

# Study Of Hypothyroidism In Metabolic Syndrome

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## Abstract

**Introduction:** Metabolic syndrome (MetS) is a combination of risk factors that could raise the risk of cardiovascular disease, diabetes and death. Several studies have demonstrated a correlation between thyroid function and MetS indices. The present study was designed to study hypothyroidism in metabolic syndrome.

**Aims and objectives:** To study co-relation of hypothyroidism with central obesity, triglyceride level, hypertension, fasting blood sugar.

**Materials and methods:** This cross-Sectional study was conducted in the Department of General Medicine, Santosh medical college and hospital, Ghaziabad, Uttar Pradesh. In a semi-structured fashion, weight and waist circumference were noted. The fasting blood sugar was done by the enzymatic calorimetric method using semi auto analyzer. The high-density lipoprotein cholesterol and triglycerides were done enzymatically on fully automated clinical chemistry analyzer. The thyroid hormone assay was done by ChemiluminescenceImmuno Assay.

**Results:** The prevalence of hypothyroidism was higher among increased high risk central obesity (50%) than high risk (27.5%) and low risk (7.3%). The prevalence of hypothyroidism was higher among hypertensive patients (31%) than non-hypertensive (13.8%). Five MS criteria was fulfilled among 40% patients. The prevalence of hypothyroidism was higher among whom MS criteria was five (32.5%) than three (17.1%) and four (8%). There was significant ( $p=0.04$ ) association of prevalence of hypothyroidism with central obesity, MS criteria fulfilled, and hypertension.

**Conclusion:** We found a significant association of prevalence of hypothyroidism with central obesity, hypertension, and MS criteria fulfilled.

**Keywords :** Hypothyroidism, central obesity, triglyceride level, hypertension, fasting blood sugar, metabolic syndrome.

## Introduction:

Metabolic syndrome (MetS) is a combination of risk factors that could raise the risk of cardiovascular disease, diabetes and death, such as hypertension, atherogenicdyslipidemia, hyperglycemia, truncal obesity, and even prothrombotic and proinflammatory disorders. MetS is

most commonly related to obesity and consists of distinct metabolic risk factors associated with a higher risk of heart disease, type 2 diabetes and mortality.

The IDF (International Diabetes Federation) and the National Cholesterol Education Program (NCEP)-Adult Care Panel III (ATPIII; NCEP-ATPIII) propose the two requirements.<sup>1</sup> The four features present in both criteria are also usually reported in other defining criteria, irrespective of the adopted standard recommendations. Those four major components of MetS consist of different physiological characteristics: (a) body adiposity, especially central adiposity measured by waist circumference; (b) serum glucose levels that reflect diabetes diagnosis or the risk for its development; (c) lipid abnormalities related to metabolic risk [high serum triglycerides or low high-density lipoprotein cholesterol (HDL-c)]; and (d) increased blood pressure levels.

It was observed that some studies applied a predefined criterion to establish the presence or absence of MetS and its associations with thyroid function, but the majority just evaluated the presence of one or more specific features related to MetS and not necessarily its diagnosis.<sup>2-4</sup>

THs, and also some of their metabolites, regulate metabolic rate, leading to variations in weight gain and adiposity.

Thyroid function influences the metabolism of lipoproteins as well as certain risk factors for cardiovascular disease (CVD), thereby affecting the overall risk of CVD.

Several studies have demonstrated a correlation between thyroid function and MetS indices.<sup>2,5</sup> The present study was designed to study hypothyroidism in metabolic syndrome.

## Materials and methods:

This cross-sectional study was conducted in the Department of General Medicine, Santosh Medical College and Hospital, Ghaziabad, Uttar Pradesh. The patients attending the OPD of Medicine Department, Santosh Medical College & Hospital were the participants of the study.

A total of 100 subjects of old and newly diagnosed metabolic syndrome on the basis of IDF criteria for central adiposity for the diagnosis of metabolic syndrome, according to the guidelines and waist circumference: waist circumference >90cm (M), >80cm (F) in the South Asian individuals were included in the study.

Those with history of acute myocardial infarction or cerebral vascular accidents, pregnancy, renal disease, liver disease, old cases of hypothyroid, history of thyroidectomy, patients receiving steroids, patients receiving lipid lowering agents and patients receiving contraceptives were excluded from the study.

Newly diagnosed hypothyroid patients according to selection criteria were selected. Patients who have serum TSH level >5.0mU/L and normal FT4 level (9.5-25 pmol/l) were taken as subclinical hypothyroidism. TSH >10.0mU/L and FT4 <9.5pmol/L were taken as overt hypothyroidism. TSH level 0.5-5.0mU/L and FT4 level 9.5-25.0pmol/L were taken as euthyroid group.

The ethical approval was taken from the Ethical Committee of the Institute and consent was taken from each participant before including in the study.

Detailed drug history and anthropometric measurements have been taken, such as subject height. In a semi-structured fashion, weight and waist circumference were noted. In a sitting position, blood pressure was measured in the right upper limb. After eight hours of fasting, blood is drawn in a single sitting for fasting blood sugar levels, lipid profile testing and thyroid assay.

The fasting blood sugar was done by the enzymatic calorimetric method using semi auto analyzer. The thyroid hormone assay (TSH, T3 and T4) were done by Chemiluminescence Immuno Assay (CLIA) using AD VIA Centaur equipment.

## Results and observations:

The present study was conducted in the Department of General Medicine, Santosh medical college and hospital, Ghaziabad, Uttar Pradesh with the objective to study hypothyroidism in metabolic syndrome. A total of 100 patients were included in the study.

Hypothyroid was in 7%, and subclinical hypothyroidism was in 14% patients. (Table 1). The prevalence of hypothyroidism was 21%. More than one third of patients were between 41-50 years of age (44%) followed by 30-40 (30%) and >50 (26%) years. The prevalence of hypothyroidism was higher among patients of age >50 years (26.9%) than 41-50 (20.5%) and 30-40 (16.7%) years (not significant).

More than half of patients were females (56%). The prevalence of hypothyroidism was higher among female patients (25%) than males (15.9%) (not significant).

High risk of central obesity was among about half of patients (51%). The prevalence of hypothyroidism was higher among increased high risk central obesity (50%) than high risk (27.5%) and low risk (7.3%). There was significant ( $p=0.007$ ) association of prevalence of hypothyroidism with central obesity. (Table and Figure 2)

Hypertension was present among 42% patients. The prevalence of hypothyroidism was higher among hypertensive patients (31%) than non-hypertensive (13.8%). There was significant ( $p=0.03$ ) association of prevalence of hypothyroidism with hypertension. (Table and Figure 3)

FBS was abnormal among 21.4% patients. The prevalence of hypothyroidism was higher among whom FBS was abnormal (21.4%) than normal (20%) (not significant).

Total cholesterol was abnormal among 38% patients. The prevalence of hypothyroidism was higher among whom total cholesterol was abnormal (26.3%) than normal (17.7%) (not significant).

TG was abnormal among 37% patients. The prevalence of hypothyroidism was higher among whom TG was abnormal (21.6%) than normal (20.6%) (not significant).

Five MS criteria was fulfilled among 40% patients. The prevalence of hypothyroidism was higher among whom MS criteria was five (32.5%) than three (17.1%) and four (8%). There was significant ( $p=0.04$ ) association of prevalence of hypothyroidism with MS criteria fulfilled (Table 4 and Figure 4). T4 and TSH were significantly ( $p=0.0001$ ) higher among hypothyroidism patients than normal patients. (Table 5 and Figure 5)

There was no significant ( $p>0.05$ ) difference in blood pressure between hypothyroidism patients than normal and correlation of T4 and TSH with metabolic syndrome parameters.

## Discussion:

A number of studies have confirmed that associations of thyroid activity in the general population with metabolic parameters. Most of the studies conducted to date were population-based, cross-sectional studies that performed TSH and thyroid hormone levels association analyses with individual metabolic parameters.<sup>6-8</sup>

A research conducted in Taiwan investigated the components of serum TSH and metabolic syndrome and concluded that even a small rise in serum TSH levels may also be a metabolic syndrome risk factor, as in subclinical hypothyroidism.<sup>9</sup>

In hypothyroidism patients, metabolic syndrome is increased and hypothyroidism is recommended to be considered in newly diagnosed patients with metabolic syndrome.<sup>6</sup> In line with the studies alluded to above, this study found that hypothyroidism poses an increased risk of metabolic syndrome.

In this study, 7 percent of the patients were hypothyroid. 14% of the patients had subclinical hypothyroidism. Other studies that have been carried out have similar findings in which the predominance of subclinical hypothyroidism (14.6% to 53%) was reported, followed by overt hypothyroidism (3.5% to 7.4 %).<sup>10-12</sup>In the study by Choudhary and Jani (2016), the overall prevalence of thyroid dysfunction in patients with MetS was 41.5% with high prevalence of subclinical hypothyroidism (27%).<sup>13</sup>

The prevalence of hypothyroidism was 21 percent in the current study. This is in line with the findings of other trials. that have been conducted from India.<sup>14,15</sup> A total 28% of MetS patients were diagnosed with hypothyroidism in the study by Deshmukh et al (2018).<sup>16</sup>

In the present study, hypertension was present among 42% patients. The prevalence of hypothyroidism was higher among hypertensive patients (31%) than non-hypertensive (13.8%). There was significant ( $p=0.03$ ) association of prevalence of hypothyroidism with hypertension.

## Conclusion:

We found a significant association of prevalence of hypothyroidism with central obesity, hypertension, and MS criteria fulfilled. Overall, the results from the current study would help to ascertain a correlation between thyroid dysfunction and metabolic syndrome in patients of Indian descent. This early diagnosis of Thyroid Dysfunction in Metabolic Syndrome will help to alter the trajectory of the disorder through early lifestyle adjustment measures.

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## List of tables and figures:

**Table-1: Distribution of thyroid dysfunction**

Thyroid dysfunction	No. (n=100)	%
Euthyroid	79	79.0
Hypothyroid	7	7.0
Subclinical hypothyroidism	14	14.0

**Table-2: Distribution of patients according to central obesity and its association with hypothyroidism**

Central obesity	No.(n=100)		Hypothyroidism		Normal		p-value <sup>1</sup>
	No.	%	No.	%	No.	%	
Low risk	41	41.0	3	7.3	38	92.7	0.007*
High risk	51	51.0	14	27.5	37	72.5	
Increased high risk	8	8.0	4	50.0	4	50.0	

<sup>1</sup>Chi-square test, \*Significant, Low: WC < 94 cm in men and < 80 cm in women, High: WC of 94–102 cm in men and 80–88 cm in women, Increased high: WC > 102 cm in men and > 88 cm in women (Ashwell et al., 2016)

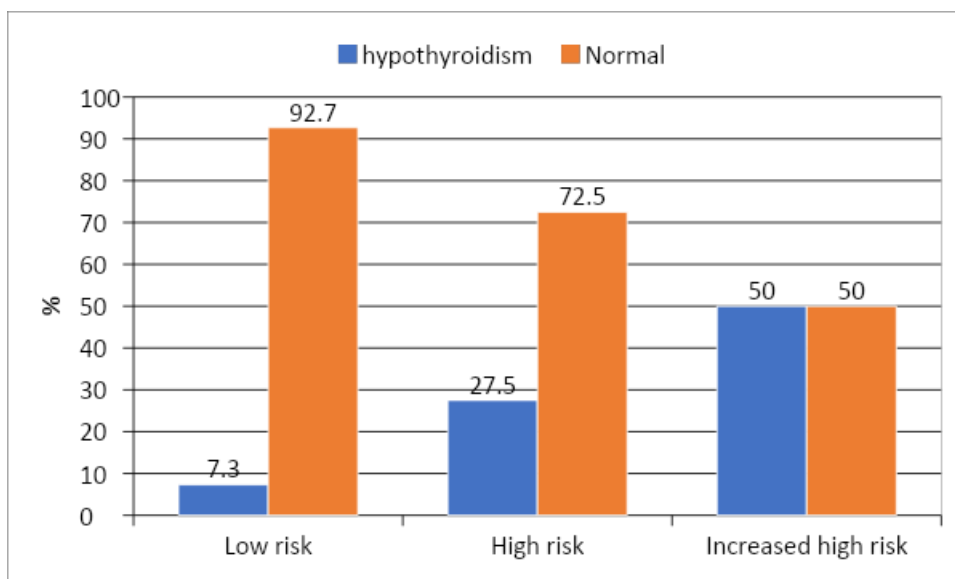


Fig. 2: Distribution of patients according to central obesity and its association with hypothyroidism

**Table-3: Distribution of patients according to hypertension and its association with hypothyroidism**

Hypertension	No.(n=100)		Hypothyroidism		Normal		p-value <sup>1</sup>
	No.	%	No.	%	No.	%	
Hypertensive	42	42.0	13	31.0	29	69.0	0.03*
Non-hypertensive	58	58.0	8	13.8	50	86.2	

<sup>1</sup>Chi-squaretest,\*Significant

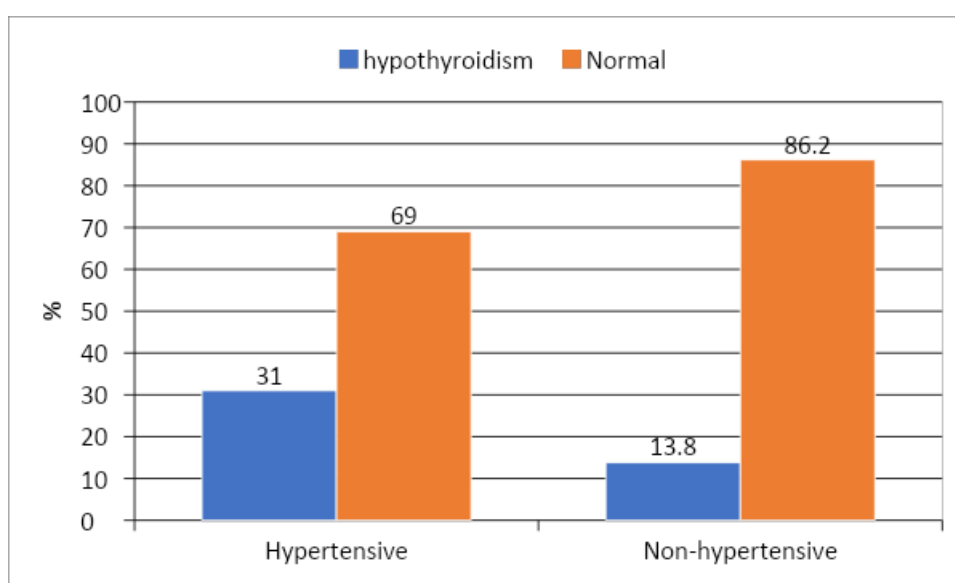


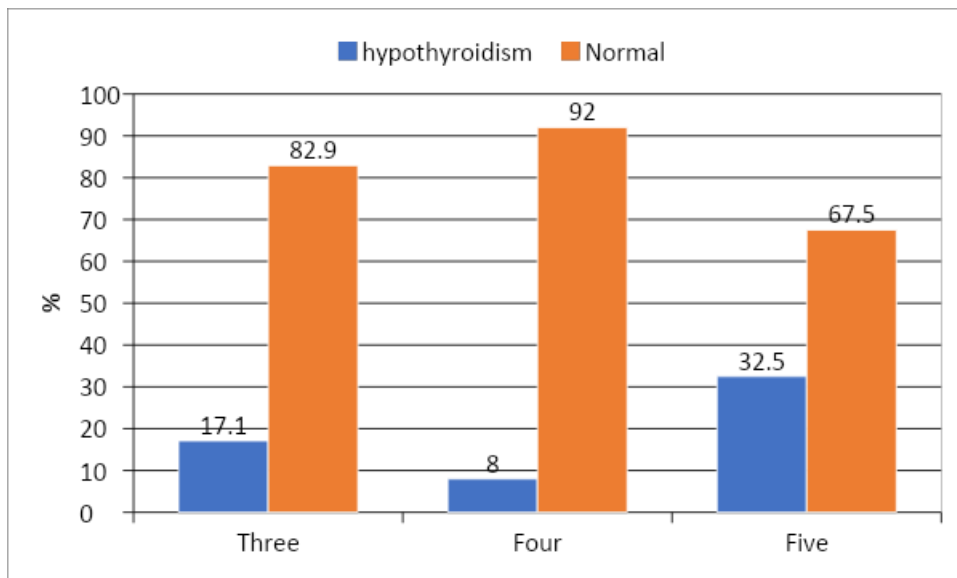
Fig. 3: Distribution of patients according to hypertension and its association with hypothyroidism

**Table-4: Distribution of patients according to no. of MS criteria fulfilled and its association with hypothyroidism**

No. of M Scriteria fulfilled	No.(n=100)		Hypothyroidism		Normal		p-value <sup>1</sup>
	No.	%	No.	%	No.	%	
Three	35	35.0	6	17.1	29	82.9	0.04*
Four	25	25.0	2	8.0	23	92.0	
Five	40	40.0	13	32.5	27	67.5	

<sup>1</sup>Chi-squaretest,\*Significant

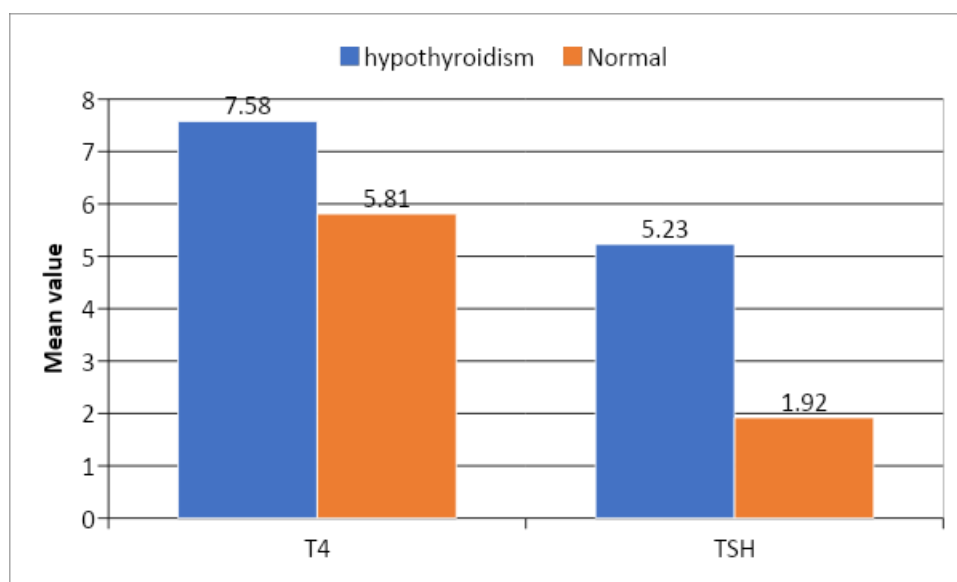
Fig. 4: Distribution of patients according to no. of MS criteria fulfilled and its association with hypothyroidism



**Table-5: Comparison of thyroid levels with hypothyroidism**

Thyroid levels	Hypothyroidism	Normal	p-value <sup>1</sup>
T4	7.58±0.87	5.81±1.67	0.0001*
TSH	5.23±2.23	1.92±1.40	0.0001*

<sup>1</sup>Unpaired t-test, \*Significant



**Fig.5: Comparison of thyroid levels with hypothyroidism**