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Research Article

The Prevalence of Subclinical Hypothyroidism in Patients with Metabolic Syndrome in Saudi Community based Hospital: A Retrospective Single Centre Study

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Abstract

Background and Objective: Thyroid gland is one of the important organ in human body and the burden of thyroid diseases in the general population and patients with Metabolic syndrome (MetS) is enormous. We aim to find out the prevalence of subclinical hypothyroidism (SCH) in patients with MetS in Saudi adults.

Design: We analyzed retrospectively 1764 participants between the age 18 to 89 years. Cases were selected from the primary care clinic at King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia. All data were collected on the basis of a review of electronic medical data. Patient who are pregnant were excluded. Patients with serum TSH level > 4.2 mU/L and normal FT4 level were taken as SCH. We defined MetS components using the 2006 IDF criteria. We separated cases into four groups: < 40 years, 40 - 49 years, 50 - 59 years and ≥ 60 years.

Results: 1764 subjects were included. There were 280 (15.9%) male and 1484 (84.1%) were female with mean age 44.9 ± 15.3 with mean body mass index 31.0 ± 7.4 kg/m2. SCH was present in 665 (37.7%). The mean TSH and FT4 values were 3.7 ± 2.4 mIU/l and 15.0 ± 2.0 pmol/l respectively. Patients with MetS were older than without MetS, 53.6 ± 12.4 vs. 37.1 ± 13.2, $p < 0.0001$. There were 674 (80.8%) female cases compared to 160 (19.2%) male cases, $p < 0.0001$. Moreover, SCH was more significantly more prevalent in patients with than in patients without MetS, (41.2% vs. 34.5%, $p = 0.004$). TSH and FT4 levels were significantly different between patients with and without Mets, (3.9 ± 2.5 vs. 3.6 ± 2.3, $p = 0.03$) and (14.9 ± 2.0 % vs. 15.1 ± 2.0%, $p = 0.01$) respectively. SCH was significantly increased with age in patients with than in patients without MetS within all age groups ($p = 0.004$) and non significantly different between each group. Moreover, SCH was non-significantly increased with age in male and female patients with MetS within all age groups ($p = 0.1$) and SCH in patients with MetS was not significantly different between genders across all age groups.

Conclusion: The prevalence of SCH in patients with MetS was high. The majority of our patients with SCH were old and predominantly females. These two observations remain to be validated by population-based studies.

Keywords: *Subclinical Hypothyroidism; Metabolic Syndrome; Saudi Arabia*

Introduction

The metabolic syndrome (MetS) is metabolic abnormalities which include central obesity, hyperglycemia, hypertension (HTN), dyslipidemia [1]. MetS was initially observed in 1923 by Kyln, who described the clustering of hypertension, hyperglycaemia and gout as the

syndrome [2]. Subsequently, several other metabolic abnormalities have been associated with this syndrome, including obesity, microalbuminuria, and abnormalities in fibrinolysis and coagulation [3]. In 1988, Gerald Reaven reintroduced the concept of Syndrome X for the clustering of cardiovascular risk factors like hypertension (HTN), glucose intolerance, high triglycerides (TG) and low high density lipoprotein (HDL) concentration [4]. The first official definition of MetS put forward by a working group of the World Health Organization (WHO) in 1999, a number of different definitions have been proposed. There have been several definitions of MS, but the most commonly used criteria for definition at present are from the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III), the International Diabetes Federation (IDF), and the World Health Organization (WHO) [5-10].

Thyroid hormones might play a role in regulating carbohydrate, lipids and protein metabolism [11]. Hypothyroidism affects MetS parameters including high density lipoprotein (HDLC), triglycerides (TG) and fasting blood glucose (FBS). Thyroid hormones are regulatory hormones that may be associated with MetS [12]. In a study conducted by Fahimeh., *et al.* the prevalence of euthyroid women with MetS was 16.9%, which was similar to its prevalence among women with subclinical hypothyroidism (SCH) (19.2%) [13]. Higher levels of thyroid stimulating hormone (TSH) indicative of hypofunctioning of the thyroid gland may predict MetS in Koreans [14]. About one sixth of the MetS patients attending the outpatient Department of a training and research hospital in Istanbul, Turkey were found to have SCH [15]. It is estimated that 20 - 25% of South Asian have MetS and many more are prone to develop it [16]. There are few local data regarding the relationship between SCH and MetS. We aim to find out the prevalence of subclinical hypothyroidism (SCH) in patients with MetS in Saudi adults.

Methods

We analyzed retrospectively 1764 participants between the age 18 to 89 years. Cases were selected from the primary care clinic at King Fahad Armed Forces Hospital, Jeddah, Saudi Arabia. All data were collected on the basis of a review of electronic medical data. Patient who are pregnant were excluded. The reference range values of TSH 0.22 - 4.2 mU /L and Free T4 12.0 - 22.0 pmol/L. Patients with serum TSH level > 4.2 mU/L and normal FT4 level were taken as SCH. We defined MetS components using the 2006 IDF criteria [17]. We separated cases into four groups: < 40 years, 40 - 49 years, 50 - 59 years and ≥ 60 years.

Statistical analysis

Univariate analysis of baseline demography between groups were accomplished using unpaired t-test and Chi square test were used for categorical data comparison. Pearson correlation was used for correlation. P value < 0.05 indicates significance. The statistical analysis was conducted with SPSS version 23.0 for Windows.

Results

1764 subjects were included. There were 280 (15.9%) male and 1484 (84.1%) were female with mean age 44.9 ± 15.3 with mean body mass index 31.0 ± 7.4 kg/m^2 (Table 1). SCH was present in 665 (37.7%). The mean TSH and FT4 values were 3.7 ± 2.4 mIU/l and 15.0 ± 2.0 pmol/l respectively. Patients with MetS were older than without MetS, 53.6 ± 12.4 vs. 37.1 ± 13.2, p < 0.0001. There were 674 (80.8 %) female cases compared to 160 (19.2%) male cases, p < 0.0001. Moreover, SCH was more significantly more prevalent in patients with than in patients without MetS, (41.2% vs. 34.5%, p = 0.004). TSH and FT4 levels were significantly different between patients with and without Mets, (3.9 ± 2.5 vs. 3.6 ± 2.3, p = 0.03) and (14.9 ± 2.0 % vs. 15.1 ± 2.0%, p = 0.01) respectively. SCH was significantly increased with age in patients with than in patients without MetS within all age groups (p = 0.004) and non significantly different between each group (Figure 1). Moreover, SCH was non-significantly increased with age in male and female patients with MetS within all age groups (p = 0.1) and SCH in patients with MetS was not significantly different between genders across all age groups (Figure 2).

Parameters		Total Present	Metabolic syndrome		P value
			Absent		
Numbers		1764	834 (47.3)	930 (52.7)	
Age (years)		44.9 ± 15.3	53.6 ± 12.4	37.1 ± 13.2	< 0.0001
Gender	Male	280 (15.9)	160 (19.2)	120 (12.9)	< 0.0001
	Female	1484 (84.1)	674 (80.8)	810 (87.1)	
Body mass index (kg/m^2)		31.0 ± 7.4	32.8 ± 6.8	29.4 ± 7.5	< 0.0001
Subclinical hypothyroidism		665 (37.7)	344 (41.2)	321 (34.5)	0.004
TSH (mIU/l)		3.7 ± 2.4	3.9 ± 2.5	3.6 ± 2.3	0.03
FT4 (pmol/l)		15.0 ± 2.0	14.9 ± 2.0	15.1 ± 2.0	0.01

Table 1: *Base line characteristics and bivariate analysis for patients with metabolic syndrome [mean ± standard deviation or number (%)].*

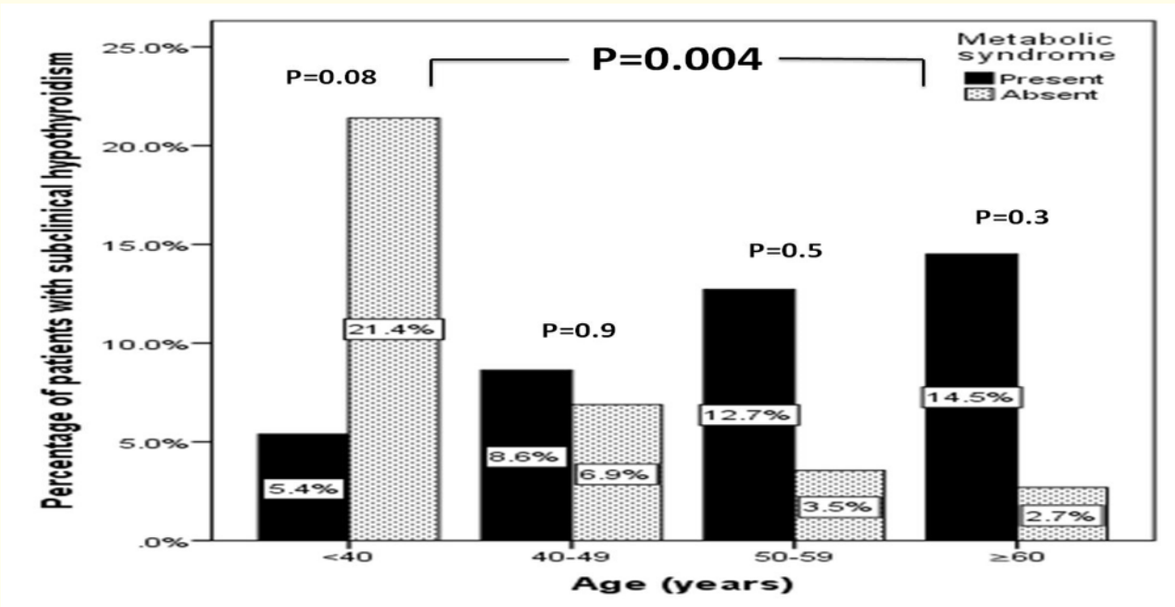

Figure 1: *Percentage of patients with subclinical hypothyroidism in patients with and without metabolic syndrome in correlation to age groups.*

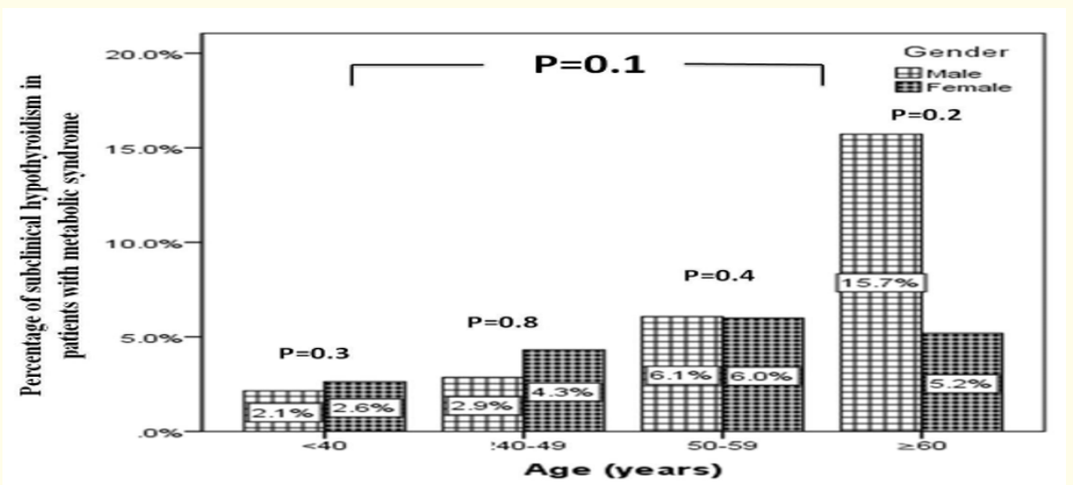

Figure 2: *Percentage of patients with subclinical hypothyroidism in patients with metabolic syndrome in correlation to gender and age groups.*

Discussion

Hypothyroidism and MetS are considered as risk factors for cardiovascular disease. We investigated the prevalence of SCH in MetS. In the present population based study of 1764 cases, we found SCH was present significantly in patient with Mets (41.2% vs. 34.5%, p = 0.004). Our results are in agreement with previous studies [13,18-22]. Meher LK., *et al.* showed a high prevalence of SCH (22%) in the MetS subjects [18]. A similar publication from India has shown a high prevalence of SCH (21.90%) in patients with MetS [19]. A study from Taiwan reported that SCH were present in 7.21% [11]. A study from Nepal showed that the prevalence of SCH (29.32%) [20]. In a study conducted by Fahimeh., *et al.* the prevalence of SCH among women was 19.2% [13]. A study by Khatiwada., *et al.* identified thyroid dysfunction as a common endocrine disorder in MetS patients; SCH (26.6 %) was the commonest [22].

We observed SCH to be more common in females than males patients (74.4 % vs. 25.6%, p = 0.009) which is in agreement with Uzunulu., *et al.* and Meng., *et al.* and this has been observed in a number of studies including the general population [15,19,23]. This is attributed to the higher iodine requirements in females; moreover, changes in reproductive hormones also cause changes in thyroid hormone levels. In addition, some females develop autoimmune antibodies to thyroid during pregnancy, which causes postpartum subacute thyroiditis and can increase the risk of developing permanent hypothyroidism [24]. In the present study, SCH was more common in the age group 60 ≥ years older (14.5%) which older than previously reported and in concordance with Singh., *et al* [25,26].

TSH significant positively associated with obesity (r = +0.07, p = 0.002) and FT4 significant negatively associated with obesity (r = -0.06, p = 0.01). In a study in Germany, euthyroid subjects with TSH in the upper normal range (2.5 - 4.5 mU/L) were more obese (BMI > 30 Kg/m^2), had an increased likelihood of having MetS [27]. The positive correlation between SCH and obesity may be due to increased TSH levels in obese individuals include neuro-endocrine dysfunction, leptin-induced hypothalamic-pituitary axis alteration, and thyroid hormone resistance due to partially bio-inactive TSH protein. Studies have reported a correlation between TSH and leptin which might indicate that leptin might have an important role in the link between TSH and obesity [28].

Our study also suggested that TSH was significantly higher while FT4 levels were significantly lower in patients with than without MetS (3.9 ± 2.5 vs. 3.6 ± 2.3, p = 0.03) and (14.9 ± 2.0 % vs. 15.1 ± 2.0%, p = 0.01) respectively in agreement with other studies [19,21,29]. In accordance to our study, Park., *et al.* found that levels of TSH above the normal reference range are associated with risk of MetS [30].

We aimed to identify the prevalence of SCH in patients with MetS in primary health care setting. Due to the retrospective nature of this study, Our studied population reflects a selected yet comprehensive group of patients rather than the general population. The current study population may appear limited in size and therefore may underestimate the true frequency of SCH in the general population.

Conclusion

In conclusion, the prevalence of SCH in patients with MetS was high. The majority of our patients with SCH were old and predominantly females. These two observations remain to be validated by population-based studies. Larger studies involving diverse population samples could help to provide further information on the true frequency nationally.

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Conflict of Interests

The authors declare no conflict of interests.

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