International Journal of Research in Medical Sciences
Ray S et al. Int J Res Med Sci. 2016 Oct;4(10):4434-4437
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20163306

Research Article

Thyroid dysfunction in metabolic syndrome: the ensuing storm

Subhashree Ray[1]*, Samir Sahu[2], Anirban Poddar[1]

[1]Department of Biochemistry, [2]Department of General Medicine IMS & SUM Hospital, S'O'A University, Bhubaneswar, Odisha, India

Received: 30 July 2016
Accepted: 31 August 2016

***Correspondence:**
Dr. Subhashree Ray,
E-mail: subhashreeray@soauniversity.ac.in

ABSTRACT

Background: Metabolic syndrome was initially defined as a constellation of hypertension, hyperglycemia, android obesity and gout. Thyroid dysfunction is characterized by altered thyroid stimulating hormone levels with normal or altered thyroid hormone levels. The aim of the study was to observe thyroid hormone levels and thyroid stimulating hormone levels in a cohort of patients with established metabolic syndrome and to report significant variations if any.
Methods: 54 established cases of metabolic syndrome satisfying the IDF criteria were included in the study along with 54 ages and sex matched healthy controls.
Results: Amongst the controls 92.6% were euthyroid, 5.6% were hypothyroid, 1.9% were subclinical hypothyroid. Among cases 64.8% were euthyroid. Thyroid dysfunction was found to be prevalent among 35.2% metabolic syndrome patients.
Conclusions: Present study clearly reveals a higher incidence of thyroid dysfunction in metabolic syndrome. Metabolic syndrome and thyroid dysfunction are both considered as independent risk factors for cardiovascular disease. Therefore presence of both these entities in an individual increases the risk of a cardiovascular compromise. Hence assessment of thyroid function in metabolic syndrome might serve as a risk assesment tool to identify individuals predisposed to cardiovascular disease early, thereby resulting in a timely intervention.

Keywords: Thyroid dysfunction, Metabolic syndrome, Hypothyroidism

INTRODUCTION

Metabolic syndrome in its primitivity was described for the first time by Kylin E in 1920 as a constellation of hypertension, hyperglycemia, gout and android obesity.[1] The term "syndrome X" was used by Harmans Hellar in 1977.Reaven described it as "Insulin resistance syndrome".[2]

The present name "Metabolic syndrome" was coined by WHO in 1999 for the constellation of symptoms comprising of hypertension, dyslipidemia, abdominal obesity, impaired fasting blood glucose.[3] Thyroid dysfunction is defined as an altered thyroid stimulating hormone status along with normal or altered thyroid hormone status. People suffering from metabolic syndrome are highly predisposed to suffer from cardiovascular disease. Few studies conducted in india have reported that 25%-35% of the total adult population in india is suffering from metabolic syndrome.[4,5]

Thyroid hormones have a profound role in metabolism and significantly influence lipid dynamics. Therefore even slightest alteration in thyroid hormone status might trigger an alteration in lipid metabolism rendering the person dyslipidemic which in turn is an important feather in the cap called metabolic syndrome.[6]

We therefore intended to observe thyroid function in patients with metabolic syndrome and to decipher significant correlations if any which might in turn help in a better understanding of the complex metabolic cascade

dysfunction which eventually predisposes a person with metabolic syndrome to develop cardiovascular disease.

METHODS

The study was carried out at Institute of Medical Sciences & SUM Hospital, Bhubaneswar, Odisha, India during the period extending from January 2016-May 2016. 54 cases of metabolic syndrome were recruited from patients who presented to the general medicine OPD at IMS and SUM Hospital during the aforesaid period and fulfilled the below mentioned inclusion criteria. 54 age and sex matched healthy controls were also recruited who presented to the general medicine OPD for general health check-up.

5 ml of venous blood was collected with full aseptic precautions from each patient and control subject after properly explaining the entire procedure in their local language. A written consent was obtained from each of these patients and subjects wherein they expressed their willingness to participate in the study. Each of the blood samples collected was subjected to assay for; Fasting blood glucose, Lipid profile, FT4 and TSH.

Waist circumference was recorded in horizontal plane midway between the inferior margin of the ribs and the superior border of the iliac crest. Blood pressure was recorded in both arms in supine posture after a minimum of 5 minutes of rest.

Inclusion criteria

Patients with metabolic syndrome were included in the study who satisfied the IDF consensus (2006).

- Men with waist circumference ≥90 cm and women with waist circumference ≥80cm were taken as having central obesity.
- Triglyceride levels >150 mg/dl or those already receiving specific medication for same were classified as having dyslipidemic.
- HDL levels <40mg/dl in case of males and <50 mg/dl in case of females or those who were already receiving medication for these were considered as dyslipidemic.
- Blood pressure: systolic blood pressure >130 mm of Hg & diastolic blood pressure >85 mm of Hg were considered as hypertensive.
- Hyperglycemia: Fasting plasma glucose level>100 mg/dl or previously diagnosed cases of type 2 diabetes mellitus.

Exclusion criteria

- Known cases of hypothyroidism, subclinical hypothyroidism or hyperthyroid patient's already receiving treatment.
- Individuals less than 18 years of age.
- Pregnant women.
- Patients with liver disorders, heart failure, renal failure.

Statistical analysis

The data was analysed using SPSS v 17. Descriptive and inferential statistics were employed in the present study. Data was expressed as Mean±SD. The patients were classified as subclinical hypothyroid, overt hypothyroid, hyperthyroid, overt hyperthyroid as per the ATA guidelines.

TSH levels ranging from 4.5-10 mIU/ml and normal FT4 were categorised as subclinical hypothyroid. Patients having TSH levels >10 mIU/ml and low FT4 were classified as overt hypothyroid. TSH levels<0.45 mIU/ml with elevated FT4 were classified as hyperthyroid. Individuals with TSH<0.45mIU/ml and normal FT4 were categorised as subclinical hyperthyroid.

RESULTS

Present study clearly demonstrates the high incidence of thyroid dysfunction in patients with metabolic syndrome. Amongst the total of 108 individuals who participated in the study 38.8% males in the study group and 61.2% were females. In the control group though 27.7% were males and 72.3% were females. The mean waist circumference in the cases was 89.07±5.31 cm, whereas for the control group it was 69.07±4.03 cm.

Table 1: Comparison of SBP among cases and controls.

Systolic Blood Pressure (SBP) [mm of Hg]	Cases		Controls	
	No	%	No	%
>130	8	14.8	54	100.0
<130	46	85.2	0	0.0
Total	54	100.0	54	100.0
Mean±SD	148.26±16.83		112.96±5.64	

The mean FBS in cases was 187.02±59.86 mg/dl whereas in controls it was 80.76±9.55 mg/dl. A total of 51 out of the 54 cases exhibited impaired glucose tolerance and had FBS>100mg/dl. The patients with metabolic syndrome exhibited considerably higher ranges for both systolic and diastolic blood pressures (Table 1 and 2).

Table 2: Comparison of DBP in cases and controls.

Diastolic blood pressure (DBP) [mm of Hg]	Cases		Control	
	No	%	no	%
>85	16	29.6	54	100.0
<85	38	70.4	0	0.0
Total	54	100.0	54	100.0
Mean±SD	88.81±7.35		74.22±5.08	

Table 3: Comparison of TSH levels among cases and controls.

TSH (mIU/ml)	Cases		Controls	
	No	%	No	%
<0.45	0	0.0	0	0.0
0.45-4.5	35	64.8	50	92.6
>4.5	19	35.2	4	7.4
Total	54	100.0	54	100.0
Mean±SD	5.75±9.84		2.81±2.95	

Table 4: Thyroid status in cases and controls.

Thyroid Status	Cases (n = 54)		Controls (n = 54)	
	No	%	No	%
Euthyroid	35	64.8	50	92.6
Subclinical hypothyroid	13	24.1	1	1.9
Hypothyroid	6	11.1	3	5.6
Inference	Hypothyroid and Subclinical hypothyroid is significantly more associated with cases with P<0.001			

46 out of the 54 metabolic syndrome patients exhibited SBP >130 mg/dl. Results have been summarised from tables 1-4.

DISCUSSION

Present study clearly demonstrates that thyroid dysfunction is more prevalent in patients with metabolic syndrome. This finding of ours is in clear agreement with the famous Rotterdam study.[7] The Rotterdam study has also reported that patients with hypothyroidism have a twofold increased risk of atherosclerosis.[7]

The increase in serum cholesterol in hypothyroidism is accompanied by increased levels of serum phospholipids, serum triglycerides and LDL cholesterol. The activity of cholesterol ester transfer protein is decreased in hypothyroidism, thus HDL cholesterol level reduced in hypothyroidism. Aneemieke Ross et al found that free T4 was significantly associated with insulin resistance and with four of five components of the metabolic syndrome (except glucose intolerance).[8] Uzunlulu et al have reported similar findings as ours wherein the mean blood pressure, mean waist circumference, TSH levels, cholesterol and triglyceride levels were found to be considerably higher in patients with metabolic syndromes as compared to healthy controls.[9]

CONCLUSION

Thyroid dysfunction, metabolic syndrome, dyslipidemia are all individual risk factors for development of cardiovascular disease specially ischaemic heart disease. Therefore a concomitant presence of both these entities clearly increases the risk of cardiovascular disease. Thus screening of metabolic syndrome patients for thyroid function will equip clinicians with the insight of identifying individuals who are at greater risk of suffering a cardiovascular morbidity.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kylin E. Studies of the hypertension, hyperglycemia, hyper uricemia syndrome. Zentrolbi Internal Medicine. 1923;44:105-27.
2. Reaven GM. Role of insulin resistance in human disease. Diabetes. 1988;37:1595-607.
3. World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications: report of a WHO Consultation. Part 1:diagnosis and classification of diabetes mellitus. Geneva, Switzerland: World Health Organization; 1999.
4. Pradeeep BV. Prevalence and correlation of Metabolic syndrome in the adolescents. Indian J community medicine. 2015;10:43-8.
5. Manopriya, Gounder T. Prevalence of metabolic syndrome in local population in India. J croation society of medical Biochemistry and Laboratory Medicine. 2010;20(2):2049-52.
6. Fauci AS, Braunwald E, Kasper DL, Hauser SL, Longo DL, Jameson JL, et al. Harrison's Principles of Internal Medicine. 18th ed. USA: McGraw-Hill; 2012.
7. Daese MD. Effect of thyroxin therapy on serum lipoprotein in patients with mild thyroid failure. J Clin Endocrinol Metab. 2000;22:153-8.
8. Roos A, Bakker SJ, Links TP, Gans RO, Wolffenbuttel BH. Thyroid Function Is Associated with Components of the Metabolic Syndrome in Euthyroid Subjects. J Clin Endocrinol Metab. 2007;92(2):491-6.
9. Uzunlulu M, Yorulmaz E, Oguz A: Prevalance of subclinical hypothyroidism in patients with metabolic syndrome. Endocr J. 2007;54:71-6.

Cite this article as: Ray S, Sahu S, Poddar A. Thyroid dysfunction in metabolic syndrome: the ensuing storm. Int J Res Med Sci 2016;4:4434-7.