

Prevalence of Metabolic Syndrome among Patients with Hypothyroidism

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ABSTRACT

Background: hypothyroidism is of concern in our society; it has an effect on metabolic parameters.

Objective: this study aimed to predict the prevalence of metabolic syndrome (MetS) among patients with hypothyroidism in Jeddah, Saudi Arabia and to determine the effect of treating hypothyroidism on MetS.

Methods: we conducted this cross-sectional study, in which MetS was defined by presence of at least three of the five AHA/NHLBI criteria. We included patients with hypothyroidism that were managed in an outpatient department or admitted in King Abdulaziz University Hospital from 1 March to 30 April 2016. We measured lipid parameters, blood pressure (BP), waist circumference (WC) and serum fasting blood glucose (FBG).

Results: in total 57 patients were included in our study, of which 47 (82%) were females. the majority of patients were greater than 50 years of age (n=35, 60%). We found that 36.8% of patients uncontrolled for hypothyroidism had high levels of TSH (serum level of TSH >5 mlu/L) , while 64.9% of patients who were controlled for hypothyroidism had normal levels of TSH (serum level of TSH 0.5 - 5 mlu/L). Overall, 71.9% (n=41) of hypothyroidism patients had MetS. However, we found that 51.8% (n=21) uncontrolled hypothyroidism patients suffered from MetS and 48.2% (n= 20) patients controlled for hypothyroidism suffered from MetS. However, 70.68 %, 31.03%, 34.48%, 79.31% and 70.6% of participants had abnormal waist circumference (WC), hypertriglyceridemia, abnormal high-density lipoprotein (HDL), hypertension and elevated serum levels of fasting blood sugar, respectively

Conclusion: hypothyroidism plays an important role in MetS. Future advanced studies including larger numbers of patients are needed to test the effect of treating hypothyroidism on MetS. Routine screening for cardiovascular risk factors in patients with hypothyroidism may unmask MetS.

Keywords: hypothyroidism, metabolic syndrome, euthyroid, medicine.

Abbreviations: WC: waist circumference, TG: triglyceride, BP: blood pressure, HDL: high-density lipoprotein, FBS: fasting blood sugar, AHA: American heart Association, NHLBI: National Heart Lung and Blood Institute.

INTRODUCTION

Hypothyroidism is a syndrome resulting from thyroid hormone deficiency, or in rare cases, inefficacy. It is a common endocrinological problem particularly affecting women and the elderly [1]. The prevalence of hypothyroidism in women and men is 2% and 0.1-0.2%, respectively [2].

One of the most important symptoms of hypothyroidism is weight gain or inability to lose weight [3]. Some studies have found a relationship between thyroid function and body weight in a small number of selected studies including obese individuals [4,5] or those with thyroid disease [6]. Some studies [4,5], but not all [6] have reported an association between thyroid function and body weight. Thyroid hormones play an important role in synthesis, metabolism and mobilization of lipids thus determining their effects on cholesterol synthesis [7].

However, overt hypothyroidism is a condition characterized by high thyroid stimulating hormone (TSH) and low serum free thyroxine (FT4), and is closely related to dyslipidemic conditions and coronary artery disease [8]. Overt hypothyroidism is reported as a recognized risk factor of atherosclerotic cardiovascular disease, hyperlipidemia, low-grade inflammation and hypercoagulability, which in turn, affect the cardiovascular system both directly by altering cardiac function through changes in myocyte specific gene expression and indirectly resulting in increased cardiac contractility and reduced systemic vascular resistance [9].

However there have been significant changes in the atherosclerotic risk factors including hypercholesterolemia, diastolic dysfunction, carotid intimal and media thickness and endothelial derived relaxation factor (nitric oxide) which are associated with overt hypothyroidism [9]. It is known that thyroid diseases are often associated with cardiovascular morbidity, but the mechanisms that mediate this risk are unclear. Metabolic syndrome (MetS) may be potentially responsible for this. Low thyroid function may attenuate elevations in ALT in the context of

MetS and insulin resistance^[10]. One study found that the prevalence of MetS was more common in females (61%) than males (39%)^[11]. Additionally, the development of MetS significantly increases in women after menopause^[12]. Female patients with MetS, have a higher prevalence of thyroid dysfunction, which predisposes them to cardiovascular events^[13]. A study conducted in Turkey also found that the frequency of thyroid dysfunction was higher in those with MetS^[14]. Additionally, a study conducted in Southern India showed that overt hypothyroidism increased the risk in females with MetS; patients had increased C-reactive protein, which is a sign of systemic inflammation^[15]. Higher levels of TSH indicative of hypofunctioning of the thyroid gland may predict MetS in Koreans^[16]. Insulin resistance may lead to a state of increased hepatic cholesterol production and very low clearance of low-density lipoprotein (LDL) and increased clearance of high-density lipoprotein (HDL)^[11]. Although the pathophysiology is still unclear, it is known that it is closely linked to insulin resistance and obesity^[10]. MetS constitutes a cluster of risk factors characterized by hypoglycemia, atherogenic dyslipidemia, symptomatic hypertension, and prothrombotic and proinflammatory conditions^[17].

The aim of our study was to predict the prevalence of MetS among hypothyroidism patients in Jeddah, Saudi Arabia. Additionally, we wanted to determine the effect of treating hypothyroidism on MetS.

METHODOLOGY

Design

We conducted a cross sectional study of patients with hypothyroidism who were managed in a medical outpatient department or admitted in King Abdulaziz University Hospital, in Jeddah, Saudi Arabia from 1 March to 30 April 2016.

Patients

We included adults received treatment for primary hypothyroidism who were managed in an outpatient department or admitted in King Abdulaziz University Hospital from 1 March to 30 April 2016. Patients were excluded if they were pregnant, had polycystic ovary syndrome, used steroids or antipsychotic medications and/or if they had pituitary or adrenal disease.

Primary Outcome

According to the AHA/NHLBI^[18] MetS is defined as the presence of at least three of the following criteria:

waist circumference (WC) greater than 40 and 35 inches in men and women, respectively; blood pressure (BP) greater than 130/85 mmHg or on treatment; fasting triglyceride (TG) levels greater than 150 mg/dl or on treatment; fasting HDL cholesterol levels less than 40 and 50 mg/dl in men and women or on treatment, respectively; and fasting blood sugar levels greater than 100 mg/dl or on treatment. Serum levels of TSH > 5 mlu/L were indicative of high levels of TSH, or uncontrolled hypothyroidism, while serum levels of TSH from 0.5 - 5 mlu/L were indicative of normal levels of TSH, or controlled hypothyroidism.

Statistical analysis

Data were analyzed using the statistical package for social science (IBM SPSS), version 22. We calculated the prevalence of MetS and its parameters in hypothyroid patients and displayed these data using frequencies and proportions.

Ethical Consideration

Our study was approved by The Research Ethics Committee at King Abdul-Aziz University Hospital, Jeddah and all participants provided informed consent.

RESULT

In total of 57 patients whom were included in our study 47 (82%) were females. The mean age (\pm standard deviation) was 56.7 \pm 11.6 years and 51.4 \pm 21.5 years among the patients who were and were not suffering from MetS, respectively; the majority of patients were of age greater than 50 years (n=35, 60%). We found that 36.8% of patients had high TSH levels or uncontrolled hypothyroidism (serum level of TSH >5 mlu/L), while 64.9% of patients had normal TSH levels or controlled hypothyroidism (serum level of TSH 0.5 - 5 mlu/L).

Overall, 71.9% (n=41) of hypothyroidism patients suffered from MetS (**Table1**).

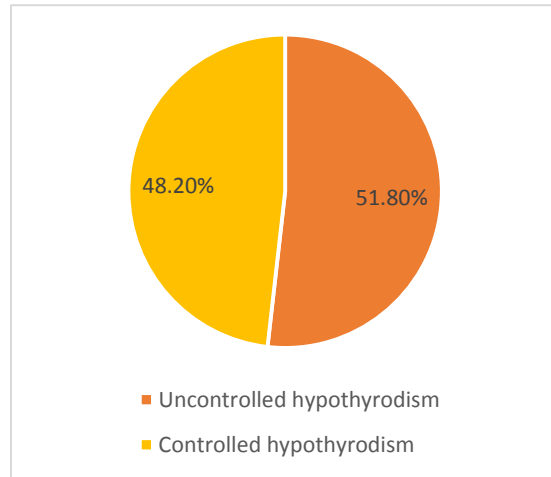
However, we found that 51.8% (n=21) of uncontrolled hypothyroidism patients suffered from MetS and 48.2% (n= 20) of controlled hypothyroidism patients suffered from MetS (**Figure 1**). Overall, 70.68% (n=41) of men and women had a WCs over 40 and 35 inches, respectively, and 31.03% (n=18) of men and women had hypertriglyceridemia. Although serum levels of fasting HDL cholesterol less than 40 and 50 mg/dl in men and women, respectively occurred in 34.48%(n=20) participants, hypertension was identified in 79.31%

(n=46)patients. Serum levels of fasting blood sugar greater than 100 mg/dl, were identified in 70.6% (n=41) of patients (**Figure 2**).

Table1. Sex and age distribution of our study group and measured serum levels of thyroid stimulating hormone, the prevalence of patients had metabolic syndrome

Variables	Categories	N (%)
Sex	Male	N=10(18%)
	Female	N=47 (82%)
Age	50> years old	N=35 (60%)
	<50 years old	N= 22 (40%)
Hypothyroidism	controlled	N= 37 (64.9%)
	uncontrolled	N= 21 (36.8%)
Metabolic syndrome	Metabolic syndrome	N=41 (71.9%)
	No Metabolic syndrome	N= 16 (28.1%)

Figure1.The prevalence of metabolic syndrome among



patients with controlled and uncontrolled hypothyroidism

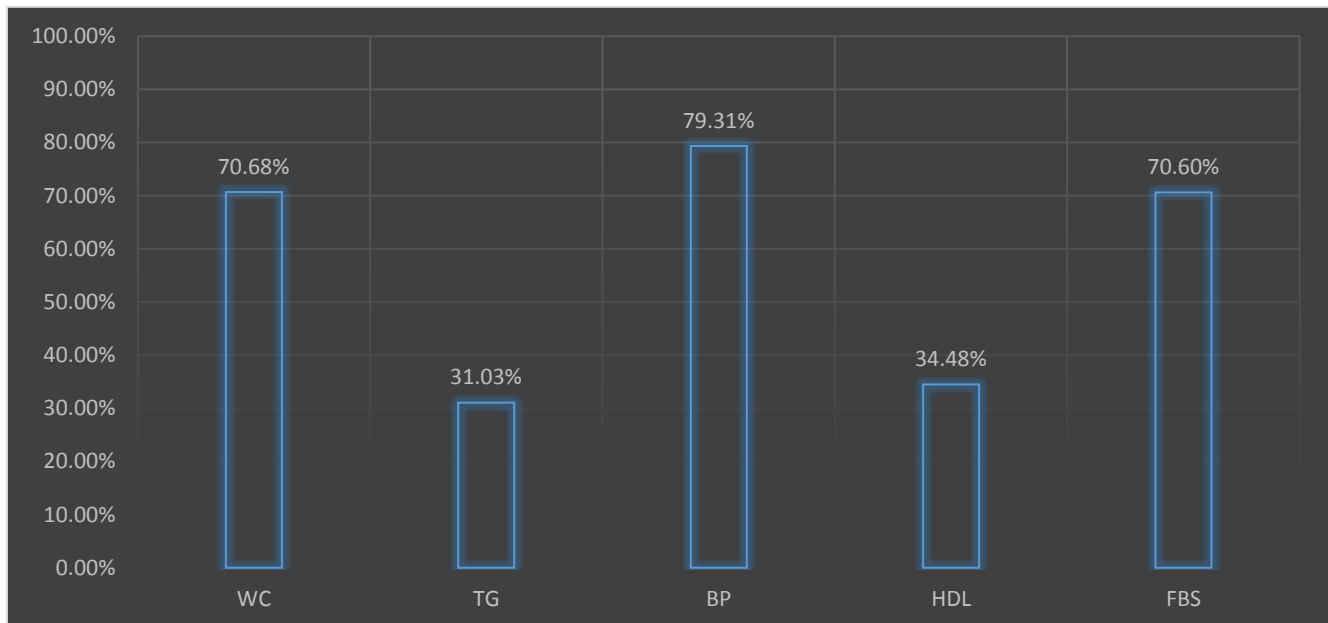


Figure 2. The prevalence of metabolic components among patients with hypothyroidism

DISCUSSION

The frequency of hypothyroidism varies among communities [19]. It is known that hypothyroidism affects MetS parameters via various metabolic changes [20]. However, the associations between overt hypothyroidism and MetS are well described; people

with high TSH levels have more than two times the risk of developing MetS [12, 21].

However, as was consistent with our study findings, hypothyroidism frequency in women was 2% while in men it was 0.1-0.2% [2]. MetS is a cluster of conditions defined by pre-defined diagnostic criteria, which are slightly different according to

various health organization definitions [22]. Moreover, metabolic changes and increased cardiovascular risk described in MetS patients [23] are very similar to the changes seen in patients with hypothyroidism. Hypothyroidism is associated with increased BP, [24] dyslipidemia, [25] and an increased cardiovascular risk [26].

These findings correlate with those from the Third National Health and Nutrition Examination Survey conducted in USA which showed that the prevalence of MetS in men and women was 22.8% and 22.6%, respectively. A previous study found that the prevalence of MetS rises from 7% among those aged 20-29 years to 40% among those over the age of 29 years; it reaches a plateau in those older than 60 years of age [27]. Another previous study revealed that MetS incidence increases with age (mean age 53±10.2 years) and that the peak incidence of MetS occurred in those 50-60 years of age, which was consistent with the findings in our study. Additionally, they found that the peak incidence of MetS occurred in males and females 52-84 and 52.8 years of age [11]. As was consistent with the findings in our study, another study revealed that the prevalence of MetS among patients with overt hypothyroid was 44%; this was significant ($P=0.002$). However, insulin resistance among patients in the overt hypothyroid group was 37% [2].

The complex interplay between insulin resistance and thyroid dysfunction results in diabetic dyslipidemia. The link between thyroid hypofunction and dyslipidemias well established. More than 90% of individuals with overt hypothyroidism will develop hyperlipidemia. Thyroid hormones regulate the metabolism and mobilization of lipids in the body. Hypothyroidism results in increased total cholesterol, apolipoproteins, TGs and LDL. Cell surface LDL receptors are responsible for LDL clearance from serum. In hypothyroidism, cell surface LDL receptors are reduced thereby decreasing the biliary excretion of cholesterol, resulting in elevation of serum LDL and VLDL levels. It also decreases the lipoprotein lipase activity causing triglyceridemia [28]. Presence or degree of hypothyroidism plays a role in the development of MetS. It has been proven that the risk of cardiovascular disease and the mortality rate increase with increasing WC [29].

A significant difference in abdominal obesity without a similar significant difference in body mass index among groups may suggest that hypothyroidism may increase cardiovascular events and mortality risk

by causing abdominal obesity. In various studies, a 0-50% prevalence of hypertension in hypothyroidism patients was reported [30]. MetS is comprised of a constellation of interrelated metabolic risk factors, in which components coexist more frequently in a given individual than could be expected by chance alone. These risk factors included abdominal obesity, raised TGs, low levels of HDL, elevated BP and dysglycemia [31].

CONCLUSION

Hypothyroidism plays an important role in the development of MetS, especially in patients with increased WC and insulin resistance, which are known to have direct negative effects on cardiovascular morbidity and mortality. The effect of the treatment of hypothyroidism on metabolic components needs further studies. Routine screening for cardiovascular risk factors in patients with thyroid disorders, especially in those with hypothyroidism, may assist in the detection of MetS.

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