Research Article

A Cross Sectional Study to Determine the Association Between Metabolic Syndrome and Hypothyroidism among Women Population

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ABSTRACT

The aim of the study is to assess the thyroid status in women with metabolic syndrome and the objective of study is to find the association between the thyroid levels and the metabolic syndrome. Metabolic syndrome is a global health problem characterized by abdominal obesity and insulin resistance. Thyroid dysfunction is one of the most common endocrine diseases associated with the increasing levels of TSH with obesity. Hypothyroidism is common in obese women. There is an increased incidence of hypothyroidism especially in females with higher TSH concentration in metabolic syndrome patients. The concurrent existence of both metabolic syndrome and thyroid dysfunction will substantially increase the risk of atherosclerotic cardiovascular disease. The aim of the current study is to find out the association of metabolic syndrome and hypothyroidism among women population. We have taken 50 cases (metabolic syndrome patients) & 50 healthy controls and the following parameters like fasting plasma glucose, waist circumference, blood pressure, triglycerides & HDL, FT4 &TSH are assessed. Statistical analysis is done by using SPSS (version 21) software. The study may be concluded by saying that the assessment of thyroid status and early diagnosis of metabolic syndrome especially in obese women may help to prevent the complications of metabolic syndrome.

Keywords: hypothyroidism, metabolic syndrome, obesity.

INTRODUCTION

Metabolic syndrome also called insulin resistance syndrome, syndrome X, cardio metabolic syndrome has become increasingly common in the developing countries. Metabolic syndrome originates with deposition of fat in our body especially visceral fat which initiates the inflammation process inside. This inflammation along with oxidative stress is the major reason for developing metabolic syndrome.[1-3] Imbalance between the anti oxidant system and oxidative species leads to the development of chronic disorders. Hence metabolic syndrome is a key factor for development of complication in our body.[4]

The metabolic syndrome is diagnosed if an individual has three or more of the following criteria such as abdominal obesity [i.e. waist circumference should be greater than 35 inches (women) or 40 inches (men)], fasting plasma glucose ≥110, triglycerides greater than 150mg/dl, HDL cholesterol less than 50mg/dl (women) or less than 40mg/dl (men), blood pressure greater than or equal to 130/85 mm Hg according to NCEP ATP III guidelines (2001).

Thyroid dysfunction is one of the most common endocrine diseases associated with obesity. Long before the definition of metabolic syndrome, alteration in thyroid function is observed in obese patients.[2,5]

Several studies have reported that higher TSH concentration is associated with a higher incidence of metabolic syndrome, especially in females. Thyroid dysfunction, especially overt hypothyroidism, is associated with atherosclerotic cardiovascular disease.[6,7]

The concurrent existence of both metabolic syndrome and thyroid dysfunction will substantially increase the risk of atherosclerotic cardiovascular disease.[2]

The aim of the present study is to find out the association of metabolic syndrome and hypothyroidism among women population.

MATERIALS AND METHODS

Totally 100 women subjects were selected for the study. Based on NCEP-ATP III guidelines 50 metabolic syndrome subjects were selected and 50 subjects without metabolic syndrome were selected.

According to NCEP-ATP III guidelines waist circumference greater than 80 cm in females, Blood pressure more than 130 mm Hg in systolic and more than 80 mm Hg in diastolic, triglycerides more than 150 mg/dl, HDL cholesterol in females less than 50 mg/dl and fasting plasma glucose more than 110 mg/dl are considered as features of metabolic syndrome.

Anyone satisfying three out of these five criteria can be classified as metabolic syndrome.

Pregnant women and the patients already on treatment for diabetes, hypertension, and hypothyroidism were excluded from the study.

Anthropometric parameters (height, weight, waist circumference) were recorded and documented. Blood

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was obtained in at red top vacutainers under aseptic precaution by skilled phlebotomist.

Fasting plasma glucose were estimated by using GOD-POD method serum triglycerides were estimated using GPO-POD method, serum HDL cholesterol were estimated using direct method, free T4 and Thyroid stimulating hormone were estimated using Chemiluminescence Immuno assay method (CLIA).

Statistical Analysis

Data analysis of this study was done by SPSS statistical software version 21. Mean values of all these variables are obtained and on analysis with independent t-test gives highly significant p-values for waist circumference (.000), systolic blood pressure (.001), diastolic blood pressure (.001), fasting plasma glucose (.000), TGL (.000), HDL (.000), TSH (.046).

RESULTS

Group I was Metabolic Syndrome subjects and Group II subjects without Metabolic Syndrome

Table 1

	Group				Independent Samples t-test	
	Metabolic Syndrome		Control			
	Mean	SD	Mean	SD	t-Value	Sig.
Age	**41.04**	7.31	34.12	8.14	4.472	**.000**
Height	153.28	5.57	151.04	14.75	1.004	.318
Weight	**69.68**	20.47	61.34	11.67	2.502	**.014**
Waist Circumference	**88.16**	7.52	81.62	9.74	3.758	**.000**
Hip Circumference	**103.81**	10.76	98.10	12.19	2.484	**.015**
W/H Ratio	.85	.07	.84	.07	1.331	.186
Systolic blood pressure	**125.90**	22.72	112.80	13.71	3.491	**.001**
Diastolic blood pressure	**83.80**	9.61	77.80	8.40	3.323	**.001**
Fasting plasma glucose	**119.30**	37.85	96.90	15.07	3.888	**.000**
TGL	**133.74**	70.07	87.00	34.60	4.229	**.000**
HDL	45.16	12.98	**57.52**	19.52	-3.728	**.000**
FT4	.88	.25	.93	.18	-1.043	.300
TSH	**5.61**	13.14	1.80	.74	2.051	**.046**

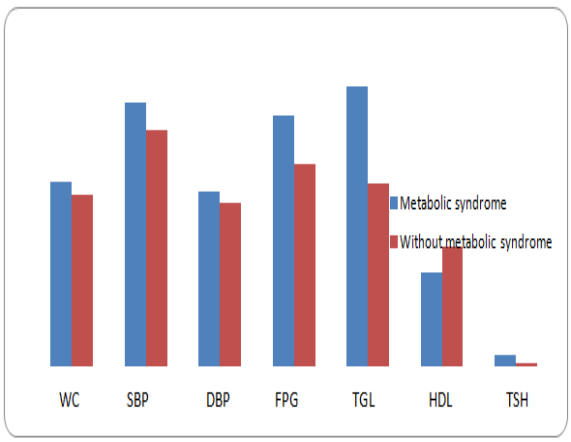

Figure 1: Metabolic Syndrome Patients and Controls

WC: waist circumference, SBP: systolic blood pressure, DBP: diastolic blood pressure, FPG: fasting plasma glucose, TGL: triglycerides, HDL: high density lipoprotein and TSH: thyroid stimulating hormone

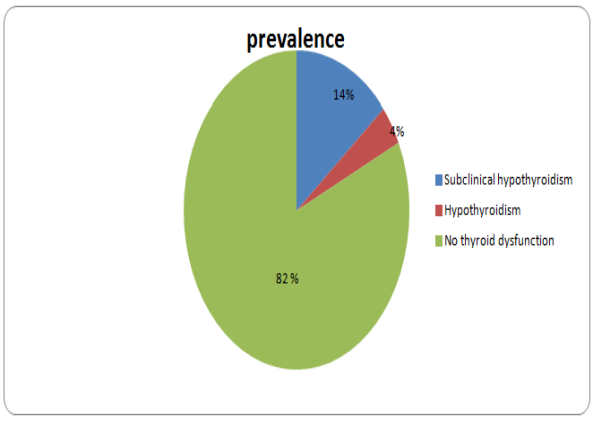

Figure 2: Percentage of thyroid dysfunction among metabolic syndrome

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DISCUSSION

The observation of metabolic syndrome among hypothyroidism patients, the increasing levels of TSH with obesity and the increased incidence of hypothyroidism and obesity in women has been previously studied.[6,7] The present cross sectional study designed is to evaluate the association between metabolic syndrome and hypothyroidism in woman.

Data analysis of this study was done by SPSS statistical software version 21. The mean weight was 69.68 ± 20.47 kg in metabolic syndrome and 61.34 ± 11.67 kg in controls (P value < 0.014). The mean waist circumference was 88.16 ± 7.52 cm in metabolic syndrome and 81.62 ± 9.74 cm in controls (P value < 0.00). The mean hip circumference of group I 103.81 ± 10.76 cm and group II was 98.10 ± 2.19 cm (P value < 0.015).

The mean systolic and diastolic blood pressure was 125.90 ± 22.72 and 83.80 ± 9.61mm Hg, respectively in group I whereas the mean systolic and diastolic blood pressure was 112.80 ± 13.71 and 77.80 ± 8.40mm Hg respectively in group II and the difference was statistically significant. (P value < 0.001)

The mean fasting plasma glucose level was 119.30 ± 37.85mg/dl in metabolic syndrome as compared to 96.90 ± 15.07mg/dl in controls (P value < 0.00).

Similarly, there was a significant difference in triglyceride level 133.74 ± 70.07mg/dl in metabolic syndrome and 87.00 ± 34.60 in controls (P value < 0.00) and also HDL cholesterol level was 45.16 ± 112.98mg/dl (group I) and 57.52 ± 19.52mg/dl (group II) with significantly correlated (P value < 0.00).

Thyroid function tests were done in both groups. The difference in mean T4 levels was insignificant in both the groups 0.88 ± 0.25 µg/dl in metabolic syndrome and 0.93 ± 0.18µg/dl in controls ($P < 0.3000$). Mean TSH levels in group I (5.61 ± 13.14 µIU/ml) subjects was higher as compared to group II (1.80 ± 0.74 µIU/ml) and the rise was statistically significant($P < 0.046$). Data derived from the groups on analysis shows a statistically significant association between metabolic syndrome and hypothyroidism which correlates well with other studies supporting the association between hypothyroidism and metabolic syndrome. The Mean TSH of metabolic syndrome 5.6 IU/ml correlates well with the mean obtained in a study done by KeranChugh.[8]

Though the waist circumference is higher in group I. The total number of hypothyroidism among 50 metabolic syndrome are only 9. Two subjects show overt hypothyroidism (TSH ↑and FT4 ↓). Whereas the other 7 subjects have TSH levels in sub-clinical hypothyroidism range (TSH ↑ and FT4 (Normal)). The prevalence of hypothyroidism among metabolic syndrome is 4 % in one study. The subclinical hypothyroidism has higher prevalence rate of 14% than overt hypothyroidism.

CONCLUSION

Metabolic syndrome and hypothyroidism cause derangements in the carbohydrate, lipid and protein metabolism.

Abdominal obesity plays an important interconnecting role between them. Subclinical hypothyroidism is higher than overt hypothyroidism because patients have elevated TSH levels without clinical manifestations. In this study there is a statistically significant association between metabolic syndrome and hypothyroidism.

The study may be concluded that the assessment of thyroid status in females especially the obese ones may help in earlier diagnosis of metabolic syndrome which may prevent the progression of its pathogenesis.

REFERENCES

1. Silvia Longhi and Giorgio Radetti. Thyroid Function and Obesity. J Clin Res PediatrEndocrinol. 5(Suppl 1), 2013 Mar, 40–44.
2. S. A. Ritchie and J. M. C. Connell. "The link between abdominal obesity, metabolic syndrome and cardiovascular disease," Nutrition, Metabolism and Cardiovascular Diseases, vol. 17, no. 4, 2007, 319–326.
3. Guilherme A1, Virbasius JV, Puri V, Czech MP. Adipocyte dysfunctions linking obesity to insulin resistance and type 2 diabetes Program in Molecular Medicine, University of Massachusetts Medical School, Worcester, Massachusetts 01605, USA.
4. Sridevi Devaraj, PhD, 1 Rajeev Goyal, MD2 and Ishwarlal Jialal, MD, PhD3 Inflammation, Oxidative Stress, and the Metabolic Syndrome touchendocrinology.com/system/files/private/articles/.../jialal.pd
5. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. J ClinEndocrinolMetab, 93, 2008, S9-30.
6. Mebmet Bastemir. Obesity is associated with increased serum TSH level, independent of thyroid function SWISS MED WKLY, 137, 2007, 431-434.
7. Chih-Yuan Wang. Associations between subclinical thyroid disease and metabolic syndrome Endocrine Journal, 59(10), 2012, 911-917.
8. Kiran Chugh. Is there thyroid receptor resistance in obesity journal of pharmaceutical and biomedical sciences JPBMS, 21(01), 2012.

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