Original Article

Study of Thyroid Dysfunction in Metabolic Syndrome Patients

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Background : The "Metabolic Syndrome" is the combination of metabolic abnormalities in which people are Obese and Hypertensive with high triglyceride levels, decreased high-density lipoproteins and abnormal fasting glucose levels. Dysfunction of thyroid gland may be related to different components of Metabolic Syndrome like obesity, insulin resistance, lipid and glucose metabolism irregularities, Cardiovascular dysfunction and raised BP. Thus on correcting the thyroid abnormality at an earlier stage, adverse effects of Metabolic Syndrome can be brought down.

Materials and Methods : This is a randomized cross sectional study enrolling total 54 OPD and indoor patients having Metabolic Syndrome in our Tertiary Care Hospital of South Gujarat. Pretested proforma was used to collect data after taking informed consent. Patient's data including clinical examinations, physical examination and relevant investigations like Lipid profile, FBS, S.T3,T4,TSH were collected. Final analysis has been done with the help of IBP SPSS version 22.

Results : In our study, 8 patients were having Thyroid Dysfunction, out of which 4 patients (50%) fulfilled all 5 criterias of Metabolic Syndrome. This study clearly shows that the association of Thyroid Dysfunction in Metabolic Syndrome patients was higher than that of normal population. This finding indicates a need to investigate the presence of Thyroid Dysfunction in management of Metabolic Syndrome patients.

Conclusion : There is possible correlation between Thyroid Dysfunction and Metabolic Syndrome. If we consider evaluation of Thyroid function in each Metabolic Syndrome patient, the early diagnosis and treatment will help to modify course of disease.

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Key words **: Thyroid Dysfunction, Metabolic Syndrome.**

The "Metabolic Syndrome" also called "deadly quartet" and "syndrome X", is the combination of metabolic abnormalities in which people are Obese and Hypertensive with high triglyceride levels, decreased high-density lipoproteins and abnormal fasting glucose levels[1,2]. People with Metabolic Syndrome are at increased risk for developing cardiovascular disease like myocardial infarction and stroke[3]. Insulin resistance is invented to be the main underlying pathophysiological phenomenon[4]. Thyroid disease is often associated with atherosclerotic diseases (commonly cardiovascular disease)[5,6]. Most of the organs of body are influenced by thyroid hormones in a sense that this hormone accelerates metabolic process and it may be associated with Metabolic Syndrome. Dysfunction of thyroid gland may be related to different components of Metabolic Syndrome like obesity, insulin resistance, lipid and glucose metabolism irregularities, cardiovascular dysfunction and raised BP[7]. This study is an effort to evaluate association between Thyroid Dysfunction and Metabolic Syndrome.

Editor's Comment :

- There is possible correlation between thyroid dysfunction and metabolic syndrome. If we consider evaluation of thyroid function in each metabolic syndrome patient, the early diagnosis and treatment will help to modify course of disease.

Aims and Objectives

To discover the association between Thyroid Dysfunction and Metabolic Syndrome and to discover the type of Thyroid Dysfunction in Metabolic Syndrome.

Materials and Methods

The study was done at Surat Municipal Institute of Medical Education and Research (SMIMER) Hospital, Surat, Gujarat, from year July, 2020 to November, 2021. It was randomized cross sectional study enrolling total 54 OPD and indoor patients having Metabolic Syndrome.

Patients aged >18 years, who satisfied the criteria of Metabolic Syndrome by ATP III ie, any three of the

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five [Central obesity: waist circumference ≥102cm or 40 inches (male), ≥88cm or 36 inches (female); Dyslipidemia : TG ≥1.7 mmol/L (150 mg/dl); Dyslipidemia : HDL-C < 40 mg/dl (male), <50 mg/dl (female);Blood pressure ≥130/85 mm Hg; Fasting plasma glucose ≥6.1 mmol/L (110 mg/dl)]; patient willing for admission and willing to participate in study and all patient giving informed written consent for study were included in the study.

Patients taking drugs that alter thyroid levels (eg, Iodine, Amiodarone, Anti-neoplastic agents, Systemic steroids, Phenytoin, Furosemide, Heparin); diagnosed case of hypothyroidism or sub-clinical hypothyroidism or hyperthyroidism; individual less than 18 years of age and not willing to participate in study were excluded.

Approval for this study was taken in Institutional Ethical Committee. Informed written consent of all the participants were taken. All necessary confidentiality of participants were maintained.

Patient's data including age and sex, medical history including family history, risks factors, clinical examinations, physical examination and relevant investigations were included as part of the methodology. Blood investigation including CBC, RFT, Lipid profile, Liver function test including S Bilirubin, SGOT/SGPT, Total protein, S. ALP, S. T3,T4,TSH and Urine routine microbiological examination were done.

Data entry and statistical analysis was performed with the help of IBP SPSS version 22. Statistical analysis was done by appropriate statistical method.

Result

This study was piloted in 54 cases of Metabolic Syndrome who were admitted in our Tertiary Care Hospital. All cases met inclusion criteria. The observations made in this study are debated here (Table 1).

In the present study, majority patients were from age group of 51-60 years 15 (27.77%) followed by 21-30 years 14 (25.93%), 31-40 years 14 (25.93%) and 41-50 years 11 (20.37%) respectively. The mean and Standard Deviation for age in the participants were 40.68 ± 11.14 years respectively (Table 2).

Table 1 — *Agewise Distribution of Patients*

Age (Years)	No of Patients
21-30	14 (25.93%)
31-40	14 (25.93%)
41-50	11 (20.37%)
51-60	15 (27.77%)
Total	54 (100%)
Mean Age (Years)	40.68 ± 11.14

In the view of gender wise distribution, there were more number of females 30 (55.56%) as compared to males 24 (44.44%). The male: female ratio was 0.8:1 (Table 3, Fig 1).

In this study, Thyroid Dysfunction was 14.81% prevalent in Metabolic Syndrome patients. Among these, subclinical Hypothyroidism was highly prevalent (9.26%). Hypothyroidism was seen in 3.70% patients with Metabolic Syndrome. Prevalence of subclinical Hyperthyroidism was 1.85% prevalent. No overt Hyperthyroidism patients in our study (Table 4).

In the present study, 13 patients were between the age of 20-29 years, out of which 1 was Hypothyroid, 1 was subclinical Hypothyroid and rest were euthyroid. 13 patients were between the age of 30-39 years, out of which 3 were Subclinical Hypothyroid, 1 was subclinical Hyperthyroid and rest were euthyroid. All 12 patients between the age of 40-49 years were euthyroid. 16 patients were between the age of 50-59 years, out of which 1 hypothyroid, 1 subclinical hypothyroid and rest were euthyroid (Table 5, Fig 2).

In the present study, total 17 patients were fulfilling 3 criteria and 17 patients were fulfilling 4 criteria of Metabolic Syndrome, out of which, 15 were euthyroid and 2 were having Thyroid Dysfunction in each group. Rest 20 patients were fulfilling all five criteria of Metabolic Syndrome, out of which 4 were having thyroid

Table 2 — Genderwise Distribution of Patients

Gender	No of Patients
Male	24(44.44%)
Female	30(55.56%)

Table 3 — *Distribution of Patients According to Thyroid Dysfunction*

Category	No of Patients	%	Male	Female
Euthyroid	46	85.19%	23	23
Hypothyroid	2	3.70%	1	1
Subclinicalhy pothyroidism	5	9.26%	0	5
Subclinicalhy perthyroidism	1	1.85%	0	1
Hyperthyroidism	0	0	0	0

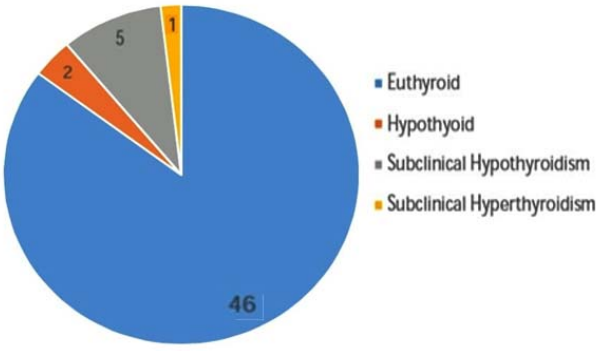

Fig 1 — Distribution of Patients According to Thyroid Dysfunction

Table 4 — *Agewise Thyroid Dysfunction*

Age	Total no	Euthyroid	Hypothyroid	Subclinical hypothyroid	Subclinical hyperthyroid
20-29	13	11	1	1	0
30-39	13	9	0	3	1
40-49	12	12	0	0	0
50-59	16	14	1	1	0

Table 5 — *Metabolic Syndrome Parameterswise Thyroid Dysfunction*

Metabolic Syndrome Criteria Fulfilled	Total no	Eu-thyroid	Hypo-thyroid	Subclinical hypothyroid	Subclinical hyperthyroid
3	17	15	1	1	0
4	17	15	0	1	1
5	20	16	1	3	0

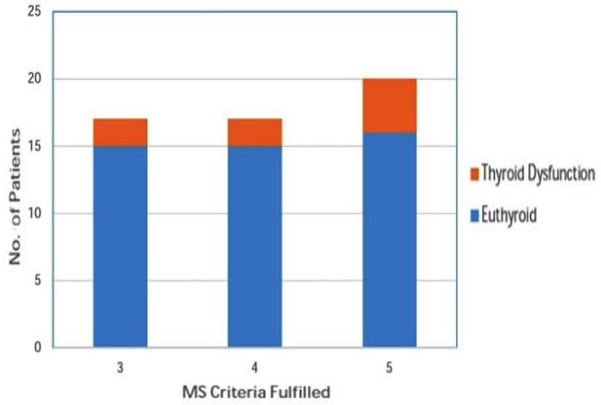

Fig 2 — Metabolic Syndrome Parameters Wise Thyroid Dysfunction

Dysfunction. As considerable number of patients were only in Euthyroid group (46) and sub-clinical Hypothyroid group (5), further statistical analysis was done between these 2 groups only (Table 6).

In the present study, all MS parameters were analysed between Euthyroid and sub clinical hypothyroid groups. Mean, SD and p value of each of them were obtained. P value of each parameter was >0.05 (statistically insignificant). As there was small number of patients with very high variants, statistically significant result was not established.

Table 6 — *Metabolic Syndrome Parameterwise Comparison between Euthyroid and Sub Clinical Hypothyroid*

Metabolic Syndrome parameter	Euthyroid		Sub Clinical hypothyroid		P Value
	Mean	SD	Mean	SD	
WC	96.72	8.79	95.60	4.77	0.78
SBP	137.30	9.75	144.40	12.99	0.14
DBP	88.83	5.62	92.00	7.07	0.25
FBS	122.83	19.68	114.80	26.48	0.41
HDL	41.09	8.28	45.20	4.09	0.28
TGL	158.30	13.66	165.80	14.18	0.25

Discussion

The Metabolic Syndrome is a group of metabolic abnormalities in which there is weight gain, Raised BP, high triglyceride level, low high-density lipoprotein cholesterol and abnormal fasting glucose levels. Patients with metabolic syndrome are having high chances of developing cardiovascular abnormalities and Type 2 Diabetes in the future. Hypothyroid patients are also having lipid abnormalities like high triglycerides and low high-density lipoproteins with weight gain, glucose intolerance and Hypertension[8]. Thus, hypothyroidism imitates the parameters of Metabolic Syndrome. Therefore, Thyroid Dysfunction is commonly seen in patients with metabolic syndrome.

In the present study, mean age was 40.6±11.1, which is comparable to other studies. In our study, females predominated males, which is comparable to all other studies. In this study, Thyroid Dysfunction was found in 14.81% among Metabolic Syndrome patients. Prevalence of overt Hypothyroidism was 3.7% and sub clinical Hypothyroidism was 9.26% in Metabolic Syndrome patients (total hypothyroidism prevalence was 12.96%). This study result is consistent with study done by Uzunulu, *et al*[9], as 16.4% of Metabolic Syndrome patients had Hypothyroidism.

According to Unnikrishnan AG, *et al*[10], prevalence of hypothyroidism in normal population was 10.95%, which is lower than prevalence in Metabolic Syndrome patients.

In our study, sub-clinical hypothyroidism was highly prevalent (9.26%) and subclinical hyperthyroidism was least prevalent (1.85%). These findings were consistent with the other studies.

According to studies done by Meier C, *et al* and Nadia C, *et al*, risk reduction of Cardiovascular mortality of 9-31% was possible by decreasing low-density lipoprotein cholesterol in sub clinical hypothyroidism patients treated with levothyroxine therapy[11,12]. Surks, *et al* also commends treating sub-clinical Hypothyroidism associated with Type 2 Diabetes and Hypertension[13]. As the metabolic syndrome patients have dyslipidemia, diabetes mellitus, hypertension and increased cardiovascular risk, it seems important to manage metabolic syndrome patients with sub clinical hypothyroidism by levothyroxine replacement therapy. Inadvertent over treatment occurred in 14-21% of Metabolic Syndrome patients treated with levothyroxine[14,15]. Probable risk of Osteoporosis and atrial fibrillation were present when serum TSH falls below 0.1 mU/L. These patients should be frequently evaluated for Thyroid function to avoid these complications. This study shows prevalence of Thyroid

Dysfunction was greater in Metabolic Syndrome patients than in normal population. This finding point towards the need for investigating the presence of Thyroid Dysfunction while managing Metabolic Syndrome patients. As described above, managing Hypothyroidism in Metabolic Syndrome patients was worthwhile by improving the metabolic parameters and sinking the Cardiovascular risk.

Conclusion

Study results indicates possible correlation between Thyroid Dysfunction and Metabolic Syndrome. This data will help the practitioner in their routine clinical practice for developing better management strategies in Metabolic Syndrome patients. If we consider evaluation of thyroid function in each metabolic syndrome patient, the early diagnosis and treatment will help to modify course of disease. However, prospective study in future correlating management of Thyroid Dysfunction and its implication in course of Metabolic Syndrome disease will be more conclusive.

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