

## STUDY OF METABOLIC SYNDROME PREVALENCE IN PATIENTS WITH HYPOTHYROIDISM : A TERTIARY HOSPITAL BASED ANALYSIS

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### ABSTRACT

**Background:** Hypothyroidism and the metabolic syndrome (MetS) are well-known predisposing factors to atherogenic cardiovascular disease. The term "MetS" describes a group of risk factors that induce prothrombotic, proinflammatory, dyslipidemia, hypertension, and hyperglycemia, all of which hasten the body's atherogenic process. Hypothyroidism causes endothelial dysfunction, diastolic hypertension, hyperlipidemia, and cardiovascular disease. Numerous theories have been proposed to explain the association between increased cardiovascular morbidity and hypothyroidism. The principal objective of this study is to determine the prevalence of the metabolic syndrome in individuals with hypothyroidism. **Methods:** This study involved 100 patients, aged 20 to 60, who were known to have hypothyroidism. In addition to completing laboratory tests, every patient who arrived at the hospital was requested to give a detailed medical history, including both indoor and outdoor patients. In addition to the results of laboratory testing, such as thyroid profile tests, glucose analyses, and cholesterol analyses, the history of any hypothyroidism symptoms was recorded. **Result:** This study involved 100 patients, aged 20 to 60, who were known to have hypothyroidism. In addition to completing laboratory tests, every patient who arrived at the hospital was requested to give a detailed medical history, including both indoor and outdoor patients. In addition to the results of laboratory testing, such as thyroid profile tests, glucose analyses, and cholesterol analyses, the history of any hypothyroidism symptoms was recorded. **Conclusion:** This study found a significant relationship between subclinical hypothyroidism and MetS. Comparable to research on hypothyroid patients, the overall MetS prevalence rate in this study was marginally higher than rates found in the general population across a number of studies. Among Indian MetS patients, hypothyroidism was the most common TD. **Keywords:** Metabolic syndrome, Hypothyroidism, TD, MetS

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### INTRODUCTION

The conditions hypothyroidism and metabolic syndrome (MetS) are well-known predisposers to atherogenic cardiovascular disease. The body's atherogenic process is accelerated by a number of risk factors referred to as MetS, including prothrombotic and proinflammatory states, dyslipidemia, hypertension, and hyperglycemia<sup>1,2</sup>. Thyroid disorders are the most common endocrine illnesses; around 10.95% of the general population has hypothyroidism.<sup>3</sup> Hypothyroidism causes endothelial dysfunction,

diastolic hypertension, hyperlipidemia, and cardiovascular disease.<sup>3,4</sup>

There are numerous theories explaining why hypothyroidism and increased cardiovascular morbidity are related<sup>5</sup>. Causative relationships (MetS) are one of the hypothesized linkages between the metabolic syndrome and other factors. The MetS was identified by the Adult Treatment Panel III report (ATP III) of the National Cholesterol Education Program as a major risk factor for cardiovascular disease that needed greater therapeutic attention.

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Around 31.6% of Indians have MetS overall, with women having a prevalence of 39.9% and men having a prevalence of 22.9%<sup>5</sup>. Many factors, including MetS, population, age, ethnicity, etc., affect the prevalence rates. Due to socioeconomic shifts to escalating mechanization, wealth, urbanization, and urban migration<sup>6</sup>, 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<sup>4,7</sup>. 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 characterized 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<sup>5,8</sup>. Unmistakably the basal plasma affront of hypothyroidism (Goodness) and subclinical hypothyroidism (SH) is weakened, and insulin sensitivity may improve with replacement therapy<sup>9</sup>. Rapid urbanization and industrialization 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<sup>10</sup>. 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 utilize of thyroxine substitution can lead to its poisonous quality.

It has been hypothesized 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<sup>11</sup>. 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<sup>12</sup>. Finding the prevalence of the metabolic

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

## MATERIAL AND METHODS

This study was conducted in the medicine department of Darbhanga Medical College and Hospital in Laheriasarai, Bihar, between March 2023 and February 2024. Participants in this trial were 100 hypothyroid individuals, ages 20 to 60. Every patient who came to the hospital was asked to provide their whole medical history, including laboratory work, for both OPD and IPD patients. The patient's medical history as well as the outcomes of laboratory tests, such as cholesterol, glucose, and thyroid profile tests, were documented. Adult patients with a history of hypothyroidism who were willing to participate in the research 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 analyzed 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±SD (Male)	Range	Mean value±SD (Female)
Age (years)	20-60	50.3±10.3	20-59	41.9±11.1
BMI (kg/m <sup>2</sup> )	15.6-49.4	28.4±6.1	17.5-35.3	28.2±5.5
WC (cm)	85.6-105.4	110.5±11.2	80.2-135.2	105.2±12.1
TC (mg/dL)	80-340	179±67.2	71-349	166±69.8
LDL (mg/dL)	60-240	92±41.5	56-287	85±44.2
HDL (mg/dL)	13-60	34.5±10.6	22-75	43±12.6
TG (mg/dL)	65-450	142±64.1	54-379	140±64.9
Duration of hypothyroidism (years)	2-39	10.5±15.2	1-49	12.6±17.1

**Table 2 : Showing the prevalence of patients 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.<sup>13</sup>, 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.<sup>14</sup> revealed a prevalence of MetS of 26.9% in males and 18.4% in females, while Deepa et al.<sup>15</sup> reported a frequency of 18.3%. According to a study by Shantha et al.<sup>16</sup>, 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.<sup>17</sup>, 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%<sup>18</sup>.

Hypercholesterolemia and high LDL-C values are typical lipid disorders. Even with severe hypothyroidism, HDL-C levels might be normal or even elevated<sup>19</sup>. 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.<sup>20</sup>, 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<sup>21</sup>. Another investigation by Gyawali et al.<sup>22</sup> 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<sup>23</sup>.

## 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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