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Original article

Study of thyroid dysfunction in metabolic syndrome and association with its components

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ABSTRACT

Background: Metabolic syndrome is a constellation of metabolic derangements such as obesity, insulin resistance, hyperinsulinemia, impaired glucose tolerance, dyslipidemia, hypertension, and a proinflammatory and prothrombotic state. Thyroid dysfunction is common among metabolic syndrome patients. This study investigates association of thyroid dysfunction with components of metabolic syndrome with an aim to establish link between both entities.

Objectives: To study the spectrum of thyroid dysfunction in patients with metabolic syndrome and to evaluate the association of thyroid dysfunction with components of metabolic syndrome.

Methodology: In this prospective case control study, thyroid profile was estimated in 100 metabolic syndrome patients as well as 100 age/sex matched control population attending OPD and various wards of New Hospital Medical College Kota, over a period of one year.

Results: In the 100 metabolic syndrome patients included in this study 37% had subclinical hypothyroidism (SCH), 12% had overt hypothyroidism and 2% had overt hyperthyroidism. In control group 8% had SCH and 4% had overt hypothyroidism. Thyroid dysfunction was significantly associated ($P=0.025$) with high waist circumference in patients with metabolic syndrome.

Conclusion: Thyroid dysfunction particularly subclinical hypothyroidism is a common endocrine abnormality associated with metabolic syndrome patients, more so in female population and elderly and is associated with one component of metabolic syndrome (waist circumference). Hence, thyroid function tests may be included as a routine investigation in all metabolic syndrome patients.

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1. Introduction

The concept of interrelated metabolic disturbances was first introduced years ago as a constellation of hypertension, hyperglycemia, and gout. In the year 1988 it was proposed that insulin resistance and its compensatory hyperinsulinemia predisposed individuals to hypertension, dyslipidemia (high plasma triglycerides level and low levels of high-density lipoproteins) and diabetes thus being the underlying cause of cardiovascular disease risk.¹ The worldwide prevalence of metabolic syndrome was found to be between 10% and 84% depending on the ethnicity, age, gender and race of the population² whereas the IDF estimates that one-quarter of the world's population has metabolic syndrome. In various studies in India about 25–35% adults have metabolic syndrome.^{3,4}

Thyroid hormone plays an important role on various aspects of metabolism, development and differentiation of the cells.⁵ Thyroid disease constitutes the most common endocrine abnormality in the recent years, diagnosed either in subclinical or clinical form in patients with metabolic syndrome.⁶ Thyroid dysfunction is defined as the alteration in serum TSH level with normal or altered thyroid hormones (T3, T4).

About 300 million people in the world are affected from thyroid dysfunction and over half are presumed to be unaware of their condition. It has been estimated that about 42 million of people in India suffer from thyroid disease.⁷ Thyroid function affects the parameters causing metabolic syndrome including low density lipoproteins, triglycerides, blood pressure and plasma glucose. The prevalence of thyroid dysfunction was reportedly more among women with metabolic syndrome.^{8,9} Metabolic syndrome and thyroid dysfunction are independent risk factors for cardiovascular disease risk and mortality associated with it, it is possible that patients suffering from both these disease may have a compounded risk.^{10,11}

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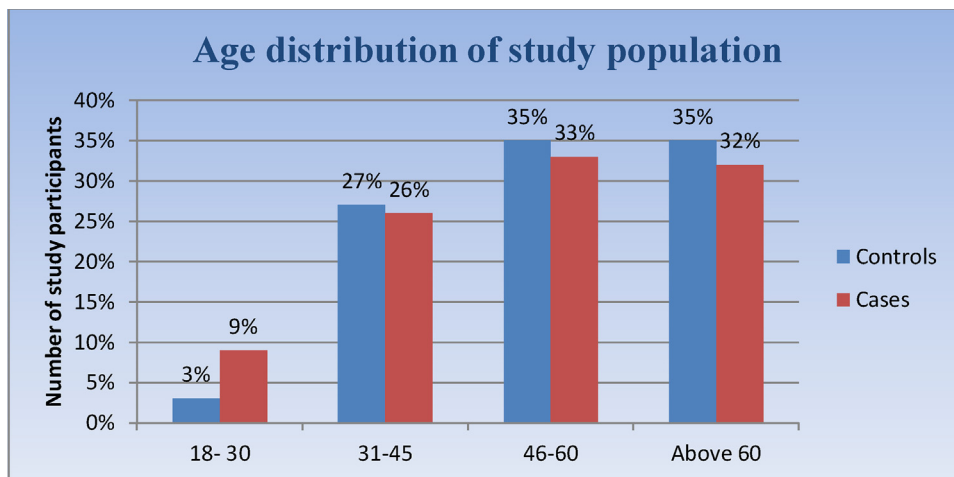


Fig. 1. Age composition of study subjects.

The present study was done to understand the overall prevalence of thyroid dysfunction in metabolic syndrome patients in Rajasthan with the objective of early correction of thyroid dysfunction, thus preventing complications of metabolic syndrome.

2. Methodology

This was a prospective case control study. 100 patients with metabolic syndrome as well as 100 age/sex matched controls attending the medical OPD or admitted in various wards of new hospital medical college, Kota were included in the study. Serum TSH and free t_4 levels were measured by electrochemiluminescence immunoassay using cobas auto-analyzer in all patients.

2.1. Inclusion criteria

Patients with metabolic syndrome are diagnosed based on the criteria by the joint statement committee [International Diabetes Federation (IDF) task force on Epidemiology and Prevention, National Heart, Lung and Blood Institute (NHLBI), the American Heart Association, the World Heart Federation, the International Atherosclerosis Society, and the International Association for the Study of Obesity]. The patients having at least three components of joint statement definition of metabolic syndrome are included in the study.

1. Waist circumference >90 cm for men and >80 cm for women.
2. Raised triglyceride level ≥ 150 mg/dl or any specific treatment.
3. HDL cholesterol levels <40 mg/dl in males, <50 mg/dl in females or any specific treatment.

4. Raised blood pressure $\geq 130/85$ mm of Hg or any medication.
5. Raised fasting glucose ≥ 100 mg/dl or previously diagnosed type 2 diabetes mellitus.

2.2. Exclusion criteria

1. Patients with known thyroid dysfunction.
2. Any medications that alter or modify thyroid profile like estrogen, corticosteroids, iodine containing drugs.
3. Severely ill patients.
4. Pregnant women.

2.3. Ethical aspects

The study was approved by the ethical committee of our institution. Written informed consent was obtained from all study subjects after explaining all the features of the study.

A detailed history including physical examination was done in all patients diagnosed of metabolic syndrome. Routine blood investigations were done including fasting levels of lipid profile, blood glucose and thyroid profile by standard laboratory techniques using single window approach. The patients with thyroid dysfunction are categorized according to the standard reference range.

3. Results

A prospective case-control study of 200 patients admitted and attending medical OPD from December 2015 to November 2016 was done. We included 100 cases and 100 controls. The mean age

Table 1
Metabolic syndrome components in male/female (study group).

Metabolic syndrome components	Male		Female		Total 100%	Mean SD
	No.	%	No.	%		
Waist circumference	37	52.11	34	47.88	71	92.04 \pm 13.21
Blood pressure	27	32.14	57	67.85	84	140.02 \pm 16.29 87.02 \pm 9.65
Fasting blood glucose	37	45.12	45	54.87	82	136.18 \pm 52.50
Triglycerides	32	45.71	38	54.28	70	199.38 \pm 106.12
HDL cholesterol	29	41.42	41	58.57	70	40.76 \pm 18.93

HDL – high density lipoproteins, SD – standard deviation.

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