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PREVALENCE OF METABOLIC SYNDROME AND ITS COMPONENTS IN PATIENTS OF HYPOTHYROIDISM IN A NORTH INDIAN TERTIARY CARE HOSPITAL.

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ABSTRACT Thyroid disorders and metabolic syndrome are both individual risk factors for development of cardiovascular disease. Given the role that thyroid hormones play in regulating energy balance, metabolism of glucose, and lipids, researchers have pointed out towards the possibility of a relationship between hypothyroidism and metabolic syndrome. While the prevalence of metabolic syndrome in hypothyroid patients across the globe has varied from 35 to 50 %, studies in the Indian population have been scanty. In our study we found the prevalence of metabolic syndrome to be 43 % in hypothyroid patients and 26 % in euthyroid patients. Prevalences of raised waist circumference(WC), blood pressure, fasting blood glucose, triglycerides(TG) and lowered HDL in hypothyroid patients were 75%, 28%, 12%, 52% and 65% respectively, out of which WC (0.000), Systolic BP(0.035), TG(0.002) were significantly elevated. A significant rise in prevalence of metabolic syndrome as well as its individual components is seen in hypothyroid patients. Routine screening for cardiovascular risk factors in patients with thyroid disorders, especially in those with hypothyroidism, may assist in the detection of MetS.

KEYWORDS : Hypothyroidism, Metabolic Syndrome, Obesity, Hypertension

INTRODUCTION

Thyroid disorders and metabolic syndrome are considered to be amongst most common disorders across the world. Both are individual risk factors for development of cardiovascular disease, contributing to both mortality as well as morbidity [1]. The overall prevalence of hypothyroidism has been shown to vary from 0.2 % to more than 10% in studies conducted across different populations in the world [2]. In the Indian population alone, the overall combined prevalence of sub clinical hypothyroidism and overt hypothyroidism has been shown to be 15-30% [3]. Similarly, the worldwide prevalence of metabolic syndrome has been reported to be about 25 % [4], although this estimate varies widely due to the age, ethnicity, and gender of the population studied. In the Indian population, it has been shown to vary from 20-40% [5, 6].

Thyroid hormones are known to regulate carbohydrate and lipid metabolism in a no. of ways. Thyroid function is believed to be associated with glucose metabolism at various stages including absorption, peripheral assimilation, gluconeogenesis and decreased peripheral tissue disposal. Similarly hypothyroidism has also been associated with raised cholesterol, glucose, insulin levels as well as insulin resistance, altered insulin secretion [7,8,9].

Given the role that thyroid hormones play in regulating energy balance, metabolism of glucose, and lipids, researchers have pointed out towards the possibility of a relationship between hypothyroidism and metabolic syndrome.

While the prevalence of metabolic syndrome in hypothyroid patients has been shown to vary from 35 to 50 % in different studies across the globe (10-13), studies in the Indian population have been scanty. Two studies conducted in South Indian population showed a prevalence of 43 % and 53% respectively [14, 15]. No such study has been done in the North Indian population though.

Some studies have also attempted to evaluate the relationship between individual components of metabolic syndrome and hypothyroidism. Conflicting results have been reported. [16-17]

The current study was thus planned to estimate the prevalence of metabolic syndrome and its components in patients of hypothyroidism in a tertiary hospital in North India.

MATERIALS AND METHODS

A cross sectional study was conducted in the departments of Biochemistry and General Medicine, Govt. Medical College Hospital, Srinagar on two hundred patients out of which hundred were hypothyroid and hundred euthyroid. Known patients of hypothyroidism and their age and gender matched euthyroid controls attending medical OPD were selected for the study. Pregnant women, patients receiving steroids or lipid lowering agents and patients with serious systemic illness were excluded from the study.

Metabolic Syndrome was defined according to modified NCEP-ATP III criteria [18] as under:
Presence of any 3 of the following:

1. Waist circumference ≥ 90 cm in male, ≥80cm in female. (ethnicity specific) [18,19].
2. SBP: ≥130 mm of Hg or DBP ≥ 85 mm of Hg (or use of antihypertensive medications for treatment of hypertension).
3. TG: ≥150 mg/dl. (or drug treatment for elevated triglycerides)
4. HDL-C < 40mg/dl in male, <50 mg in female. (or drug treatment for reduced HDL)
5. Fasting glucose ≥ 5.6 mmol/L (100mg/dl) (or drug treatment for elevated blood glucose)

A self designed, pretested questionnaire that included relevant history, clinical details including anthropometric measures was used for the study. Sitting Blood pressure was measured at least after 10 minutes of rest by standard procedure. A second measurement will be made after at least 3 minutes. The mean of two measurements will be taken for systolic and diastolic blood pressure 10. Height in cm and weight in kg was measured with light clothing and without shoes. Waist circumference in cm was measured at the superior border of iliac crest in midaxillary line in accordance to NIH protocol [20].

Fasting morning serum sample were obtained. The blood was collected aseptically preferably from anticubital vein in a green top (heparinised) venipuncture tube. Thyroid hormones, lipid profile and blood glucose levels were then measured. When needed, the samples were refrigerated at 2-8°C for a maximum period of five days and at -20°C for up to 30 days.

Estimation of thyroid hormones (TSH, T3, T4, fT4) was done by Chemiluminescence immunoassay technique on Abbot i1000 analyser. Blood glucose and parameters of lipid profile were estimated by enzymatic methods on ABBOT c4000 analyser. Data was analysed using MS EXCEL 2007 and STATA 15.

A written informed consent was taken from the patients. Ethical clearance was sought from institutional ethical committee.

RESULTS

One hundred and nine hypothyroid patients and an equal no of euthyroid controls met the inclusion criteria for the study. The average age of the study population was 40.91 ± 14.69 years. Female patients(67%) were quite higher in proportion to males(33%) .

Prevalence of metabolic syndrome was found to be 43 % in hypothyroid patients and 26 % in euthyroid patients. Prevalence of individual components of metabolic syndrome in hypothyroid and euthyroid populations is summarized in Fig 1.

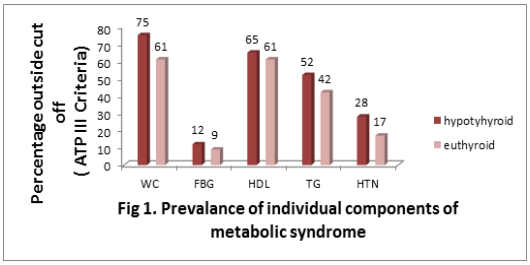

Fig 1. Prevalance of individual components of metabolic syndrome

While an increase in prevalence was seen in all 5 components of metabolic syndrome in patients of hypothyroidism as compared to euthyroid controls, the association was significant in obesity (waist circumference) (0.000), TG levels (0.002) and systolic BP levels (0.034) Table 1.

Table 1: Associations of individual components of metabolic syndrome with thyroid status

Components of metabolic syndrome						
	FBG	**TG**	**HDL**	**WC**	**BP**	
					Systolic	**Diastolic**
Hypothyroid	94±19	180±101	41±10	91±12	120±14	75±8
Euthyroid	93±19	144±61	43±12	85±11	117±11	73±7
p value	0.943	0.002	0.246	0.000	0.035	0.086

DISCUSSION

Thyroid hormones are known to regulate metabolism in a no. of ways. Thyroid function is believed to influence overall CVD risk significantly by affecting lipoprotein metabolism as well as some cardiovascular disease (CVD) risk factors. Hypothyroidism is associated with altered glucose metabolism at various stages including absorption, peripheral assimilation, gluconeogenesis and decreased peripheral tissue disposal. Studies have shown that thyroid disorders (hypo/hyper thyroidism) as well as euthyroid state with low thyroid function is associated with raised cholesterol, glucose, insulin levels as well as insulin resistance, altered insulin secretion [7,8,9]. Association between hypothyroidism and obesity has also been reported [21]. Hypothyroidism (overt as well as sub clinical) when associated with hyperlipidemia and elevated blood pressure, has been known to increase cardiovascular risk [22]. Given this role that thyroid hormones play in regulating energy balance, metabolism of glucose, and lipids, researchers have pointed out towards the possibility of a relationship between hypothyroidism and metabolic syndrome.

In our study, female patients were quite higher in proportion to males (67% females, 33% males). This can be attributed to the high prevalence of hypothyroidism in females as compared to males [14]. Prevalence of metabolic syndrome was found to be 43 % in hypothyroid patients and 26 % in euthyroid patients. This was similar to studies done in populations of Yemen [37% in hypothyroid, 17 % in euthyroid pateints], Nigeria [40 % in hypothyroid patients] Jeddah [51 % in hypothyroid] and South India[33 % in hypothyroid patients] [10-12,14]

The prevalence of components of metabolic syndrome in hypothyroid patients and euthyroid controls respectively was central obesity 82 (75%) and 61 (55%), high blood pressure 30 (27%) and 18(16%), reduced high density lipoprotein 71(65%) and 67 (61%), high serum triglyceride 57(52%) and 46(42 %) and raised fasting blood glucose 13 (12%) and 10 (9%).

These finding were partly comparable to study conducted by Bamashmos etal who found the commonest occurring metabolic syndrome defined criterion in hypothyroid patients were central obesity 89 (67.9%), high blood pressure 88 (67.1%), reduced high density lipoprotein (61%), high serum triglyceride (59.5%) and raised fasting blood glucose (54.9%). [12]. Also AbuAlhamael etal in a study found that 70.68 %, 31.03%, 34.48%, 79.31% and 70.6% of hypothyroid patients had abnormal waist circumference (WC), hypertriglyceridemia, abnormal high-density lipoprotein (HDL), hypertension and elevated serum levels of fasting blood sugar, respectively.[10]

While an increase in prevalence was seen in all 5 components of metabolic syndrome, the association was significant in obesity (waist circumference) (0.000), TG levels (0.002) and systolic BP levels (0.034) Table .This was in agreement to a similar study performed in a Yemeni population that found significance levels of .008, .001, .002 for the three parameters respectively. [12]

In other studies it has been shown that the risk of cardiovascular disease and the mortality rate increase with increasing waist circumference. A significant difference in abdominal obesity among groups may suggest that hypothyroidism may increase cardiovascular events and mortality risk by causing abdominal obesity [23].

CONCLUSION

A significant rise in prevalence of metabolic syndrome is seen in patients of hypothyroidism. Individual components of metabolic syndrome are also raised in hypothyroid patients. Thus hypothyroidism can serve as a significant risk factor in the development of Metabolic Syndrome specially by contributing to central obesity. Routine screening for cardiovascular risk factors in patients with thyroid disorders, especially in those with hypothyroidism, may assist in the detection of MetS. The effect of the treatment of hypothyroidism on metabolic components needs to be assessed by therapeutic trials.

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