

**“PREVALENCE OF METABOLIC SYNDROME IN HYPOTHYROIDISM PATIENTS IN VINDHYA REGION WITH SPECIAL REFERENCE TO TSH LEVEL”**

Running Title - Prevalence of Metabolic Syndrome in Hypothyroidism patients

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**ABSTRACT**

**Introduction:** Thyroid disorders are among the most common endocrine disorders, with an overall prevalence of Hypothyroidism about 10.95% in the general population. Prevalence of the Metabolic Syndrome (MetS) in the Indian population is about 31.6%, with the prevalence of 22.9% in men and 39.9% in women.

**Aim:** The aim of this study is to determine the prevalence of Metabolic Syndrome and its components in people with Hypothyroidism.

**Materials and Methods:** A total of 200 Hypothyroid patients attending our out-patient and in-patient department were consecutively enrolled for the study. Clinical data were obtained by interviewing the patients and referring to their case folders and prescriptions. The anthropometric indices were recorded. The laboratory parameters that were analyzed included fasting lipid profile, thyroid function tests, and fasting blood sugars.

**Results:** The patients were aged between 18 to >65 years, with a mean age of 45.11 years, and the female-to-male ratio was 1:2.48. The overall prevalence of the Metabolic Syndrome was significantly higher than that in the general population, as reported earlier in various studies. The most common occurring Metabolic Syndrome defining criterion was increased waist circumference, and hypertension was the least documented criterion.

**Conclusion:** Metabolic Syndrome occurs in approximately every second patient of hypothyroidism, and so, routine screening for components of Metabolic Syndrome may be of benefit in this group.

**Keywords:** Hypothyroidism, Metabolic Syndrome

**INTRODUCTION:**

Thyroid disorders are among the most common endocrine disorders, with an overall prevalence of Hypothyroidism about 10.95% in the general population.<sup>1</sup> Hypothyroidism is often associated with increased cardiovascular morbidity, but the mechanisms for this are unclear, for which various theories have been proposed. One of the proposed theories is the causal association with the Metabolic Syndrome. Hence, our aim of the study was to find the prevalence of Metabolic Syndrome in Hypothyroid patients.

People living with Metabolic Syndrome are at high risk for developing cardiovascular disease<sup>2</sup> and are three times as likely to have Myocardial Infarction, Stroke and twice likely to die compared with people without this syndrome.

Insulin resistance is supposed to be the central pathophysiological phenomenon underlying the clustering.<sup>3</sup>

Thyroid disease is known to be associated with atherosclerotic Cardiovascular disease.<sup>4,5</sup> Thyroid hormones have ubiquitous effects and influence on functions of the most organs of body. This hormone acts as a general pacemaker, speeding up metabolic processes and is thought to be linked to Metabolic Syndrome. Little knowledge is gained about the relationship between Metabolic Syndrome and Thyroid dysfunction. Both Thyroid dysfunction and Metabolic Syndrome are associated with increased risk of atherosclerotic heart disease. Only a few small studies have been performed.<sup>6,7</sup>

Aim of the study: To determine the prevalence of Metabolic Syndrome in people with Hypothyroidism and to correlate the occurrence of metabolic syndrome with severity of Hypothyroidism.

### **METHODS**

This is Non randomized cross sectional study done from April 2020 to June, 2021 in Shyam Shah Medical College and Sanjay Gandhi hospital Rewa M.P. coming to the Outpatient Clinic.

#### ***Inclusion criteria***

- Patients with Hypothyroidism.
- Age group between 18-65 years.

#### ***Exclusion Criteria***

- Iatrogenic hypothyroidism (Iodine<sup>131</sup> treatment or post-thyroidectomy)
- Drugs (iodine excess, lithium, anti-thyroid drugs, p-aminosalicylic acid, interferon-alpha & other cytokines)
- Congenital hypothyroidism
- Severely ill patient
- Age below 18 years or above 65 years
- Nephrotic syndrome
- Patients taking steroids
- Infiltrative disorders (amyloidosis, haemochromatosis, scleroderma, cystinosis)
- Postpartum thyroiditis
- Hypopituitarism of any cause
- Hypothalamic disorders.

### **SELECTION OF DATA**

Detailed history including medication, smoking, alcohol intake, anthropometric measurements like height, weight, waist circumference were noted in a semi structured Performa. Thyroid hormone assay was performed.

Waist circumference was measured keeping tape in a horizontal plane around the abdomen at level of iliac crest. Blood Pressure was recorded in sitting position in the right arm, with a mercury sphygmomanometer. After eight hours of fasting, blood was drawn for fasting blood sugar and lipid profile in a single sitting.

### **INVESTIGATION DETAILS:**

- The fasting blood sugar was done by enzymatic method (Glucose Oxidase peroxidase) using fully automated analyzer.
- Lipid profile (Totalcholesterol, HDL, Triglycerides)

- LDL was calculated by the formula.
- $LDL = \text{Total Cholesterol} - HDL - (\text{Triglyceride}/5)$
- Thyroid hormone assay was done

#### DATA COLLECTION AND METHODS:

Patients presenting to our hospital with Hypothyroidism during the study period will be studied. Informed consent will be taken from all. Detailed history and thorough clinical examination will be done as per pre-instructed proforma. After which, cases will be subjected to thyroid function tests for biochemical evidence of Hypothyroidism and other test related to Metabolic Syndrome.

**STATISTICAL ANALYSIS:** Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean  $\pm$  SD (Min- Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance. Appropriate statistical tests will be used to analyze the data.

#### RESULTS:

**Table 1-**

Gender	No. of cases	Percentage
Male	58	29.0
Female	142	71.0
<b>Age Distribution</b>		
Upto 35	30	15
36-45	78	39
46-55	52	26
>55	40	20
<b>Age wise distribution of metabolic syndrome</b>		
Upto 35	13	43%
36-45	30	38%
46-55	21	40%
>55	10	25%
<b>Sex Wise Distribution of Metabolic Syndrome</b>		
Male	22	37.9
Female	52	36.61

**Table 2- Clinical characteristics**

<b>Waist circumference in relation to thyroid status in male</b>						
Thyroid status	WC<90		WC>90		Total	
	N	%	N	%	N	%
Euthyroid	5	62.5	3	37.5	8	13.79
Subclinical Hypothyroidism	26	68.42	12	31.57	38	65.51
Clinical Hypothyroidism	4	33.33	8	66.66	12	20.68
<b>Waist circumference in relation to thyroid status in female</b>						
	WC<80		WC>80		Total	
	N	%	N	%	N	%
Euthyroid	12	66.66	06	33.33	18	12.6
Subclinical Hypothyroidism	54	62.79	32	37.20	86	60.56

Clinical Hypothyroidism	16	42.10	22	57.89	38	26.76
<b>Triglyceride level in relation to thyroid status</b>						
	<b>TG&lt;150mg/dl</b>		<b>TG&gt;150mg/dl</b>		<b>Total</b>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Euthyroid	20	76.92	06	23.07	26	13
Subclinical Hypothyroidism	64	51.61	60	48.38	124	62
Clinical Hypothyroidism	26	52	24	48	50	25
<b>Fasting Plasma sugar in relation to thyroid status</b>						
	<b>FPS&lt;100mg/dl</b>		<b>FPS&gt;100mg/dl</b>		<b>Total</b>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Euthyroid	20	76.92	06	23.07	26	13
Subclinical Hypothyroidism	78	62.90	46	37.09	124	62
Clinical Hypothyroidism	18	36.00	32	64.00	50	25
<b>Frequency of Metabolic Syndrome in relation to Thyroid status (TSH level) in Hypothyroid Patients</b>						
	<b>MS Absent</b>		<b>MS Present</b>		<b>Total</b>	
	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>	<b>N</b>	<b>%</b>
Euthyroid	22	84.61	04	15.38	26	13.0
Subclinical Hypothyroidism	84	67.74	40	32.25	124	62.0
Clinical Hypothyroidism	20	40	30	60	50	25.0

**Interpretation of results were drawn from the study,**

In present study Clinical Hypothyroidism is maximum in below 35 years age group and were almost equal ( $\approx 20-23\%$ ) in other age groups. Hypothyroidism has female preponderance with Male:Female 1:2.48. Metabolic Syndrome is most prevalent in Hypothyroid patients of age upto 35 years of age. Metabolic Syndrome prevalence in Hypothyroidism patients is nearly equal in Male and Female. Serum level of TSH is directly related to increase in waist circumference but in statistically not significant manner. In present study Clinical and subclinical Hypothyroidism is associated with raised triglycerides but it is statistically not significant. Increased Fasting plasma sugar level is directly related to TSH level in statistically not significant manner. In present study among patients with Hypothyroidism, Serum level of TSH is directly related to prevalence of Metabolic Syndrome, but statistically not significant.

**DISCUSSION**

**AGE**

Majority of study patients were in age group of 36-55(65%), followed by >55 (20%) then by <35 (15%). Metabolic Syndrome was most prevalent in age group <35(43%) followed by second peak in 46-55 year (40%).

**Ford ES et al.(2002)<sup>8</sup>** study conducted in U.S.A showed that the prevalence of Metabolic Syndrome increased from 7% in 20-29 years age to 44% in patients aged 60-69 years.

**GENDER**

71% of study population is female with Male-Female ratio of 1:2.48, suggesting Hypothyroidism is more prevalent in females. Prevalence of Metabolic Syndrome in Hypothyroid patients is 37% and is nearly equal in male (37.9%) and female (36.61).

**The Jaipur Heart Watch Study (2004)** showed that Prevalence of Metabolic Syndrome in India is 18.4% in men, 30.9% in women and 24.9% overall.

### **HYPOTHYROIDISM AND WAIST CIRCUMFERENCE**

Our study shows that Clinical hypothyroidism patients has higher waist circumference 66.66% in Men and 57.89% in women as compared to subclinical Hypothyroid patients 31.57 % in men and 37.20% in women. Above data suggest linear relationship between TSH and waist circumference.

**Gupta et al. (2009)** shows that truncal obesity was more in the population compared to the obesity (obesity in 50.3%, truncal obesity in 68.0 %<sup>9</sup>).

**Ramachandran et al.(2003)**in his study found out truncal obesity ( $WC \geq 85\text{cms}$ ) was 31.4% in this region<sup>10</sup>.

### **HYPOTHYROIDISM AND DYSLIPIDEMIA**

Our study shows that 45% of Hypothyroid population have hypertriglyceridemia ( $TG > 150\text{mg/dl}$ ). Prevalence of hypertriglyceridemia is 48% in Clinical and subclinical Hypothyroidism as compared to 23.07% in euthyroid status. This shows that TG have direct relation with increase in TSH level.

**HUNT study(2007)** shows that increasing level of TSH is associated with less favorable lipid concentrations<sup>11</sup>.

**Lai Y et.al.(2010)** study shows that subclinical hypothyroidism is correlated with elevated triglyceride level<sup>12</sup>.

**Mohan et al.(2007)**in another study in industrial population found that dyslipidemia was prevalent in 40.2% of the study group<sup>15</sup>

**Gupta et al.** revealed that elevated total cholesterol ( $\geq 200\text{mg}$ ) in 45.8% and hypertriglyceridemia ( $\geq 150\text{mg}$ ) in 28.6% of the urban female population in this region<sup>16</sup>.

### **HYPOTHYROIDISM AND FASTING PASMA SUGAR**

Our study shows that 38% of study population has  $FPS > 100\text{mg/dl}$ . Clinical Hypothyroidism(64%) has higher prevalence of impaired fasting plasma sugar level as compared to subclinical Hypothyroidism(37%) and euthyroid status(23.07) showing direct relation between TSH and insulin resistance (fasting plasma sugar level).

**Shah et al. (1975)** study shows that glucose intolerance in Hypothyroidism is not characterized by insulin resistance<sup>17</sup>.

**Ramachandran et al. (2003)**in his study shows  $FPG \geq 110\text{mg}$  was present in 26.7% in the population<sup>10</sup>.

**Mohan V. et.al. conducted CURES study(2001-2002)** showed that according to the ADA criteria 19% had diabetes in Chennai and this scaled down to 16% when WHO criteria was used<sup>18</sup>.India with its dubious distinction of being called, "the diabetic capital of the world" is presently estimated to have over 30 million individuals affected by this deadly disease.

### **METABOLIC SYNDROME AND HYPOTHYROIDISM**

Our study shows that 37% of Hypothyroid patients have Metabolic Syndrome. 60% of Clinical Hypothyroidism has Metabolic Syndrome followed by 32.25% of subclinical Hypothyroidism and least in 15.38% of euthyroid status. This shows direct relation between TSH and Metabolic Syndrome.

**Mohan V. et. al. (2007)** showed that prevalence of Metabolic Syndrome in India is 23.2% by WHO criteria,18.3% by ATP III criteria and 25.8% by IDF criteria<sup>15</sup>.

**Ramchandran et al.(2003)** shows that prevalence of Metabolic Syndrome is 41%

based on modified ATP criteria<sup>11</sup>.

**Chandra L et al.(2007)** study shows overall prevalence of Metabolic Syndrome is 32%. Maximum prevalence of Metabolic Syndrome is in euthyroid (43.75%) followed by hypothyroid (21.4%) and least in hyperthyroid patients (20.83)<sup>7</sup>

**Uzunulu et al.(2007)** study in Japan shows that the subclinical Hypothyroidism is prevalent in 16.4% of Metabolic Syndrome patients<sup>6</sup>.

### CONCLUSION:

Metabolic syndrome has increased prevalence in female frankly Hypothyroid patients with poor drug compliance, subclinical Hypothyroidism not started on levothyroxine, and newly diagnosed Hypothyroid patient. Prevalence of Metabolic Syndrome is 34% as per IDF criteria in the study group which was higher than the general Population. All the parameters of Metabolic Syndrome like central obesity hypertension, decreased HDL, elevated triglycerides and glucose intolerance are increased in direct relation with TSH levels. All Hypothyroid patients at the time of diagnosis must be screened for all Metabolic Syndrome parameters and if present should be treated promptly. As the prevalence of diabetes, dyslipidemia and premature coronary artery disease are higher in South East Asia compared to the rest of the world due to genetic predisposition. Clinical as well as subclinical Hypothyroidism patients should be treated with proper replacement therapy to prevent the Metabolic Syndrome related correlation in these patients.

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