years, who fulfilled the criteria for metabolic syndrome by International Diabetic Federation (IDF).
2. Subjects with metabolic syndrome not on any medications–newly detected metabolic syndrome patients.
3. Subjects who gave written informed consent.

Exclusion Criteria

1. Patients with liver disorders, renal disorders, congestive cardiac failure and pregnant women.

Sample Size and Sampling Method

Assuming that 50% of them will have a risk of developing metabolic syndrome and with absolute precision of 10% and with two sided confidence interval of 95%, the minimum sample size was calculated to be 100. Consecutive sampling strategy was adopted till the sample size is completed.

Study Procedure

The participants were interviewed by the principal investigator by using a Pretested semi structured questionnaire, containing demographic data, current health status, medical history, family history for cardiovascular and thyroid disorders and diabetes, menstrual status for the females, current smoking. Body height, weight, waist circumference and sitting arterial blood pressure at the arm were measured.

All cases were subjected to following investigations.

FBS, PPBS, HbA1C, Lipid profile, TSH, Free-T4 was done if there was abnormal TSH.

Using a tape Waist circumference was measured.

BMI calculated as: - wt in kg/ht in m2.

BP recorded in both arms while sitting/supine position.

Statistical Analyses

Data were entered in EpiData version 3.1 (The EpiData Association, Odense, Denmark) and analysis was done using SPSS version 22. Descriptive statistics were represented as frequencies and percentages.

Ethical Considerations

Prior to the onset of the study, ethical approval was obtained from Institutional Ethics Committee (IEC), Kolar.

RESULTS

In this study, total of 100 patients with metabolic syndrome were included. Of these 100 patients, 68 were males and 32 were females. Overall, 35% patients were in age group of 41-50 years and 43% in 51-60 years and the least number of patients in 31-40 years (22%).

Of total 100 patients with metabolic syndrome, 19 of them symptoms related to hypothyroidism, 19 had goitre on examination. 11 had diffuse goiter and 2 patients had multinodular goitre (Table 1)

	Frequency (n=100)	Percent (%)
Subclinical hypothyroidism	29	29%
Hypothyroidism	12	12%
Euthyroidism	54	54%
Subclinical hyperthyroidism	4	4%
Hyperthyroidism	1	1%

Table 1. Prevalence of Thyroid Dysfunction in Female Patients in Present Study

Table 2 shows the components of the metabolic syndrome and its values represented as Mean and Standard deviation.

Components of Metabolic Syndrome*	Mets (Mean ± SD)
Age (Years)	54.31 ± 6.83
Height (CM)	159.1 ± 8.87
Weight (Kg)	73.29 ± 11.22
BMI (Kg/Sq.M)	29.74 ± 5.44
HC (CM)	97.12 ± 9.98
WC* (CM)	101.12 ± 10.81
Systolic BP* (mmHg)	143.75 ± 14.92
Diastolic BP* (mmHg)	90.21 ± 11.21
FBG* (mg/dL)	137.82 ± 34.23
TG* (mg/dL)	171.69 ± 65.35
HDL-C* (mg/dL)	43.86 ± 5.41

Table 2. Components of Metabolic Syndrome and its Descriptive Statistics

BMI, body mass index; WC, waist circumference; HC, hip circumference; FBG, fasting blood glucose; TG, triglycerides; HDL-C, high density lipoprotein cholesterol.

Table 3 shows the values of mean and standard deviation of the T3, T4 and TSH among the patients who were fulfilling the criteria of Metabolic Syndrome as per IDF criteria.

	Mets (Mean ± SD)
T3 (ng/mL)	1.28 ± 0.70
T4 (µg/dL)	6.43 ± 2.57
TSH (µIU/mL)	19.34 ± 31.32

Table 3. Comparison of Thyroid Functions between MetS group. Thyroid Function Variables

The prevalence of Metabolic Syndrome was more in Thyroid dysfunction i.e, both Hypothyroidism and Hyperthyroidism when compared to Euthyroid status which tells that thyroid profile has an impact on development of metabolic syndrome among individuals.

Thyroid Status	Presence of Metabolic Syndrome	Percentage (%)
Euthyroid	12 of 54 euthyroid patients	22.2%
Hypothyroid	5 of 12 hypothyroid patients	41.6%
Hyperthyroid	2 of 5 hyperthyroidism Patients	40%

Table 4. Prevalence of Metabolic Syndrome according to Thyroid Status

DISCUSSION

Metabolic syndrome is an important risk factor for the development of cardiovascular disease. Many studies done in the past has shown higher incidences of association of thyroid dysfunction (subclinical hypothyroidism) with metabolic syndrome.[11,12] Thus the detection of thyroid abnormalities and its treatment in patients with metabolic syndrome may help in reducing the risk of CVD they already have.

46% of the study population had thyroid dysfunction, of which most of them had subclinical hypothyroidism (29 of 100 patients) followed by 12 patients with hypothyroidism and 4 patients with subclinical hyperthyroidism and 1 patient with hyperthyroidism.

Jayakumar et al., included 120 patients with metabolic syndrome, of which 60% of patients had thyroid abnormalities. 44% had subclinical hypothyroidism, 15% had hypothyroidism, 1% patients with subclinical hyperthyroidism and 40% had normal values.[13] Gyawali et al., studied the prevalence of thyroid dysfunction in patients with metabolic syndrome which showed the overall prevalence of the thyroid dysfunction to be 31.25% of which 28.90% had subclinical hypothyroidism, 1.55% had overt hyperthyroidism, 0.80% had subclinical hyperthyroidism and 68.75% were euthyroid which were identical with our study findings.

Sat Byul Park et al. a study done in Korean population considered 594 patients with metabolic syndrome. 41% of patients had thyroid dysfunction. Of 594 patients, 158 had subclinical hypothyroidism, 49 patients had subclinical hyperthyroidism and hypothyroidism in 38 patients.[14]

Tehrani et al. in his study enrolled 914 women with hypothyroidism, of this 19.2% had subclinical hypothyroidism but our study had 29% of patients with hypothyroidism.[15]

Gaurav et al. in a study done in south Indian women included 76 patients with metabolic syndrome, of which 53% had subclinical hypothyroidism and 25% were euthyroid which were contrasting to our study findings.[16] Park HT et al. in his study done in postmenopausal euthyroid women, who included 2205 women, identified a close relationship between TSH values and metabolic syndrome. Higher the value of TSH more is the prevalence of metabolic syndrome.[17]

Shresta et al. studied the association of metabolic syndrome with thyroid abnormalities in 48 females from Nepal. 32% of the study population had metabolic syndrome. Of which, the prevalence of metabolic syndrome was more common in the euthyroid group compared to the hyperthyroid and hypothyroid group. This study stated that the thyroid dysfunction might be protective for the development of metabolic syndrome, which contradicts from our study.[18]

Avanthika C Waring et al. studied the thyroid function in incidence and prevalence of metabolic syndrome in older adults, which showed that the higher TSH levels more than 10 mIU/ml were more commonly associated with prevalent metabolic syndrome.[19] Muhammed et al. in his study done in a euthyroid population from Pakistan, included 100 patients with metabolic syndrome and 30 patients in the control group compared the TSH values between both the group and showed that there was a significant difference in TSH values between both groups.[20]

CONCLUSION

The prevalence of thyroid dysfunction is seen in 46% of the patients with metabolic syndrome studied. Subclinical hypothyroidism was more common than other thyroid dysfunction contributing 29% of the total study population. One must have a strong suspicion of subclinical hypothyroidism in patients with metabolic syndrome, as the incidence is high in them. Thyroid hormone significantly affects and is associated with components of metabolic syndrome. Present study suggests that hypothyroidism is known to be associated with metabolic syndrome and increases the risk for cardiovascular diseases therefore it should be considered as one of the new component in newly diagnosed metabolic syndrome patients in future. Thyroid functions should regularly be checked for the parameters of metabolic syndrome. Early detection of thyroid dysfunction can prevent the complications of metabolic syndrome.

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