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Study of Assessment of Thyroid Profile in Metabolic Syndrome Patients

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Abstract

Introduction: Metabolic syndrome is a serious health condition that affects about 23 percent of adults and places them at higher risk of cardiovascular disease, diabetes, stroke and diseases related to fatty buildups in artery walls. The underlying causes of metabolic syndrome include overweight and obesity, physical inactivity, genetic factors and getting older.

Objectives: To estimate the thyroid hormones among the patients attending hospital with Metabolic Syndrome and to find out any relation from the result when was compared with the status of thyroid hormones of age-sex matched control group.

Methodology: This cross sectional study includes total 400 participants among them 200 metabolic syndrome patients 35-60 age group as well as 200 age-sex matched normal healthy control who visited Medicine OPD of our Institute from Oct 2015-Dec 2016.Thyroid profiles were estimated from all participants. Results compared among them to see the correlation.

Result: Though serum T_3 and T_4 levels are within the normal range but serum TSH level is remarkably increased of metabolic syndrome patients in comparison with that of the control group. And it is also observed that in the younger age group of metabolic syndrome patients, serum TSH levels are drastically increased in contrast to that of the same age group of controls.

Conclusion: From this study, we would like to conclude that Hypothyroidism was the most common Thyroid dysfunction observed in metabolic syndrome patients.

Keywords: Thyroid Profile, Metabolic syndrome, Diabetic, Lipid, Subclinical hypothyroidism.

Introduction

The metabolic syndrome is a constellation of interrelated risk factors of metabolic origin that appear to directly promote the development of atherosclerotic cardiovascular disease. At present metabolic syndrome appears to have multiple underlying risk factors, the most important of these being central obesity and insulin resistance. Other associated conditions include physical inactivity, aging, hormonal imbalance, and genetic or ethnic predisposition.[1,2]

Thyroid hormone plays an important role on various aspects of metabolism, development and differentiation of cells. [3] The thyroid gland secretes the thyroid hormones, thyroxine (T_4) and the more biologically active form

triiodothyronine (T_3). Thyroid disease, namely hypothyroidism and hyperthyroidism, constitutes the most common endocrine abnormality in recent years, diagnosed either in subclinical or clinical form. [4,5]

Obesity is associated with an increased risk of diabetes, dyslipidemia, kidney disease, cardiovascular disease- all cause mortality, and cancer. [6] Thus, severe obesity is an important cause of premature mortality among middle-aged adults. [7] Moreover, obesity, especially central obesity, is linked to many endocrine abnormalities,[12] including thyroid dysfunction. [8] Hence the study is undertaken to establish the effect of central obesity leading to metabolic syndrome on the thyroid hormones.

Methodology

In this cross-sectional study, adult patients of age group 35-60 year with an established diagnosis of Metabolic syndrome were enrolled The study was conducted at Parul Sevashram hospital, Parul Institute of medical science and Research, Vadodara, Gujarat from Oct 2015-Dec 2016.

Inclusion criteria : Patients aged 35 to 65 years, with an established diagnosis of Metabolic syndrome based on the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III criteria (with modified waist), with or without known Thyroid dysfunction.(N=200)

Exclusion criteria : Pregnant patients or patients with a history of jejunoileal bypass, biliopancreatic diversion, extensive small bowel resection, total parenteral nutrition, any forms of chronic liver disease, hepatocellular carcinoma, patients on weight loss therapies or steatogenic drugs, and known HIV-positive cases were excluded from the study.

Collection and Preparation of Blood Sample:

Blood samples were drawn from all subjects, both cases as well as healthy controls, after 12 hours overnight fasting. 10 ml of blood was drawn from each of them and divide it in to EDTA ,Flouride and plain vaccutainer for estimation of following parameters.

Parameters Studied

Demographic Parameters: Age, Sex.

Anthropometric Parameters: Waist circumference, Height, Weight, Body Mass Index (BMI).

Blood Pressure: Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP).

Biochemical Parameters: Lipid Profile (serum high density lipoprotein [HDL], low density lipoprotein [LDL], very low density lipoprotein [VLDL] and triglycerol [TG] levels), Diabetic Profile (Fasting Plasma Glucose [FPG], Post-Prandial Plasma Glucose [PPPG], and Glycosylated Haemoglobin [HbA1c]) and thyroid profile (Serum Triiodothyronine [T_3], Thyroxin [T_4] and Thyroid Stimulating Hormone [TSH]).

An Uniq ID was given to each participants to hidden the identity of the patients.

The obtained data were analyzed statistically to calculate Mean and SD. P value was calculated by using graph pad prism software to determine the significance of difference among two groups. p value less than 0.005 was considered as significant.

Results

This cross sectional study includes total 400 participants among them 200 metabolic syndrome patients 35-60 age group as well as 200 age-sex matched normal healthy control.(Table 1 and 2)

Group	Number(n)	Age Group(yr)	Mean Age
Case	200	35-60	47.5± 5
Control	200	35-60	48 ± 4

Table 1: Age wise distribution between Case & Control group.

Group	Number(n)	Male: Female (n)	Male: Female (%)
Case	200	120:80	60:40
Control	200	130:70	65:35

Table 2: Sex wise distribution between Case & Control group

Among the cases, 60% of them were females and remaining 40% were males. The minimum age recorded among the cases was 37 and the maximum was 58.

Height, weight, waist circumference (WC), and hip circumference (HC) were recorded for each subject. Body mass index (BMI) and waist-hip ratio (WHR) were calculated from collected data. BMI was calculated by [weight in kilogram / (height in meter)^2]. Then the data was summarized by calculating the mean and SD for each parameter in both the group differently. (Table 3)

Parameters	Case (n=200)	Control (n=200)	p value
Height (cm)	168.9±5.5	166.1±8.5	0.805
Weight (Kg)	83.2±6.5	68.2±10.2	<0.005*
HC (cm)	103.2±6.2	101.6±5.2	0.184
WC (cm)	90.2±5.3	82.6 ±3.5	<0.005*
WHR	0.9±0.02	0.80±0.03	<0.005*
BMI (Kg/m^2)	29.8±1.2	24.8±1.5	<0.005*
SBP (mm of Hg)	138.5±10.0	130.4±8.0	<0.005*
DBP (mm of Hg)	88.1±6.0	80.8±5.0	0.008

Indicates significant difference

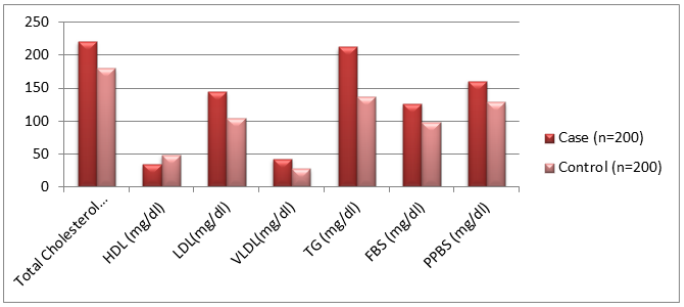
Table 3: Comparisons of anthropometric data between case and control group

The means of SBP and DBP the both case and control groups were compared and tested by independent sample t test for statistical significance. Significantly higher SBP (P<0.005) and DBP (P= 0.008) were observed among cases in comparison to the control group.

Parameters	Case (n=200)	Control (n=200)	p value
Total Cholesterol (mg/dl)	220.9±15.5	180.2±20.2	<0.005*
HDL (mg/dl)	34.50.±5.3	48.8±6.2	<0.005*
LDL(mg/dl)	143.9±12.5	103.94±10.6	<0.005*
VLDL(mg/dl)	42.46±8.0	27.46±9.2	<0.005*
TG (mg/dl)	212.3±10.0	137.3±8.0	<0.005*
FBS (mg/dl)	126.0±5.0	98.0±6.3	<0.005*
PPBS (mg/dl)	160.9±8.0	128.4±8.5	<0.005*

Table 4: Comparisons of lipid profile and Plasma sugar of Case and Control groups

Indicates significant difference

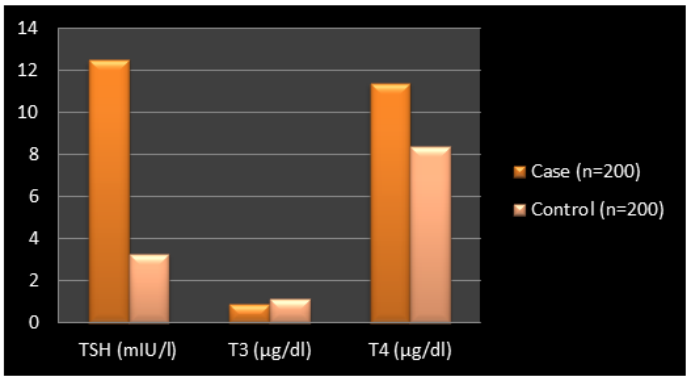


Graph 1: Graphical presentation of Comparisons of lipid profile and Plasma sugar of Case and Control groups

Parameters	Case (n=200)	Control (n=200)	p value
TSH (mIU/l)	12.5±0.5	3.3±0.6	<0.005*
T_3 (µg/dl)	0.9±0.3	1.17±0.2	0.900
T_4 (µg/dl)	11.4±2.0	8.4±3.2	0.850

Table 5: Comparison of thyroid profile of Case and Control groups

Indicates significant difference



Graph 2: Graphical presentation of Comparison of thyroid profile of Case and Control groups

From this comparison, the mean of serum T_3 and T_4 of cases and controls are not statistically significant, but the mean of serum TSH are more in cases than controls and is statistically strongly significant ($p < 0.005$) between cases and controls.

Discussion

Thyroid hormones play an essential role in regulating energy balance and metabolism of glucose and lipids, thereby affecting the MetS parameters, including HDL-C, TG, blood pressure, and plasma glucose. Hypothyroidism is found to be associated with obesity, dyslipidemia, and increased risk of atherogenic CVD [9,10].

From this study, it is observed that serum T_3 and T_4 levels in metabolic syndrome patients are almost in the same levels in comparison to that of the normal individuals, but in case of serum TSH levels are in higher side in the metabolic syndrome patients in contrast to controls and it is statistically proven. So it is clear from this study that the metabolic syndrome has a great tendency to bring on sub-clinical hypothyroidism. Another important finding of this study is there is a trend of presence of metabolic syndrome in the lower age group i.e. even in 30-40 years age group. And in this age group, the serum TSH concentration is increased in contrast with the control group.

Thyroid dysfunction, prominently subclinical hypothyroidism has been observed more frequently in metabolic syndrome patients than general population [11]. Both metabolic syndrome and hypothyroidism are independent risk factors for cardiovascular diseases (CVD). Presence of both conditions may be compounded to increase the risk for CVD and a considerable overlap occurs in the pathogenic mechanisms of atherosclerotic cardiovascular disease by metabolic syndrome and hypothyroidism [12,13]. There are reports about higher thyroid stimulating hormone (TSH) level in metabolic syndrome patients than in healthy ones, and high prevalence of metabolic syndrome in subjects with TSH level higher than normal as compared to those with normal TSH level[14,15]. However the association between thyroid dysfunction and components of metabolic syndrome is still debatable.

Conclusion

From this study, we would like to conclude that Hypothyroidism was the most common Thyroid dysfunction observed in metabolic syndrome patients.

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