

Hypothyroidism and possible association with Metabolic Syndrome

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Abstract

Background: Thyroid dysfunctions are the most common forms of endocrine disorder in our country, Thyroid hormones perform a wide array of metabolic functions including regulation of lipids, carbohydrates, protein and electrolytes and mineral metabolism, Thyroid hormones are major regulatory hormones that controls the rate of metabolic function and alteration in the levels of thyroid hormones may be associated with metabolic syndrome

Aim: The study was performed to investigate the association between Altered thyroid state i.e hypothyroidism and metabolic syndrome.

Materials and Methods: The study was done on patients with symptoms of hypothyroidism or follow up cases of hypothyroidism having metabolic syndrome. T3, T4 and TSH and were analyzed by enzyme linked fluorescent assay (ELFA) technique using Vidas auto analyzer from Biomerieux, France. Fasting blood sugar and lipid profile were estimated by Erba Chem 7 semi-auto analyzer. The data was analyzed using SPSS-17 software package.

Results: The percentage of metabolic syndrome and hypothyroidism in each age group were determined and we have found that the percentage of metabolic syndrome is increasing with age and is highest 60 % in the age group of 61-75 years, both T3, T4 are comparably decreased but TSH is on the higher side in metabolic syndrome as compared to non-metabolic syndrome

Conclusion: Patients having Thyroid dysfunction should regularly be checked for parameters of metabolic syndrome: Early detection of thyroid dysfunction and treatment can prevent the complications of metabolic syndrome.

Keywords: T3, T4, TSH, Metabolic syndrome & Thyroid disorders

1. Introduction

Thyroid dysfunctions are one of the most common forms of endocrine disorder in our country [1]. It has an impact on various systems of our body [2]. The disorder manifests in a broad spectrum of clinical and biochemical disease from undiagnosed disorder to myxoedema coma [3].

In our country, with a population of around 1.21 billion peoples, an estimated 108 million peoples are suffering from endocrine and metabolic disorders. Out of these 108 million peoples, 42 millions peoples are suffering from thyroid dysfunctions [4].

Thyroid hormones perform a wide array of metabolic functions including regulation of lipids, carbohydrates, protein and electrolytes and mineral metabolism [5].

The Metabolic syndrome (Met Syn) is one of the major public health problems of our country. Met Syn is a cluster of metabolic abnormalities commonly found associated with increased risk for development of Diabetes

Mellitus (Type 2 DM), cardiovascular disorders and other medical diseases [6].

Thyroid dysfunction also affects Met Syn parameters including high density lipoprotein (HDL), triglycerides (TG) and blood glucose fasting (FBS). It is known that thyroid dysfunction i.e hypothyroidism leads to an increase in total plasma cholesterol levels. Thyroid hormones are major regulatory hormones and increase the rate of metabolic functions and may be associated with metabolic syndrome [7].

There are several reports about higher thyroid stimulating hormone (TSH) level in patients of metabolic syndrome than in control subjects, and high prevalence of metabolic syndrome in subjects with TSH level higher than normal reference range as compared to those with normal TSH level [8, 9].

This study was performed to investigate the association between hypothyroidism and metabolism syndrome in the Firozabad district.

2. Material and Methods

The present study was undertaken on the patients attending medicine OPD of F. H. Medical College and Hospital, Ferozabad. Patients with sign and symptoms of hypothyroidism or follow up cases were included in the study. After obtaining the informed consent from each patient a detailed history and clinical examination were done, which include measurements like anthropometric measurements, fasting blood sugar level and lipid profile. On the basis of measurement only those patients were selected in the study who were having hypothyroidism with or without metabolic syndrome. T3, T4 and TSH were analysed by enzyme linked fluorescent assay (ELFA) technique using Vidas auto analyser from Biomerieux, France. Fasting blood sugar level and lipid profile were estimated by Erba Chem 7 semi-auto analyser. The data was analysed using SPSS-17 software

package. Mean and Standard deviation was applied. Correlation coefficient was seen for association between each components of metabolic syndrome and thyroid function test parameters (T3, T4 & TSH). A p value < 0.05 was considered as statistically significant.

3. Result

Our study was a hospital based in which about 110 referred patients from medicine OPD having sign and symptoms of hypothyroidism, with or without metabolic syndrome, were taken. Of the 110 patients in the study group, 71 were females and 39 were males with mean age of 42.7 ±12.3 years. Age wise distribution of Patients. The percentage of metabolic syndrome and hypothyroidism in each age group were determined.

Table 1: Distribution of subjects with different age group in metabolic syndrome

Age group (in years)	Hypothyroid patients	Metabolic syndrome		Non metabolic syndrome	
		No. of patients	Age group % in	No. of patients	Age group % in
15-30	12	4	33.3	8	66.6
31-45	46	26	56.5	20	43.4
46-60	32	15	46.8	17	53.1
61-75	20	12	60	8	40

In our study the percentage of metabolic syndrome is increasing with age and is highest 60 % in the age group of 61-75 years. (Table 1)

Table 2: Comparison of Thyroid hormones and TSH parameters in males and females

Clinical condition		Sex	T3	T4	TSH
Hypothyroidism	Non- Metabolic Syndrome	M	0.79 1 0.69	53.421 5.23	16.23 ± 5.89
		F	0.791 0.09	49.191 5.99	19.221 2.39
	Metabolic Syndrome	M	0.951 0.21	39.3915.01	18.9513.09
		F	0.7110.21	56.6115.29	20.2912.39

Both T3, T4 are comparably decreased but TSH is above the reference range in both metabolic and non-metabolic syndrome but TSH is on the higher side in patients of MetSyn as compared to patients of non metabolic syndrome. (Table 2)

4. Discussion

Hypothyroidism is a condition in which there is failure from the side of thyroid gland to produce a sufficient amount of thyroid hormones and there is also an increase in the TSH. Since thyroid hormones are involved in controlling various metabolisms of the human body, the patient suffering from hypothyroidism generally suffers from a slow metabolism resulting in altered lipid metabolism.

Thyroid hormone profile test panel is commonly used for evaluating and screening thyroid hormones disorders. The American Thyroid Association recommends for adults that they must be screened by measurement of the serum thyroid stimulating hormone (TSH) concentration after the age of 35 years and then every 5 years afterwards [10].

Serum level of Thyroid Stimulating Hormone (TSH) is one of the index of the normal biological activity of thyroid gland. In some of the studies researchers have found that adipocytes and pre-adipocytes expressed TSH receptors, when TSH bounded with TSH receptors they induced pre-adipocytes to produce and release adipokines, some of them played a very important role in the onset of metabolic syndrome [11].

Waterhouse *et al* [12] in his research found that when TSH was within normal reference range; with every 1 mIU/L increase in TSH TG increased by 0.115 mg/dl.

In a study conducted by Fahimeh Ramezani Tehrani *et al* [13] the prevalence of euthyroid women with MetSyn was 16.9%, which was similar to its prevalence among women with SCH (19.2%). The average estimated total score of Mets in women with SCH was significantly higher than the euthyroid women (p=0.006) and TSH' levels in SCH subjects were negatively and positively correlated with HDL-C They have found no significant correlation between TSH level in SCH cases and other MetSyn components. But our study shows a positive correlation between TSH and metabolic syndrome.

Park *et al* [14] in her study found that levels of TSH above the normal reference range are a marker of the prevalence and risk of metabolic syndrome. This is in accordance to our study which also shows that when there is rise in serum TSH level the patients are more at a risk of metabolic syndrome.

Pirjo *et al* [15] in their study found that the prevalence of metabolic syndrome increase with age in both

the sexes. Our study is also in accordance with this study, we have also found that patient of metabolic syndrome rises with increasing age.

Park *et al* [16] in their study reported a relationship between thyroid gland function and cardiovascular risk factors and also find that the higher levels of serum TSH above the reference range is the indicative of dysfunctioning of the thyroid gland and may be associated with the MetS.

In our study we have also found the positive relationship between TSH and MetSyn.

In a study conducted by Shantha GPS *et al* [17] they have shown a strong association between Hypothyroidism (SCH and overt hypothyroidism) with MetS. which is in accordance with our study which also states a strong positive relationship between TSH and metabolic syndrome.

The TSH level was above the reference range for normal population in the study of Gyawali *et al* [18], and they also observed significantly higher TSH level in metabolic syndrome patients as compared to controls.

A positive association has also been reported, between a higher TSH level above the reference range and the prevalence of the metabolic syndrome [8].

Our study is also in accordance with these studies in which we have found the similar results that the TSH level is above the normal reference range in patient who are suffering from MetSyn.

5. Conclusion

From our study, it can be concluded that Patients having Thyroid dysfunction should regularly be checked for the parameters of metabolic syndrome. Early detection of thyroid dysfunction and treatment can prevent the complications of metabolic syndrome.

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