

Study of Metabolic Syndrome Prevalence in Patients with Hypothyroidism at JLNMCH, Bhagalpur, Bihar

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Abstract

Background: Atherogenic cardiovascular disease has a well-known antecedent in hypothyroidism and metabolic syndrome (MetS). MetS refers to a set of risk factors that accelerate the body's atherogenic process by causing hypertension, hyperglycemia, dyslipidemia, prothrombotic, and proinflammatory states. Hyperlipidemia, diastolic hypertension, endothelial dysfunction, and cardiovascular disease are all brought on by hypothyroidism. Many explanations have been put out as to why hypothyroidism is also linked to higher cardiovascular morbidity. Finding the prevalence of the metabolic syndrome in people with hypothyroidism is the primary goal of this investigation.

Methods: 100 patients known to have hypothyroidism, ranging in age from 20 to 60, were included in this study. All patients who came to the hospital were asked to provide a thorough history of both indoor and outdoor patients, and laboratory testing was also completed. The history of any hypothyroidism symptoms was noted, and laboratory test findings such as thyroid profile tests, glucose analysis, and cholesterol analysis were also noted.

Result: Out of a total of 100 patients in this study, 32 were men and 68 were women. Male to female ratio was 2.125:1. 42.7 years old was the average age. Males had mean TC, TG, LDL, and HDL cholesterol levels of 179 mg/dL, 142 mg/dL, 92 mg/dL, and 34.5 mg/dL, respectively, whereas females had mean levels of 166 mg/dL, 140 mg/dL, 85 mg/dL, and 43 mg/dL. Male and female mean WC were 110.5 and 105.2, respectively. 60 (88.2%) females and 17 (53.1%) males had elevated TG (>150 mg/dL). 14 (43.8%) men and 62 (91.2%) women had low HDL C (≤ 40 mg/dL in men and ≤ 50 mg/dL in women). Higher WC was discovered in 66 females (97.1%) and 19 males (59.4%). With an incidence of 36% overall, hypertension was discovered in 6 (18.8%) males and 30 (44.1%) females. MetS, which has an overall frequency of 84%, was identified in 19 (59.4%) males and 65 (95.6%) females.

Conclusion: This study found a strong correlation between MetS and subclinical hypothyroidism. The total prevalence rate of the MetS in this study was comparable to studies of hypothyroid individuals and slightly higher than rates reported in the general population in various investigations. The most prevalent TD among MetS patients from India was hypothyroidism.

Keywords: Metabolic Syndrome, Hypothyroidism, TD, MetS.

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Introduction

Metabolic syndrome (MetS) and hypothyroidism are well-known precursors to atherogenic cardiovascular disease. Many risk factors known as MetS, such as hypertension, hyperglycemia, dyslipidemia, prothrombotic and proinflammatory states, accelerate the atherogenic process in the body [1,2]. The most prevalent endocrine illness is a thyroid disorder, with a frequency of hypothyroidism in the general population of roughly 10.95% [3]. Hyperlipidemia, diastolic hypertension, endothelial dysfunction, and cardiovascular disease are all brought on by hypothyroidism [3,4].

Many explanations have been put out to explain why hypothyroidism is also linked to higher cardiovascular morbidity [5]. One of the hypothesised relationships between the metabolic syndrome and other factors is causative (MetS). The National Cholesterol Education Program's Adult Treatment Panel III report (ATP III) recognised the MetS as a Major risk factor for cardiovascular disease that required more therapeutic attention.

Around 31.6% of Indians have MetS overall, with women having a prevalence of 39.9% and men having a prevalence of 22.9% [5]. Many factors, including MetS, population, age, ethnicity, etc., affect the prevalence rates. Due to socioeconomic shifts to escalating mechanisation, wealth, urbanisation, and urban migration [6], its frequency has been seen to rapidly rise in India. Thyroid problems are among the most common endocrine disorders in the world. Several studies conducted in India found that 42 million persons have thyroid diseases [4,7]. Beneficial variations in the thyroid organ may be connected to MetS and its associated symptoms including weight gain, insulin resistance (IR), abnormalities in the lipid and glucose digesting systems, elevated

blood pressure, and cardiovascular disease. MetS and TD are both characterised by a collection of typical deviations from the norm, including abdominal weight, hyperglycemia, hypertension, decreased HDL-C, and increased triglycerides (TG).

Furthermore, IR, regarded as a key factor in MetS, also contributes to hypothyroidism [5,8]. Unmistakably the basal plasma affront of hypothyroidism (Goodness) and subclinical hypothyroidism (SH) is weakened, and insulin sensitivity may improve with replacement therapy [9]. Rapid urbanisation and industrialisation have significantly increased the prevalence of metabolic disorders. According to the National Cholesterol Education Program (NCEP), 41.1% of Asian Indians had a metabolic disorder [10]. One thing is clear: Clinicians typically interpret elevated TSH readings with normal thyroid hormone levels in obese persons as evidence of subclinical hypothyroidism and recommend thyroxine replacement therapy to support the current euthyroid status. It has too been famous that the pointless utilise of thyroxine substitution can lead to its poisonous quality.

It has been hypothesised that metabolic disorder is associated with affront resistance because of the deformity in post-receptor flag transduction in target tissue, and a comparative instrument of thyroid receptor resistance may be at work in these hefty individuals [11]. The mechanism of typical levels of T3, T4, and increased TSH in metabolic disorder is unknown, however. Individuals with affront resistance may have an increased risk of cardiovascular disease when compared to related risk factors such hyperlipidemia and elevated blood pressure [12]. Finding the prevalence of the metabolic

syndrome in people with hypothyroidism is the primary goal of this investigation.

Material and Methods

From November 2021 to October 2022, this study was carried out in the department of medicine at Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar. 100 patients with hypothyroidism who ranged in age from 20 to 60 years old were involved in this study. A complete history of OPD and IPD patients was reported from every patient who attended the hospital, and laboratory testing was also carried out. Records were kept on the patient's medical history and the results of laboratory testing like thyroid profile tests, glucose analysis, and cholesterol analysis. Adult patients who were willing to engage in the trial and had previously been diagnosed with hypothyroidism were enrolled.

Patients who met the eligibility requirements were enrolled, and information regarding hypothyroidism history, administration methods, and the proximity of comorbidities like diabetes mellitus and hypertension were collected. Fasting blood glucose and fasting lipid parameters were among the evaluation parameters that were tested in the laboratory

(add up to cholesterol [TC], high-density lipoprotein cholesterol [HDL-C], low-density lipoprotein cholesterol [LDL-C], and triglycerides TG]). The ATP III criteria were used to determine the MetS's proximity. The proximity of three or more of any of the followings: WC \geq 102 cm in men and \geq 88 cm in ladies; serum TG level \geq 150 mg/dL; HDL C \leq 40 mg/dL in men and \leq 50 mg/dL in ladies; blood weight \geq 130/85 mmHg (or already analysed hypertensive on antihypertensive treatment); and fasting serum glucose \geq 110 mg/dL (or already analyzed diabetic on antidiabetic treatment).

Result

Out of a total of 100 patients in this study, 32 were men and 68 were women. Male to female ratio was 2.125:1.

42.7 years old was the average age. Baseline patient characteristics are presented in table no. 1, and elements of MetS are shown in table no. 2 below. According to table no. 1 below, the mean TC, TG, LDL, and HDL levels for men were 179 mg/dL, 142 mg/dL, 92 mg/dL, and 34.5 mg/dL, respectively, while for women, they were 166 mg/dL, 140 mg/dL, 85 mg/dL, and 43 mg/dL.

Table 1: Showing baseline patient characteristics

Parameters	Range	Mean value \pm SD (Male)	Range	Mean value \pm SD (Female)
Age (years)	20-60	50.3 \pm 10.3	20-59	41.9 \pm 11.1
BMI (kg/m ²)	15.6-49.4	28.4 \pm 6.1	17.5-35.3	28.2 \pm 5.5
WC (cm)	85.6-105.4	110.5 \pm 11.2	80.2-135.2	105.2 \pm 12.1
TC (mg/dL)	80-340	179 \pm 67.2	71-349	166 \pm 69.8
LDL (mg/dL)	60-240	92 \pm 41.5	56-287	85 \pm 44.2
HDL (mg/dL)	13-60	34.5 \pm 10.6	22-75	43 \pm 12.6
TG (mg/dL)	65-450	142 \pm 64.1	54-379	140 \pm 64.9
Duration of hypothyroidism (years)	2-39	10.5 \pm 15.2	1-49	12.6 \pm 17.1

Table 2: Showing the prevalence of patient's components of metabolic syndrome.

Components	Male n=32	Percentage (%)	Female n=68	Percentage (%)	Total n=100
DM	7	21.9%	37	54.4%	44
HTN	6	18.8%	30	44.1%	36
TG (≥ 150 mg/dL)	17	53.1%	60	88.2%	77
HDL (< 40 mg/dL in male, < 50 mg/dL in female)	14	43.8%	62	91.2%	76
WC (> 102 cm in male, > 88 cm in female)	19	59.4%	66	97.1%	86
Three or more components simultaneously (metabolic syndrome)	19	59.4%	65	95.6%	84

Male and female mean WC were 110.5 and 105.2, respectively. 60 (88.2%) females and 17 (53.1%) males had elevated TG (> 150 mg/dL). 14 (43.8%) men and 62 (91.2%) women had low HDL C (≤ 40 mg/dL in men and ≤ 50 mg/dL in women). Higher WC was discovered in 66 females (97.1%) and 19 males (59.4%). With an incidence of 36% overall, hypertension was found in 6 (18.8%) males and 30 (44.1%) females. MetS was discovered in 19 (59.4%) males and 65 (95.6%) females, with an overall incidence of 84%.

Discussion

Although increased cardio-vascular risk is frequently associated with hypothyroidism, the factors that increase this risk are unclear. The MetS is one of the devices that have been suggested as potentially mindful for it. Thus, finding the prevalence of MetS in hypothyroid patients was our main concern. According to Gupta *et al.* [13], roughly 31.6% of the Indian population has MetS. Predominance of person components of the MetS in men and ladies, individually, were as takes after: central weight (WC; men > 102 cm, ladies > 88 cm) 25.6% and 44.0%; moo HDL cholesterol (men < 40 mg/dL, ladies < 50 mg/dL) 54.9% and 90.2%; tall TGs (≥ 150 mg/dL) 32.3% and 28.6%; and impeded fasting glucose or diabetes in 16.9% and

16.1%. The predominance of physical inertia, hypertension, hypercholesterolemia, and tall LDL-C was more noteworthy within the MetS bunch in both men and ladies.

In Southern India, a different study by Chow *et al.* [14] revealed a prevalence of MetS of 26.9% in males and 18.4% in females, while Deepa *et al.* [15] reported a frequency of 18.3%. According to a study by Shantha *et al.* [16], the prevalence of overt hypothyroidism in the MetS group was 7.4%, whereas the prevalence of subclinical hypothyroidism was 21.9%. A strong combination of subclinical hypothyroidism and MetS was seen in the study of Uzunzulu *et al.* [17], which supports our findings. According to the over ponders, the prevalence of MetS and its component was significantly greater in our study group of hypothyroid patients than in the general population. There isn't a lot of published research on the prevalence of MetS in hypothyroid patients, however a report from Nigeria revealed that the prevalence of MetS in these people can be as high as 40% [18].

Hypercholesterolemia and high LDL-C values are typical lipid disorders. Even with severe hypothyroidism, HDL-C levels might be normal or even elevated [19]. While in this study, mean TG and TC levels were high, mean HDL-C levels were low, and mean

LDL levels were within normal ranges. The study's findings on hypertension were comparable to those of Saito *et al.* [20], who found that hypothyroid patients had a considerably higher prevalence of the condition (15.8%) than euthyroid controls (5.5%). In this study, patients with hypothyroidism had a 36% prevalence of hypertension. The probable mechanism of pathophysiology responsible for this includes alterations in circulating catecholamines, their receptors, and abnormalities in the aldosterone system of rennin-angiotensin [21]. Another investigation by Gyawali *et al.* [22] Higher levels of TSH may predict MetS in the population as well as the cohort of this study, according to research done in Korea that demonstrates the association between aberrant thyroid function and specific MetS components like BP, TC, TG, HDL-C, and fasting glucose. This study's increase in WC revealed that it is the most prevalent MetS component, correlating with Cameron AJ *et al.* study [23].

Conclusion

This study indicated substantial connection between subclinical hypothyroidism and MetS. The total prevalence rate of the MetS in this study was comparable to studies of hypothyroid individuals and slightly higher than rates reported in the general population in various investigations.

The most prevalent TD among MetS patients from India was hypothyroidism. All MetS patients should have their thyroid function checked because, unless hypothyroidism is made illegal, a large percentage of people with thyroid problems will be misdiagnosed as having MetS, which will have an impact on how these cases are managed.

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