Original Research Article

Study of Metabolic Syndrome with Special Reference to Thyroid Profile Abnormality from Central India

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Abstract

Introduction: *Metabolic syndrome (MS) is a cluster of various clinical and biochemical abnormalities which include obesity, systemic hypertension, hypertriglyceridemia, low HDL and raised fasting blood sugar levels. The thyroid hormone has influence on almost each and every cell of various organs in the body. Its deficiency or excess is likely to have various metabolic abnormalities.*

Methods: *This cross sectional observational study was conducted in 100 consecutive patients of metabolic syndrome at MGM Medical College and MY Hospital Indore, MP, India from one year of study duration and both outdoor and in patients were included in this study.*

Results: *In this study, out of total 100 patients, 60 were females and 40 were males. Most patients (40%) were in age group of 41-50 years. Euthyroid, hypothyroid, subclinical hypothyroid, hyperthyroid, and subclinical hyperthyroid were found in 76%, 4%, 19%, 0% and 1% respectively. Out of 100 MS patients, 39% fulfilled 3 out of 5 criteria, 38% patients fulfilled 4 out of 5 criteria, and 23% patients fulfilled all 5 criteria of MS. A 'p-value' was found to be 0.342, which was statistically not significant. Mean (SD) Waist circumference in euthyroid and subclinical hypothyroid patients were 92.78(10.04) cm and 98.68(10.83) cm respectively and it was statistically significantly high (p value = 0.026). Mean (SD) BMI in euthyroid and subclinical patients were 27.31(4.37) and 29.87(5.47) respectively and it was statistically significant (p value= 0.033).*

Conclusions: *Prevalence of hypothyroidism and subclinical hypothyroidism is more common in metabolic syndrome patients. Waist circumference and BMI were significantly high in subclinical hypothyroid patients as compared to euthyroid patients.*

Keywords: *Euthyroid, hypothyroid, subclinical hypothyroid, metabolic syndrome.*

Introduction

It is a well known fact that patients with metabolic syndrome (MS) are at a high risk for developing cardiovascular disease and other co-morbidities as well as incidence of premature death several times compared to normal population.[1]

The chief culprit responsible for the MS is underlying insulin resistance.[2] People with MS

are at an increased risk of atherosclerotic cardiovascular disease and type 2 diabetes.[3] The thyroid hormone has influence on almost each and every cell of various organs in the body. Its deficiency or excess is likely to have various metabolic abnormalities[4]. Additionally, thyroid disease, especially overt hypothyroidism, is associated with atherosclerotic cardiovascular disease.[5] Since MS and thyroid dysfunction are independent risk factors of atherosclerotic cardiovascular disease (CVD), the concurrent existence of the two will substantially increase the risk of CVD. Several studies have shown a significant association which links MS with subclinical and overt hypothyroidism and the association seems to be more in females.[6,7] In a study done by Uzunlulu et al, at Japan they have analysed the prevalence of sub clinical hypothyroidism (SCH) among 220 MS patients. They found that SCH was 16.4% prevalent in MS patients. One sixth of MS patients had SCH and more prevalent in female gender.[6] In a study from Nepal, Chandra L et al, found that the MS was prevalent in 21.1% of thyroid dysfunction patients. They have assessed the association of MS and its components with thyroid dysfunction in 100 female patients. This study found that the prevalence of overall MS was 32%, more in euthyroid group (21/48) than hyperthyroid group (5/24) and hypothyroid group (6/28).[7]

Lin SY et al in a study in Chinese population, observed lower free thyroxine levels in patients of metabolic syndrome.[8]

As metabolic syndrome and 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. Our study is an effort to investigate the proposed association between these two disease entities and to identify the factors that increase the risk of this association.

Material and Methods

Study Design: It is a cross sectional, observational, and descriptive study of assessment of thyroid dysfunction in metabolic syndrome patients. The study was conducted from October 2013 to October 2014.

Study Subjects: Patients diagnosed as metabolic syndrome by Asian Indian guidelines and fulfilling inclusion and exclusion criteria attending M.Y. Hospital general medicine OPD, diabetes and cardiology OPD and medicine wards were included. 100 cases were included in the study.

Selection of Study Subjects: Asian Indian Guidelines any 3 out of 5:

1. **Central Obesity-** defined as waist circumference with specific values (for south Asians: ≥90cm for Men and ≥80cm Women
2. **Raised Triglycerides:** >150 mg/dl (1.7 mmol/L) or specific treatment for this lipid abnormality.
3. **Reduced HDL Cholesterol**: <40 mg/dl in males, <50 mg/dl in females, or specific treatment for this lipid abnormality.
4. **Raised Blood Pressure:** systolic BP >130 and/or diastolic BP >85 mm Hg or treatment of previously diagnosed hypertension.
5. **Raised Fasting Plasma Glucose:** (FPG)>100 mg/dl, or previously diagnosed type 2 diabetes mellitus.

Inclusion Criteria

1. Patients more than 18 years and less than 60 years of age were included in the study. This is because patients more than 60 yrs have other associated co-morbidities.
2. Both males and females were included in this study.

Exclusion Criteria

1. Age less than 18 years and more than 60 years
2. Seriously ill patients
3. Patients with multi system disease and malignancy

4. Patients suffering from congestive heart failure, acute or chronic renal or liver disease
5. Pregnant women
6. Known case of hypothyroidism and hyperthyroidism
7. Drugs known to alter levels of thyroid hormones and lipid levels.

Methodology

1. Patients bio data was noted as per proforma.

2. The presenting complaints pertaining to thyroid dysfunction were enquired into viz. swelling in the neck, chest pain, and palpitations. History of heat or cold intolerance, weight gain or weight loss, constipation or diarrhea, fatigability, skin, and hair changes, menstrual disturbances, sleep disturbances and symptoms related to MS.

Statistical Methods

Data analysis: The statistical software namely SPSS 15.0 Stata 8.0 and Graph Pad were used for the analysis of the data. Microsoft Word and Excel software have been used to generate graphs, tables etc. Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean (SD) (Min-Max) and results on categorical measurements are presented in number (%). Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups. Chi-square test is used for quantitative data by2x2 contingency table. Pearson correlation Coefficient has been used for finding of SCH cases. A 'p value' <0.05 is taken as statistically significant.

Significant Figure

+Suggestive significance (P value: 0.05<P<0.10)
*Moderately significant (P value: 0.01<P <0.05)
**Strongly significant (P value: P<0.01).

Results

In our study, among the 100 patients included in our study, 40 patients were male and 60 were female. Out of 100, 2(2%) patients were in between 18- 30 years, and majority of patients (40%) were in the age group of 41-50 years (Table 1).

Table 1: Age and gender distribution of patients

Age(in years)	Male	Female	Total	%
18-30	1	1	2	2
31-40	3	22	25	25
41-50	15	25	40	40
51-60	21	12	33	33
Total	40	60	100	100

Seventy six patients were found to be euthyroid (76%) and thyroid dysfunction was found in 24 patients (24%). Majority of thyroid dysfunction patients had SCH (19%). Overt hypothyroidism was seen in 4(4%) patients and 1(1%) patients had subclinical hyperthyroidism. None of our patient had hyperthyroidism (Table 2).

Table 2: Distribution of patients with metabolic syndrome as per thyroid function test

Group	Male	Female	Total	%
Euthyroid	34	42	76	76
Hypothyroid	1	3	4	4
SCH	4	15	19	19
Hyperthyroid	0	0	0	0
Subclinical hyperthyroid	1	0	1	1
Total	40	60	100	100

In age group of 18-30 years, out of 2 patients 1 was hypothyroid (50%) and 1 was euthyroid (50%). Out of 25 patients in age group of 31-40 years, 17(68%) were euthyroid, 1(4%) was hypothyroid and 7(28%) had SCH. Maximum patients, 40(40%) belonged to the age group of 41-50 years, out of which 34(85%) were euthyroid, 5(12.5%) had SCH and 1(2.5%) was overt hypothyroidism (Table 3).

Table 3: Age wise distribution of cases of metabolic syndrome as per thyroid function test

Age (in years)	Euthyroid (%)	Hypothyroid (%)	SCH	Subclinical hyperthyroidism	Total
18-30	1(50)	1(50)	0(0)	0(0)	2
31-40	17(68)	1(4)	7(28)	0(0)	25
41-50	34(85)	1(2.5)	5(12.5)	0(0)	40
51-60	24(72.7)	1(4.7)	7(21.2)	1(4.7)	33
Total	76(76)	4(4)	19(19)	1(1)	100

Out of 100 MS patients, 39(39%) fulfilled 3 out of 5 criteria, of which 33(84.6%), 5(12.8%), and 1(3%) were euthyroid, SCH, and subclinical hyperthyroidism respectively. A 38(38%) patients fulfilled 4 criteria of MS, of which 28(73.7%) were euthyroid, 2(5.2%) had hypothyroid and 8(21%) had SCH. A 23(23%) patients fulfilled all 5 criteria of MS, of which 15(65.2%) were euthyroid, 2(8.7%) had overt hypothyroidism, and 6(26%) had SCH (Table 4).

Table 4: Distribution of cases with metabolic syndrome according to number of criteria of metabolic syndrome fulfilled

No. of MS criteria fulfilled	Euthyroid (%)	Hypothyroid (%)	SCH	Subclinical hyperthyroidism	Total	P value
3	33(84.6)	0	5(12.8)	1(3)	39	
4	28(73.7)	2(5.3)	8(21)	0(0)	38	0.342
5	15(65.2)	2(8.7)	6(26)	0(0)	23	
Total	76(76)	4(4)	19(19)	1(1)	100	

In MS patients, waist circumference and BMI was significantly increased (p value< 0.05) in patients with SCH as compared to euthyroid patients (Table 5).

Table 5: Correlation of waist circumference and BMI with euthyroid and subclinical hypothyroidism

MS Parameters	Euthyroid		Subclinical Hypothyroidism		P value
	Mean	SD	Mean	SD	
Waist circumference	92.8	10	98.7	10.8	0.026
BMI	27.3	4.3	29.9	5.5	0.033

Discussion

The metabolic syndrome is a cluster of metabolic abnormalities wherein people are obese and have hypertension, high triglyceride level, low high density lipoprotein cholesterol, and abnormal fasting glucose levels.[3] People with MS are high risk for developing cardiovascular disease and type 2 diabetes. Hypothyroidism is associated with lipid abnormalities like high triglycerides and low high density lipoproteins, weight gain, glucose intolerance and hypertension.[9] Thus hypothyroidism mimics the parameters of MS.

This study was conducted in 100 cases of MS, attending diabetes and cardiology OPD and those admitted in wards in M.Y. Hospital Indore.

The observations and results are discussed here.

In this study, thyroid dysfunction is present in 24% of MS patients. Hypothyroidism was 23% prevalent in MS patients (Overt Hypothyroidism 4% and sub clinical hypothyroidism 19%). The

Association of hypothyroidism and SCH in MS patients are higher than in the normal population, which is 10.95% for hypothyroidism and 8.02% for SCH in India.[10]

This study is consistent with study done by VPS Punia as 27% of MS patients had hypothyroidism. In this study, thyroid dysfunction is 24% among MS patients. Hypothyroidism is 23% prevalent in MS patients (Overt Hypothyroidism 4% and SCH 15%).

In our study, percentage of SCH is comparable to Ghanshyam et al and slightly less compared to study by P. Gyawali. Differences may be due to different geographical conditions and prevalence of hypothyroidism as study by P. Gyawali was based in Nepal while study by Ghanshyam P et al was based in south India.

In our study, Asian Indian guidelines were used as criteria for MS. 78% patients had impaired fasting glucose. This is higher than other studies as the cut off used in our study was 100mg/dl as compared the other studies which had a cut off of fasting blood glucose >110mg/dl. In addition, as most of our patients were selected from diabetes OPD there was more no. of diabetics included in the study. Patients having systemic hypertension or a BP of ≥130/85 mm Hg was 71% which is on the higher side as compared to Ramchandra et al but comparable to study by SP Surana et al as this study was done in diabetic population and our patients also had significant number of diabetics. Elevated triglyceride was seen in 65% of patients which is comparable to study by Surana et al and VPS Punia.

Low HDL levels were seen in 82% of population comparable to study VPS Punia but slightly higher than study by Surana et al.

Increased waist Circumference was seen in 81% of population as the cut off for waist circumference was lower in our study (Asian Indian guidelines- central obesity is defined as males >90, females >80) as compared to NCEP ATP III criteria which use 102 cm and 88 cm as cut off for waist circumference in males and females respectively.

In our study, we have used Asian Indian guidelines while SP Surana et al used NCEP ATP III criteria. In our patients 39% fulfilled 3 out of 5 criteria, 28% fulfilled 4 out of 5 criteria, and 23% fulfilled 5 out of 5 criteria for MS which is comparable to study by Surana et al.

Conclusions

Prevalence of hypothyroidism and SCH is more common in metabolic syndrome patients. Waist circumference and BMI were significantly high in subclinical hypothyroid patients as compared to euthyroid patients.

Disclosure

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Conflict of interest: Not declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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