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General Medicine

STUDY OF PREVALENCE OF THYROID DYSFUNCTION AMONG CASES OF METABOLIC SYNDROME AT A TERTIARY HOSPITAL.

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ABSTRACT **Background:** Thyroid problems and metabolic syndrome can raise the chances of developing atherosclerosis, cardiovascular disease, cerebrovascular disease, and non-alcoholic fatty liver disease. **Objectives:** Present study was aimed to study the prevalence of thyroid dysfunction among cases of metabolic syndrome at a tertiary hospital. **Material and Methods:** Present study was cross-sectional, observational study, conducted in ppatients of age group 20-70 years, either gender, with features of metabolic syndrome according to NCEP criteria, underwent thyroid function evaluation. **Results:** In present study, 160 patients of metabolic syndrome were evaluated for thyroid dysfunction. Majority patients were from 40-49 years age group (38.75 %), male (68.13 %). Mean age was 52.68 ± 10.20 years.Among 160 patients of metabolic syndrome, majority had 3 components (55 %), followed by 4 components (38.75 %) & 5 components (6.25 %). Mean values of thyroid function test showed that, FT4 was 1.42 ± 0.52 ng/dl, FT3 was 1.48 ± 0.97 ng/dl & TSH 11.35 ± 7.09 µIU/ml.Majority had normal TFT's (70 %), while incidence of subclinical hypothyroidism was 16.25 %, hypothyroidism was 10.63 %, subclinical hyperthyroidism was 1.88 % &hyperthyroidism was 1.25 %.**Conclusion:** Assessing thyroid function in individuals with metabolic syndrome may be beneficial in detecting and averting the potential risk of cardiovascular and cerebrovascular events in such patients.

KEYWORDS : Hyperthyroidism; Hypothyroidism; Metabolic syndrome; Subclinical hypothyroidism; Thyroid dysfunction.

INTRODUCTION

Metabolic syndrome (MetS) is usually identified by the presence of a group of interrelated conditions including abnormal levels of blood lipids (low HDL and high triglycerides), impaired fasting glucose, elevated blood pressure, and excess abdominal obesity, among others [1]. Factors such as obesity, sedentary lifestyle, aging, dyslipidaemia, cardiovascular disease, and lipodystrophy have been identified as risk factors for developing metabolic syndrome.

The diagnostic criteria for metabolic syndrome, as per the National Cholesterol Education Programme (NCEP) Adult Treatment Panel-III guidelines, require a patient to have at least three of the following five conditions [2]:

1) Fasting glucose levels of ≥110 mg/dL (or receiving drug therapy for hyperglycemia),
2) Blood pressure of ≥130/85 mm Hg (or receiving drug therapy for hypertension),
3) Triglyceride levels of ≥150 mg/dL (or receiving drug therapy for hypertriglyceridemia),
4) Low HDL-cholesterol levels of <40 mg/dL in men or <50 mg/dL in women (or receiving drug therapy for reduced HDL-C), and
5) Waist circumference of ≥90 cm in men or ≥80 cm in women. This information is derived from reference.

Thyroid hormones are responsible for regulating various metabolic functions, including those related to lipids, carbohydrates, protein, electrolytes, and mineral metabolism. These hormones play a crucial role in increasing the rate of metabolic processes and may have a relationship with metabolic syndrome [3,4]. The association between thyroid dysfunction and metabolic syndrome is also linked to an increased risk of various health conditions, such as atherosclerosis, cerebrovascular disease, cardiovascular disease, and Non-alcoholic fatty liver disease (NAFLD). Furthermore, subclinical hypothyroidism (SCH) may serve as a risk factor for atherosclerosis, cardiovascular disease, and metabolic disorders, including hyperlipidemia, hypertension, low-grade inflammation, and hypercoagulability [5,6]. These processes are similar to the sequelae of metabolic syndrome. With this information in mind, the aim of the current study is to determine the prevalence of thyroid dysfunction in cases of metabolic syndrome at a tertiary hospital.

MATERIAL AND METHODS

Present study was cross-sectional, observational study, conducted in at the outpatient and inpatient department of general medicine, at Al Ameen Medical College & Hospital, Vijaypura, Karnataka, India. Study duration was of 1 year (June 2022 to May 2022). Study approval was obtained from institutional ethical committee.

Inclusion criteria:

- Patients of age group 20-70 years, either gender, with features of metabolic syndrome according to NCEP criteria, willing to participate in present study

Exclusion criteria:

- Patients with primary thyroid disorder, irradiation of thyroid gland, thyroidectomy or thyroid surgeries, on drugs like anti-thyroid drugs,
- Patients receiving drugs that alter thyroid functions, lipids such as statins, lithium, amiodarone, oral contraceptive pills, steroids;
- Patients with liver disorders; with renal disorders, in congestive cardiac failure,
- Pregnant women
- Not willing to participate in present study

Study was explained to patients in local language & written consent was taken for participation & study. All patients underwent detailed history taking and clinical examination. Laboratory investigations (complete blood count, liver function test, renal function test, fasting blood sugar, fasting lipid profile, serum FT4, FT3 & TSH) & radiological investigations (ultrasonography of abdomen, ultrasonography scan neck) were done.

Thyroid dysfunction was labelled when thyroid hormones level was abnormal. Normal reference range was-

1. Free T3 (0.31–0.65 ng/dl),
2. Free T4 (0.7–1.6 ng/dl)
3. TSH level (0.25–5 mIU/L)).

Overt hypothyroidism was defined as TSH > 5 mIU/L, free T3 < 0.31 ng/dl and free T4 < 0.7 ng/dl. Subclinical hypothyroidism was considered if TSH > 5 mIU/L and free T3 and free T4 within reference

range. Subclinical hyperthyroidism was defined as TSH < 0.25 mIU/L and free T3 and free T4 within reference range. Overt hyperthyroidism was defined as TSH < 0.25 mIU/L and free T3 and free T4 levels raised. Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables.

RESULTS

In present study, 160 patients of metabolic syndrome were evaluated for thyroid dysfunction. Majority patients were from 40-49 years age group (38.75 %), male (68.13 %). Mean age was 52.68 ± 10.20 years.

Table 1- General characteristics.

	No. of patients/ mean ± SD	Percentage
Age groups (in years)		
20-39	19	11.88%
40-49	62	38.75%
50-59	45	28.13%
60-70	23	14.38%
70-79	11	6.88%
Mean age	52.68 ± 10.20	
Gender		
Male	109	68.13%
Female	51	31.88%

Mean value of clinical/ anthropometric measurements suggestive of waist circumference 38.17 ± 2.13 inches, systolic blood pressure was 140.26 ± 15.93 mmHg & diastolic blood pressure was 86.82 ± 11.24 mmHg. Mean laboratory values of fasting blood glucose 151.9 ± 46.32 mg/dl, postprandial blood glucose was 201.34 ± 58.48 mg/dl, triglycerides 191.35 ± 64.31 mg/dl, HDL was 51.34 ± 28.73 mg/dl & LDL was 131.35 ± 45.48 mg/dl. Mean values of thyroid function test showed that, FT4 was 1.42 ± 0.52 ng/dl, FT3 was 1.48 ± 0.97 ng/dl & TSH 11.35 ± 7.09 µIU/ml.

Table 2- Clinical & laboratory characteristic

Characteristics	Mean ± SD
Clinical/ Anthropometric	
Waist circumference (inches)	38.17 ± 2.13
Systolic BP (mmHg)	140.26 ± 15.93
Diastolic BP (mmHg)	86.82 ± 11.24
Laboratory	
Fasting Blood Glucose (mg/dl)	151.9 ± 46.32
Postprandial Blood glucose (mg/dl)	201.34 ± 58.48
Triglycerides (mg/dl)	191.35 ± 64.31
HDL (mg/dl)	51.34 ± 28.73
LDL (mg/dl)	131.35 ± 45.48
FT4 (ng/dl)	1.42 ± 0.52
T3 (ng/mL)	1.48 ± 0.97
TSH(µIU/ml)	11.35 ± 7.09

Among 160 patients of metabolic syndrome, majority had 3 components (55 %), followed by 4 components (38.75 %) & 5 components (6.25 %). Majority had normal TFT's (70 %), while incidence of subclinical hypothyroidism was 16.25 %, hypothyroidism was 10.63 %, subclinical hyperthyroidism was 1.88 % &hyperthyroidism was 1.25 %.

Table 3: Metabolic syndrome parameter wise thyroid dysfunction

Thyroid Status	Metabolic Syndrome Criteria Present			Total
	3	4	5	
Normal	65 (40.63 %)	42 (26.25 %)	5 (3.13 %)	112 (70 %)
Subclinical Hypothyroidism	9 (5.63 %)	13 (8.13 %)	4 (2.5 %)	26 (16.25 %)
Hypothyroidism	11 (6.88 %)	5 (3.13 %)	1 (0.63 %)	17 (10.63 %)
Subclinical Hyperthyroidism	2 (1.25 %)	1 (0.63 %)	0	3 (1.88 %)
Hyperthyroidism	1 (0.63 %)	1 (0.63 %)	0	2 (1.25 %)
Total	88 (55 %)	62 (38.75 %)	10 (6.25 %)	160

DISCUSSION

The prevalence of metabolic syndrome is crucial to predicting the future burden of diabetes mellitus and cardiovascular diseases among the Indian population. This is particularly relevant due to the increasing rates of obesity, which have been linked to rising calorie intake and sedentary lifestyles. These factors have contributed to a growing obesity pandemic that has affected many facets of society over the past several years. As a result, the prevalence of Type 2 diabetes mellitus (T2DM), cardiovascular disease (CVD), high blood pressure, sleep apnea, and certain cancers has also increased in proportion to the rising rates of obesity. [7,8,9]

Insulin resistance is a defining feature of Type 2 diabetes mellitus and is also associated with an increased risk of dyslipidemia. Additionally, moderate thyroid dysfunction has been linked to insulin resistance and an elevated risk of dyslipidemia. Both sub-clinical hypothyroidism (SCH) and overt hypothyroidism (OH) are recognized risk factors for insulin resistance, hyperlipidemia, hypercoagulability, and low-grade inflammation.[10,11]

Jayakumar et al.,[12] 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. Cardiovascular manifestations are frequent in thyroid dysfunction. Overt hyperthyroidism induces a hyperdynamic cardiovascular state which is associated with tachycardia, increased left ventricular systolic and diastolic function and an increased incedence of atrial fibrillation, whereas the opposite changes occur in overt hypothyroidism.[12]

In a study by Sanketh et al., 100 patients diagnosed with metabolic syndrome were evaluated. Of the patients, 68 were male, and 35% of patients were between the ages of 41-50 years, while 43% were between 51-60 years old. During the examination, 19 patients reported symptoms associated with hypothyroidism, while 19 patients had a goitre. Of those with goitre, 11 had a diffuse goitre, and two had a multinodular goitre. The study found that 46% of the patients with metabolic syndrome had thyroid dysfunction. Of these, subclinical hypothyroidism was the most common, accounting for 29% of the total study population.[13]

According to Ritu Gupta et al, the prevalence of thyroid dysfunction among patients with metabolic syndrome was found to be 28.5%. Of these cases, 18.5% had subclinical hypothyroidism, and 8.5% had overt hypothyroidism. The study also found that in patients with both metabolic syndrome and thyroid dysfunction, the most commonly associated components were diabetes mellitus and hypertriglyceridemia. [14]

Chakradhar et al. [15] conducted a study on 134 patients diagnosed with metabolic syndrome, with 39 male (29.2%) and 95 female (70.8%) participants. The mean age of the study population was 54.63 ± 10.9 years. The study found a prevalence of thyroid dysfunction among the participants to be 28.4%. The results of the study showed that there was a significant association (p=0.032) between metabolic syndrome and thyroid dysfunction.[15]

Krishna B et al. conducted a study in which 925 subjects were screened for metabolic syndrome. Out of these, 356 subjects (38%) were found to have metabolic syndrome. The study also revealed that 4.3% of the subjects had overt hypothyroidism, 25.3% had subclinical hypothyroidism with TSH levels ranging from 5.5-10 mIU/L, 26.4% had TSH levels greater than 10 mIU/L, 0.9% had hyperthyroidism, and 2.2% had subclinical hyperthyroidism.[16]

Hypothyroidism often coexists with metabolic syndrome (MetS), which is a cluster of conditions that includes central obesity, high blood pressure, high blood sugar, and abnormal lipid levels. Managing hypothyroidism in patients with MetS can lead to improvements in their metabolic parameters and reduce their risk of cardiovascular disease. This, in turn, can enhance their quality of life. Therefore, preventing and treating MetS should be considered a crucial public health priority to reduce the incidence of cardiovascular diseases.

To achieve better protection against complications related to diabetes

and thyroid disease, further research should explore the association between the components of MetS, dietary patterns, and the measurement of anti-thyroid peroxidase (anti-TPO) antibodies. By identifying the links between these factors, we can gain a better understanding of how to protect individuals from the complications associated with these diseases.[17]

CONCLUSION

Metabolic syndrome and Hypothyroidism are independent risk factor for Obesity and atherosclerotic diseases. Evaluating the thyroid function in patients of metabolic syndrome may help to identify and prevent the risk of cardiovascular and cerebrovascular events in the patients.

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