Evaluation of Metabolic Syndrome parameters of patients with Hypothyroidism: A cross-sectional study from Central India

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Abstract

Introduction: Hypothyroidism and metabolic syndrome (MetS) are well-known precursors of atherosclerotic cardiovascular disease. MetS refers to a set of risk factors that include hypertension, hyperglycemia, dyslipidemia, prothrombotic and proinflammatory states, all of which contribute to the body's atherogenic process. **Aim**: The primary goal of this research is to determine the prevalence of metabolic syndrome in hypothyroidism patients using a clinicopathological approach **Methods**: 100 patients known to have hypothyroidism with different age groups from 20 years to 60 years old were included. Patients who came to the hospital as OPD/IPD patients had their medical histories recorded in detail and laboratory tests were performed. Laboratory examination data such as thyroid profile testing, glucose and cholesterol analysis, and history of hypothyroidism symptoms were also noted. **Result**: In this study, out of 97 patients, 32 were males, and 65 were females. The ratio of females to males was 1:2.03. The mean age was of the male was 51, and the female was 46 years old. Baseline characteristics of patients were shown in table no 1 and components of MetS in table 2 below. The mean TC, TG, LDL-C, and HDL-C levels in males were 193mg/dl, 153 mg/dl, 99 mg/dl, 34.5 mg/dl and females were 166 mg/dl, 140 mg/dl, 85 mg/dl and 43 mg/dl respectively as shown in table no 1 below. The mean waist circumference in males and females was 103 cm and 108 cm, respectively. Hyper-tension was found in 9 (28.13%) males and 29 (46.77%) females, with an overall prevalence of 40%. Diabetes Mellitus was found in 7 (21.87%) males, and 28 (43.08) females, with an overall prevalence of 35.79 % MetS with three or more components were found in 17 (53.13%) males and 63 (96.92%) females, with an overall prevalence of 84.21%. **Conclusion:** This research discovered a link between subclinical hypothyroidism and MetS. In this study, the overall prevalence rate of MetS was somewhat greater than rates reported in the general population in several studies and equivalent to hypothyroid patient studies. The most frequent thyroid malfunction in Indian MetS patients was hypothyroidism.

Keywords: Metabolic syndrome; Hypothyroidism;

Introduction

Hypothyroidism and Metabolic syndrome (MetS) are well-known precursors of atherogenic cardiovascular disease [1]. MetS refers to a set of risk factors that include hypertension, hyperglycemia, neurologic, dyslipidemia, prothrombotic, and proinflammatory diseases, all of which speed up the atherogenic process in the body [2,3].Thyroid problems are the most prevalent endocrine diseases, with an overall incidence of hypothyroidism of roughly 11% in the general population [4]. Hyperlipidemia, diastolic hypertension, cardiovascular disease and endothelial dysfunction are all symptoms of hypothyroidism. Hypothyroidism has also been linked to an increased risk of cardiovascular disease, for which several ideas have been proposed [5,6]. The causal relationship with metabolic syndrome is one of the offered theories (MetS). The Adult Treatment Panel III study (ATP III) of the National Cholesterol Education Program highlighted the MetS as a

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multifaceted risk factor for cardiovascular disease that warranted further therapeutic attention. The total prevalence of MetS in the Indian population is around 31.6%, with 39.9% of women and 22.9% of men [7,8]. In India, incidence rates vary widely based on MetS, population, age, ethnicity, and other factors; socioeconomic changes to greater mechanization, wealth, urbanization, and urban migration have rapidly increased its prevalence [9]. Hyperglycemia, hypertension, reduced HDL-C, and elevated triglycerides (TG) are typical departures from MetS and TD's norm. In addition, IR, which has been identified as a critical component in MetS, also plays a role in hypothyroidism [10-12]. A diminished basal plasma affront marks hypothyroidism and subclinical hypothyroidism (SH), and replacement therapy may improve insulin sensitivity. The prevalence of metabolic diseases has increased dramatically as a result of rapid industrialization and urbanization [13]. According to the NCEP (National Cholesterol Education Program), 41% of Asian Indians suffer from metabolic disease. One fact is that doctors routinely correlate elevated TSH readings with normal thyroid hormone levels in obese persons to diagnose Subclinical hypothyroidism and recommend thyroxine replacement therapy to restore euthyroid status [14].

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Aims & Objectives: The primary goal of this research is to determine the prevalence of metabolic syndrome in hypothyroidism patients using a clinicopathological approach.

Material and Methodology

Study location: During a one-year period, this study was done at the Department of General Medicine and Biochemistry of a Medical College in Central India.

Inclusion criteria: The participants in this research ranged from 20 years to 60 years old and had been diagnosed with hypothyroidism. Adults who had previously been diagnosed with hypothyroidism and were willing to participate in the trial were eligible.

Methodology: Patients who came to the hospital as OPD/IPD patients had their medical histories recorded in detail, and laboratory tests were performed. Laboratory examination data such as thyroid profile testing, glucose and cholesterol analysis, and history of hypothyroidism symptoms were also noted. A history of hypothyroidism, administration modes, and comorbidities such as diabetes mellitus and hypertension were collected from the patients who satisfied the inclusion criteria. Fasting blood glucose and lipid parameters (total cholesterol [TC],

high-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol [LDL-C], and triglycerides [TG]) were measured in the laboratory. The ATP III criteria were used to determine the MetS' proximity. waist circumference ≥102 cm in males and 88 cm in women; serum TG level 150 mg/dl; HDL-C 40 mg/dl in men and 50 mg/dl in women; blood pressure 130/85 mmHg (or already diagnosed hypertension on antihypertensive therapy); and fasting serum glucose 110 mg/dl (or already analyzed diabetic on antidiabetic treatment).

Result

In this study, out of 97 patients, 32 were males, and 65 were females. The ratio of females to males was 1:2.03. The mean age was of male is 51 and female was 46 years old. Baseline characteristics of patients were shown in table no 1 and components of MetS in table 2 below. The mean TC, TG, LDL-C, and HDL-C levels in males were 193 mg/dl, 153 mg/dl, 99 mg/dl, 34.5 mg/dl and females were 166 mg/dl, 140 mg/dl, 85 mg/dl and 43 mg/dl respectively as shown in table no 1 below. The mean waist circumference in males and females was 103 cm and 108 cm, respectively.

Table 1: Baseline characteristics of patients

Parameters	Male (32)		Female (65)		
	Mean ± SD	Range	Mean ± SD	Range	P value
Age (years)	51.13±11.42	28-69	46.42±9.09	22-68	0.03*
BMI (kg/m2)	27.93±5.38	18-41	27.17±4.15	19-39	0.45
WC (cm)	103.16±10.46	86-128	108.34±10.25	82-138	0.03*
TC (mg/dl)	193.13±50.47	107-312	204.86±44.29	103-336	0.24
LDL (mg/dl)	99.03±32.14	70-203	91.09±42.53	59-225	0.35
HDL (mg/dl)	31.87±8.92	15-49	37.52±10.32	20-68	0.009**
TG (mg/dl)	152.97±83.17	53-356	157.42±62	62-363	0.76
Duration of hypothyroidism (years)	12.13±8.41	2-40	11.80±8.4	2-40	0.86

BMI: Body mass index, WC: Waist circumference, TC: Total cholesterol, LDL: Low-density lipoprotein, HDL: High-density lipoprotein, TGs: Triglycerides, SD: Standard deviation,
*Significant, **Very significant

Table 2: Pattern of Components of Metabolic syndrome

Components	Male (n=32)	Female (n=65)
Diabetes mellitus	7 (21.87)	28 (43.08)
Hypertension	9 (28.13)	29 (46.77)
TG (≥150 mg/dl)	18 (56.25)	58 (93.5)
HDL (<40 mg/dl in men, <50 mg/dl in female)	16 (50)	62 (95.38)
WC (>102 cm in men, >88 cm in female)	18 (56.25)	63 (96.92)
Three or more components simultaneously (metabolic syndrome)	17 (53.13)	63 (96.92)

HDL: High-density lipoprotein, TGs: Triglycerides, WC: Waist circumference

Hyper-tension was found in 9 (28.13%) males and 29 (46.77%) females, with an overall prevalence of 40%. Diabetes mellitus was found in 7 (21.87%) males and 28 (43.08%) females, with an overall prevalence of 35.79 % MetS with three or more components were found in 17 (53.13%) males and 63 (96.92%) females, with an overall prevalence of 84.21%.

Discussion

Hypothyroidism is frequently linked to an increased risk of cardiovascular disease, although the factors that raise this risk are yet unknown. The MetS is one of the components that has been hypothesized as being perhaps responsible for it. As a result, one of our main goals was to determine the prevalence of MetS in hypothyroid individuals. According to Gupta et al. [6] the MetS prevalence in the Indian population is around 31.6 %. Individual components of the MetS that predominate in men and women were determined as follows: HDL cholesterol (men 40 mg/dl, women 50 mg/dl) 54.9 percent and 90.2%; TGs (150 mg/dl) 32.3% and 28.6%; and impaired fasting glucose or diabetes 16.9 % and 16.1%.In both men and women, hypertension,

hypercholesterolemia, and LDL-C were more prevalent inside the MetS. Another study by Chow et al. [15] found that in Southern India, the prevalence of MetS was 26.9% in males and 18.4% in females. Deepa et al. [16] found an 18.3% prevalence of MetS in their investigation. Shantha et al. [17] found that in the MetS group, the prevalence of overt hypothyroidism was 7.4%, and that of subclinical hypothyroidism was 21.9%. Uzunzulu et al. [18] found a link between subclinical hypothyroidism and MetS, which is consistent with our findings. As previously stated, the prevalence of MetS and its component was much greater in our sample of hypothyroid patients than in the general population.

Although there is little published data on the prevalence of MetS in hypothyroid patients, a report from Nigeria [19, 20] revealed that the prevalence of MetS in hypothyroid individuals is as high as 40%. Hypercholesterolemia is a common lipid abnormality, and hypothyroidism is associated with higher LDL-C values. In severe hypothyroidism, HDL-C levels may be normal or even raised, however in this research, mean TG and TC levels were high, mean HDL-C was low, and mean LDL was within normal ranges. This

study's hypertension findings were comparable to Saito et al. [21], who found a considerably greater prevalence of hypertension in hypothyroid individuals than in euthyroid participants. Hypertension was shown to be prevalent (40%) in hypothyroid individuals in this study.Changes in circulating catecholamines, their receptors, and anomalies in the renin-angiotensin-aldosterone system are among the putative pathophysiological mechanisms responsible for this. Another Korean study by Gyawali et al. [22] found a link between aberrant thyroid function and specific MetS components such as blood pressure, triglycerides, HDL-C, and fasting glucose, suggesting that higher TSH levels may predict MetS in the population and cohort. WC was elevated in this investigation, which revealed that the most prevalent component of MetS was comparable to Cameron AJ et al [23].

Conclusion

Our research discovered a link between subclinical hypothyroidism and MetS. In this study, the overall prevalence rate of MetS was somewhat greater than rates reported in the general population in several studies and equivalent to hypothyroid patient studies. The most prevalent TD among Indian MetS patients was hypothyroidism. It's a good idea to check thyroid function in all MetS patients because, unless hypothyroidism is restricted, many patients with thyroid dysfunction will be mislabeled as MetS, affecting the effect administration's impact cases.

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