



STUDY OF THYROID DYSFUNCTION IN METABOLIC SYNDROME

DRAWPATHY S^{1*}, KOLAPARTHI LS² AND NIKAM A³

1: 3rd year PG Resident, Department of General Medicine, Dr. D Y Patil Medical College,
Hospital & Research Centre, Pimpri, Pune, India -411018

2: 3rd year PG Resident, Department of General Medicine, Dr. D Y Patil Medical College,
Hospital & Research Centre, Pimpri, Pune, India -411018

3: Professor, Department of General Medicine, Dr. D Y Patil Medical College,
Hospital & Research Centre, Pimpri, Pune, India -411018

Dr. Abhijit Nikam, Professor, Department of General Medicine, Dr. D Y Patil Medical
College, Hospital & Research Centre, Pimpri, Pune, India -411018

*Corresponding Author: Drawpathy S: E Mail: abhijitnikam1@rediffmail.com

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ABSTRACT

Background: Thyroid disorders are one of the most prevalent endocrine diseases in the world. Metabolic syndrome is associated mainly with the thyroid dysfunction which impact on glucose, lipid metabolism and cardiac dysfunction.

AIM& OBJECTIVE: To study thyroid dysfunction in metabolic syndrome. The main objective of this study was to study the pattern of thyroid dysfunction in cases of metabolic syndrome and to evaluate the association of thyroid dysfunction with the components of metabolic syndrome

METHODOLOGY: It was a Cross-sectional Observational study. The Study was conducted at outpatient department and wards of Dr DY Patil Medical College and hospital, DY Patil Vidyapeeth, Pimpri, Pune. Outpatient department wards of tertiary care hospital. Registration of patients was from August 2019. They were registered when admitted under Medicine department.

RESULTS: In the present study, mean age in years was 49.27 ± 8.99 years. Majority 50% were in the age group of 46 to 55 years. Majority were females with 58% and 42% were

males. Number of Criteria positive for metabolic syndrome among study subjects, majority 48% had 3 parameters, 30% had 4 parameters and 22% had 5 parameters positive. On general examination, mean age was 49.27 ± 8.99 , height was 156.5 ± 0.04 , weight was 79.4 ± 12.2 , waist circumference was 102.44 ± 10.68 , systolic blood pressure was 129.2 ± 8.36 , diastolic blood pressure was 88.88 ± 10.46 , fasting bloodsugar 160.7 ± 54.96 , total cholesterol was 131.84 ± 21.2 , HDL was 52 ± 20.65 , triglyceride was 146.53 ± 42.25 . In present study Thyroid dysfunction was seen among 22% of metabolic syndrome patients. Majority 78% had euthyroid status, 15% had subclinical hypothyroid, 4% had hypothyroid, 2% had subclinical hyperthyroid, and 1% had hyperthyroidism. In present study majority 78% had euthyroid status, 15% had subclinical hypothyroid, 4% were hypothyroid, 2% had subclinical hyperthyroid, and 1% had hyperthyroidism. No statistical significance was seen between gender and thyroid status ($P=0.73$). No statistical significance was seen between age and thyroid status ($P=0.98$). Strong association of thyroid dysfunction with the components of metabolic syndrome was seen ($p < 0.0001$).

CONCLUSION: The study conclude that thyroid functions should be taken into account while treating a patient with metabolic syndrome which will help in early diagnosis of thyroid dysfunction and thus decrease the incidence of atherosclerotic cardiovascular disease risk.

Keywords: Thyroid, Metabolic syndrome, HDL, euthyroid, Cardiovascular disease

INTRODUCTION

Metabolic syndrome is a combination of various metabolic diseases which further lead to cardiac disorders. The major features of metabolic syndrome includes central obesity, insulin resistance, hypertension, dyslipidaemia, high Triglycerides, low HDL levels and prothrombotic conditions. The highest recorded prevalence of metabolic syndrome worldwide is among Native Americans with an age adjusted 53% women and 45% men meeting the criteria of NCEPATPIII. Overweight/obesity, sedentary lifestyle, lipodystrophy, Diabetes mellitus and

cardiovascular diseases are all risk factors for metabolic syndrome. 75% patients of Type2 DM or Impaired glucose tolerance have the metabolic syndrome. Individuals with metabolic syndrome are twice as likely to die of cardiovascular disease as those who do not, and their risk of an acute MI or stroke is threefold higher. The exact cause is not known, with insulin resistance being the central cause and etiology being multifactorial.^(1,2)

There will be an increased production of Apo-B containing triglyceride rich very low density lipoprotein when there is an

increase in free fatty acid influx to liver. Hypertriglyceridemia is an excellent marker of insulin resistant condition. The other major lipoprotein disturbance in metabolic syndrome is reduction in HDL cholesterol.⁽³⁾

Various studies found that there is a correlation between the metabolic syndrome and thyroid function, which ultimately leads to cardiovascular diseases, leading to increased morbidity and mortality.^(4,5)

Thyroid disorders are one of the most prevalent endocrine diseases in the world. Metabolic syndrome is associated mainly with the thyroid dysfunction which impact on glucose, lipid metabolism and cardiac dysfunction.⁽⁶⁾

Metabolic syndrome and thyroid dysfunction are distinguished by common abnormalities like hypertension, hyperglycaemia, reduced HDL cholesterol, elevated Triglycerides and abdominal obesity. Insulin resistance identified as a basic mechanism for metabolic syndrome.^(7,8)

Thyroid hormone has a major role in regulation of lipid synthesis and metabolism. Thus Hypothyroidism is commonly associated with lipid irregularities like low HDL and high triglycerides, glucose intolerance, weight gain and hypertension. Thus

hypothyroidism is a mimicker of metabolic syndrome parameters.^(9,10,11)

AIM & OBJECTIVES

AIMS

- To study thyroid dysfunction in metabolic syndrome

OBJECTIVES

- To study the pattern of thyroid dysfunction increases of metabolic syndrome
- To evaluate the association of thyroid dysfunction with the components of metabolic syndrome

MATERIALS AND METHODS

Type of the study: Cross sectional Observational study

Place of study: Study was conducted at outpatient department and wards of Dr DY Patil Medical College and hospital, DY Patil Vidyapeeth, Pimpri, Pune.

Study setting: Outpatient department wards of tertiary care hospital. Registration of patients was from August 2019. They were registered when admitted under Medicine department.

The main objective of this study was to study the pattern of thyroid dysfunction in cases of metabolic syndrome and to evaluate the association of thyroid dysfunction with the components of metabolic syndrome. At the time of registration the baseline information was

taken especially with respect to sociodemographic factors, clinical findings, and other investigations. Thus each & every patient was followed up in Medicine department till discharge. The data thus collected was analyzed to study thyroid dysfunction in metabolic syndrome.

Period of study: AUGUST 2019 – SEPTEMBER 2021

Sample size: 100 cases

Study participant: patients having metabolic syndrome and having inclusion criteria.

Inclusion Criteria

- Age > 12 years
- All patients fulfilling NCEPATPIII Criteria of metabolic syndrome 3 or more of the following:

In Central obesity the waist circumference in males more than 102 cm and in females more than 88 cm.

Hypertriglyceridemia:

Triglycerides > 150 mg/dl or specific medications

Low LDL: < 40 mg/dl and < 50 mg/dl for males and females respectively. Or specific medications.

Hypertension: BP > 130 mmHg systolic and > 85 mm Hg diastolic or specific medications.

Fasting blood sugar > 100 mg/dl /

previously diagnosed type 2 diabetes mellitus or specific medications or previously diagnosed Type 2 Diabetes Mellitus.

Exclusion criteria

- Known hypothyroid or hyperthyroid patients on treatment.
- Pregnancy
- Patients with Chronic liver disease, renal dysfunctions, Patients on Oral Contraceptive Pills, Corticosteroids and drugs which alter thyroid functions.
- Patients with history of bariatric surgery

Sampling technique: Patients attending and getting admitted under Medicine department with metabolic syndrome.

Data collection

Each patient was assessed as under **proforma B**. Written informed consent was taken from the participants. Patients coming to Medicine department and having inclusion criteria were included in the study. Pre designed questionnaire schedule consisting of standard questions related to socio demographic factors, addiction, clinical profile etc. were interviewed. In addition, questionnaire also included questions on past and present medical history

and health seeking behaviour.

Following main domains were covered in questionnaire:

- Age
- Sex
- General examination
 - Height weight BMI waist circumference
 - Hemogram
 - Liver function tests
 - Renal function tests
 - Thyroid function test-Free T3, Free T4 and TSH
 - Fasting lipid profile
 - Fasting blood sugar, Postprandial blood sugar/HbA1c
 - USG Abdomen and Pelvis, USG Neck

- 2D echo
- Anti Thyroid peroxidase Antibodies

Data analysis

All statistical analyses were performed by using IBM SPSS statistics Version 21.0 (SPSSInc., Chicago, IL, USA) and openepi version 2.3.1. For qualitative data proportion andpercentage were used and for quantitative data mean and SD was calculated. Chi squaretest was applied for qualitative data and student t test for quantitative type of data. A p value of<0.05 was regarded as statistically significant.

OBSERVATIONS AND RESULTS

A total of 100 patients were studied under medicine department

Table 1: Age and gender distribution among study participants

Agein years	Male	Female	Total
≤35	3	5	8
36 to 45	10	12	22
46 to 55	21	29	50
56 to 65	6	8	14
>65	2	4	6
Total	42	58	100

Mean age in years was 49.27±8.99 years. Applying chi square test, p value is 0.98, as p value is >0.05, shows nostatistical significance

Table 2: No. of criteria positive for MS in subjects

Criteria for metabolic syndrome	Frequency	Percentage
3parameters	48	48%
4parameters	30	30%
5parameters	22	22%
Total	100	100%

Table 3: General examination

Parameters	Mean	SD
Age	49.27	8.99
Height	156.5	0.04
Weight	79.4	12.2
WC	102.44	10.68
SBP	129.2	8.36
DBP	88.88	10.46
FBS	160.7	54.96
TC	131.84	21.2
HDL	52	20.65
TG	146.53	42.25

Table 4: Distribution of thyroid parameters

Parameter	Total	TSH		FreeT3		FreeT4	
		Mean	SD	Mean	SD	Mean	SD
Euthyroid	78	2.8	1.44	3.7	1.01	1.17	0.58
Hypothyroid	4	5.6	1.36	0.91	1.06	0.5	0.57
Subclinical hypothyroid	15	4.7	1.43	1.5	1.09	1.2	0.5
Subclinical hyperthyroid	2	0.41	1.47	5.7	1.1	2.1	0.3
Hyperthyroidism	1	0.39	0.0	7	0	2.5	0

Table 5: Thyroid status of the study population

Parameter	Male	Female	Total
Euthyroid	35	43	78
Hypothyroid	1	3	4
Subclinical hypothyroid	5	10	15
Subclinical hyperthyroid	1	1	2
Hyperthyroidism	0	1	1
Total	42	58	100

Applying chi square test, p value is 0.73, as p values>0.05, shows no statistical significance

Table 6: Metabolic Syndrome Parameters Wise Thyroid Dysfunction

Criteria for metabolic syndrome	Euthyroid	Hypothyroid	Subclinical hypothyroid	Subclinical hyperthyroid	Hyperthyroidism	Total
3parameters	44	1	1	1	1	48
4parameters	24	2	3	1	0	30
5parameters	10	1	11	0	0	22
Total	78	4	15	2	1	100

Applying chi square test, p value is<0.0001, as p value is<0.05, shows statistical significance

DISCUSSION

Age and gender distribution

Mean age in years was 49.27 ± 8.99 years. Majority 50% were in the age group of 46 to 55 years, 22% in 36 to 45 years, 14% in 56 to 65 years, 8% less than 35 years and 6% more than 65years. Majority were females 58% and 42% were

males. Applying chi square test, p value is 0.98, as p value is >0.05, shows no statistical significance. Similar results were seen in study by KhatiwadaSetal⁽²⁾ showed that females were commonly affected. No statistical significance was seen (p=0.06). The study also showed that the mean age was 47±12.5 years. Study by Vaishali D⁽³⁾

et al showed that most patients were in the >45 years of age group (men: 63%; women: 59%). Chakradhar M *et al*⁽¹²⁾ did a cross-sectional study among 134 patients with metabolic syndrome, 39 were male (29.2%) and 95 were female (70.8%) and mean age was 54.63± 10.9 years

Number of Criteria positive for metabolic syndrome

Number of Criteria positive for metabolic syndrome among study subjects, majority 48% had 3 parameters, 30% had 4 parameters and 22% had 5 parameters positive.

On general examination

On general examination, mean age was 49.27±8.99, height was 156.5±0.04, weight was 79.4±12.2, waist circumference was 102.44±10.68, systolic blood pressure was 129.2±8.36, diastolic blood pressure was 88.88±10.46, fasting blood sugar 160.7±54.96, total cholesterol was 131.84±21.2, HDL was 52±20.65, triglyceride was 146.53±42.25.

Similar results were seen in study by Khatiwada Setal⁽²⁾ in which mean weight, height, SBP, DBP and BMI were 70.7±7.9kg, 157.4±8cm, 129.3±13.6mmHg, 84.9±11.5mm

Hg and 28.6±3.3Kg/m² respectively. The mean waist circumference is 102.5±6.7cm. HDL fasting blood glucose, TG, were 49.9±15.3mg/dL 126.2±50.4mg/dL, 198.2

±90.8mg/dL, respectively.

Thyroid status of the study population

Majority 78% had euthyroid status, 15% had subclinical hypothyroid, 4% were hypothyroid, 2% had subclinical hyperthyroid, and 1% had hyperthyroidism. Mean TSH for euthyroid was 2.8, hypothyroid was 5.6, subclinical hypothyroid was 4.7, subclinical hyperthyroid was 0.41 and hyperthyroidism was 0.39. mean free T3 for euthyroid was 3.7, hypothyroid was 0.91, subclinical hypothyroid was 1.5, subclinical hyperthyroid was 5.7 and hyperthyroidism was 7 and free T4 for euthyroid was 1.17, hypothyroid was 0.5, subclinical hypothyroid was 1.2, subclinical hyperthyroid was 2.1 and hyperthyroidism was 2.5. Study by Khatiwada S *et al*⁽²⁾ showed that Subclinical hypothyroidism (26.6%) was the major thyroid dysfunction followed by over hypothyroidism (3.5%) and subclinical hyperthyroidism (1.7%). Lalit K Meher *et al*⁽⁴⁾ studied 100 patients, it was observed that 22% had subclinical hypothyroidism, 4% had over hypothyroidism, 74% were euthyroid in the study group as compared to 45, 2 and 90% in the control respectively. In a study from Nepal, done by Chandra L *et al*⁽¹¹⁾ showed that 32% had metabolic syndrome and among them majority were euthyroid followed by hyperthyroid and least were

hypothyroid. The prevalence of thyroid dysfunction in the study by Chakradhar M *et al*⁽¹²⁾ was 28.4%.

Age Wise and gender wise Thyroid Dysfunction

No statistical significance was seen between age and thyroid status (P=0.98).

No statistical significance was seen between gender and thyroid status (P=0.73).

Metabolic Syndrome Parameters Wise Thyroid Dysfunction

High statistical significance was seen between metabolic syndrome and thyroid dysfunction (P<0.0001).

CONCLUSION

Thyroid hormones play a crucial role in maintaining glucose and lipids balance and metabolism, consequently affecting the Metabolic syndrome parameters, which includes HDL-C, TG, blood pressure, and blood sugar levels.

Thus thyroid dysfunction is found to be associated with obesity, dyslipidaemia, and high risk of atherogenic CVD

Thyroid dysfunction is most commonly seen in Females than males. In our study nearly one fourth of the study population had thyroid dysfunction.

Thyroid dysfunction especially subclinical hypothyroidism is most commonly seen in metabolic syndrome patients, and thyroid dysfunction is strongly associated with

parameters of metabolic syndrome which has been proved in our study

Cardiovascular risk is seen more in patients who had both thyroid dysfunction and metabolic syndrome together.

So thyroid functions should be taken into account while treating a patient with metabolic syndrome which will help in early diagnosis of thyroid dysfunction and thus decrease the incidence of atherosclerotic cardiovascular disease risk.

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Conflict of Interest

The authors declare that they have no conflict of Interest

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