Journal of Endocrinology and Diabetics Research

Research Article

A SCITECHNOL JOURNAL

Presence of subclinical hypothyroidism among patients having metabolic syndrome-A Cross-sectional study

Hafiz Muhammad Khize*, Nasir Farooq Butt, Rabia Rathore and Fawad Ahmad Randhawa

Abstract

Introduction: Thyroid gland is an imperative organ and is immense in terms of the overall burden of thyroid disease and metabolic syndrome. The study focused on observing the presence of subclinical hypothyroidism in metabolic syndrome patients.

Methodology: The study design of this research was cross-sectional and it was conducted at Department of Endocrinology and Metabolic Medicine, Mayo Hospital, Lahore from February 2020 to September 2020. Total 186 patients with metabolic syndrome were included. Blood pressure, abdominal circumference, serum glucose levels, serum triglycerides and serum HDL levels were recorded. Serum Thyroid Stimulating Hormone (TSH), free T3 and free T4 levels were checked for assessing the subclinical hypothyroidism. The diagnosis of metabolic syndrome was made by National Cholesterol Education Program Expert Panel (NCEP) and Adult Treatment Panel III (ATP-III) diagnostic criteria. Data were analyzed using software SPSS v25.0. Stratification of age, gender and socioeconomic status was done to see their effect on outcome variable. For post-stratification, Chi-Square test was used; p-value ≤ 0.05 was considered significant.

Results: Out of total 186 patients with metabolic syndrome, there were 58.6% male and 41.4% female. The mean age of the patients was 50.6 ± 11.8 year. Frequency of subclinical hypothyroidism among patients with metabolic syndrome was observed in 34(18.3%) patients.

Conclusion: In patients with metabolic syndrome the incidence of subclinical hypothyroidism was statistically significant.

Keywords: Subclinical; Hypothyroidism; Metabolic Syndrome

Introduction

Sub Clinical Hypothyroidism (SCH) is a prevalent disorder among adult population; which is mostly underestimated. Thyroid dysfunction disturbs Metabolic Syndrome (MetS) parameters namely HDL cholesterol, triglycerides, blood pressure and plasma glucose. On the contrary, the association between MetS and thyroid dysfunction is not clearly documented. In SCH, serum Thyroid Stimulating Hormone (TSH) is elevated above the normal range whereas the serum concentration of free circulating T3 and free T4 remains within normal values [1]. Depending on older age and female patients, the incidence of subclinical hypothyroidism varies from 4% to 10%. In women, it is more common [2]. Thyroid dysfunction is a contributing factor of atherosclerotic cardiovascular disease by affecting lipid and glucose metabolism and blood pressure [3]. A number of lipid- and non-lipid factors contribute to increased risk of cardiovascular disease are known as metabolic syndrome [1]. For metabolic syndrome, various definitions have been used. Under national diagnostic guidelines, metabolic syndrome involves abdominal obesity, elevated triglycerides, decreased HDL, elevated blood glucose and high blood pressure according to National Cholesterol Education Program (NCEP) and the Adult Treatment Program III (ATP-III) diagnostics [4]. The risk of cardiovascular disease is elevated by both subclinical hypothyroidism and metabolic syndrome. Several studies have been undertaken to determine the relation between metabolic and subclinical hypothyroidism. In one study by Gyawali et al. 29.2% of patients with metabolic syndrome reported a prevalence of subclinical hypothyroidism.3 Study done in Venezuela by Bermúdez and colleagues showed that prevalence of subclinical hypothyroidism was 10.5% [5]. There is scanty local data regarding existence of subclinical hypothyroidism in metabolic syndrome patients. This study was developed to determine the frequency of subclinical hypothyroidism amongst patients with metabolic syndrome presenting to the largest public sector hospital in Punjab, Pakistan.

Methodology

The cross-sectional survey was conducted at Department of Endocrinology and Metabolic Medicine, Mayo Hospital, Lahore from February 2020 to September 2020. Total of 186 patients with metabolic syndrome and ages between 30 years-70 years were included. The exclusion criteria were patients on levothyroxine treatment and not given consent. Sample size 186 was estimated by using 3% margin of error with 95% confidence level and taking an expected percentage of subclinical hypothyroidism as 4.55% in patients with metabolic syndrome [5]. All patients who fulfilled inclusion criteria underwent investigation and examination after written informed consent. Patients presenting to outpatient department were checked for metabolic syndrome. Blood pressure, abdominal circumference, serum glucose levels, serum triglycerides and serum HDL levels were ordered on OPD basis. Serum Thyroid Stimulating Hormone (TSH), free T3 and free T4 levels were checked for assessing the subclinical hypothyroidism. Subclinical hypothyroidism was considered as TSH concentration of more than 4.20μIU/mL and less than 10 μIU/mL with fT3 in a normal range of 2.8-6.5 pmol/L and free T4 in a normal range of 11.5-23 pmol/L. The diagnosis of metabolic syndrome was made by National Cholesterol Education Program Expert Panel (NCEP) and Adult Treatment Panel III (ATP-III) diagnostic criteria. Data were analysed using software SPSS v25.0. Mean ± S.D was calculated for quantitative variable like age. Qualitative variables were calculated in frequencies and percentages like socio-economic status, gender and subclinical hypothyroidism. Stratification of age, gender and socioeconomic status was done to see their effect on outcome variable. For post-stratification, Chi-Square test was used; p-value ≤ 0.05 was considered significant (Table 1).

Table 1: NCEP: ATP III diagnostic criteria for metabolic syndrome.

Presence of three or more of these components	
Component	**Criteria**

***Corresponding author:** Hafiz Muhammad Khize, Department of Endocrinology, Mayo Hospital, Lohore, Punjab, Pakistan, Tel no: +92-322-492-4015; E-Mail: hmkhizer@gmail.com

Tel: : +92-322-492-4015; E-mail: hmkhizer@gmail.com

Received: August 8, 2021; **Accepted:** August 23, 2021;

Published: August 30, 2021

Abdominal obesity: Increased waist circumference	Men: > 40 inches Women: > 35 inches
Elevated triglycerides	> 150 mg/dl or drug treatment for elevated triglycerides
Reduces HDL-Cholesterol (HDL-C)	Men: >40 inches Women: >50 inches
Elevated blood pressure	> 130/85 mm Hg or Drug treatment for elevated blood pressure
Elevated fasting glucose	> 100 mg/dl or drug treatment for elevated glucose

Results

Total of 186 patients with metabolic syndrome were included in this study. There were 58.6% male and 41.4% female. The mean age of the patients was 50.6 ± 11.8 year. Among 186 patients, 70(37.6%) patients were in 30-45 years age group, while 64(34.4%) and 52(28.0%) were in 46-60 years and >60 years age groups respectively. According to socio-economic status, it was observed that 26.9% of patients belonged to poor class, 40.9% to middle class and 32.3% were from high class. Subclinical hypothyroidism frequency among patients with metabolic syndrome was observed in 34(18.3%) patients. Stratification techniques was used to observed effect of confounding variables and noted that rate of subclinical hypothyroidism was equal in male and female (p=0.977). Similarly, frequency of Subclinical hypothyroidism was almost same in all age groups; p=0.366), while frequency of Subclinical hypothyroidism was statistically significant among socio-economic status, poor class have more chances to have subclinical hypothyroidism (p=0.0004) (Tables 2 and 3).

Table 2: Frequency distribution of demographic variables.

Variables	Frequency	Percentage
Age groups		
30 years -45 years	70	37.60%
46 years -60 years	64	34.40%
>60 years	52	28.00%
Gender		
Male	109	58.60%
Female	77	41.40%
Socio-economic status		
Poor (<20,000/month)	50	26.90%
Middle (20-50,000/month)	76	40.90%
High (>50,000/month)	60	32.30%
Subclinical hypothyroidism		
Yes	34	18.30%
No	152	81.70%

Discussion

Hypothyroidism and metabolic syndrome are amongst many cardiovascular disease risk factors. In metabolic syndrome, we studied the occurrence of subclinical hypothyroidism. We found a substantial prevalence of subclinical hypothyroidism in patients with metabolic syndrome in the latest population-based sample of 186 cases (18.3%). Our findings are consistent with previous researches [6-11]. In subjects affected by metabolic syndrome Meher LK et al. demonstrated high prevalence of subclinical hypothyroidism (22%) [7]. A related study from India demonstrated a high prevalence of subclinical hypothyroidism (21.9%) in metabolic patients [8] A Taiwan study confirmed the existence of 7.21% of subclinical hypothyroidism

Table 3: Stratification of subclinical hypothyroidism with respect to demographic variables.

Subclinical hypothyroidism			
Variables	**Yes**	**No**	**p-value**
Age groups			
30-45 years	12(17.1%)	58(82.9%)	0.366
46 to 60 years	15(23.4%)	49(76.6%)	
>60 years	7(13.5%)	45(86.5%)	
Male	20(18.3%)	89(81.7%)	0.977
Female	14(18.2%)	63(81.8%)	
Socio-economic status			
Poor (<20,000/month)	17(34.0%)	33(66.0%)	
Middle (20-50,000/month)	14(18.4%)	62(81.6%)	0.0004
High (>50,000/month)	3(5.0%)	57(95.0%)	

[12]. The high prevalence of subclinical hypothyroidism was also shown by a report from Nepal (29.32%) [3]. The most widely recorded thyroids dysfunction was a study by Khatiwada, etc. in patients with Metabolic syndrome, as a common endocrine condition.[11] This study has shown similar prevalence of subclinical hypothyroidism in female and malepatients, 18.3 and 18.2 respectively, which coincide with Uzunulu et al. and Meng et al. [13,14]. Studies in recent past have shown significant association between subclinical hypothyroidism and metabolic syndrome, and it highlights the importance of thyroid function tests in patients with metabolic syndrome [5-15]. In the present research, subclinical hypothyroidism was more prevalent (23.4%), in the age group 46-60 years which are in accordance to the results of Deshmukh and associates [16]. Choudhary and associates did a cross sectional study on 200 patients having metabolic syndrome. They explored the thyroid dysfunctions in these patients. Results showed that the prevalence of thyroid dysfunction in metabolic syndrome was 41.5% out of which 27% had subclinical hypothyroidism. These patients also had significantly high metabolic components like triglycerides, fasting blood glucose, waist circumference and blood pressure. It was concluded that patients of metabolic syndrome had high prevalence of subclinical hypothyroidism which further increases their cardiovascular risk. In our study 18.3% patients of metabolic syndrome had subclinical hypothyroidism [17]. Aljabri and colleagues assessed 798 patients with metabolic syndrome and found that 242 (30.3%) had subclinical hypothyroidism. They also found that out of 242 patients with subclinical hypothyroidism, 180 (74.4%) were female and 62 (25.6%) males. Interestingly prevalence was also higher in elderly patients (age more than 60 years). In our study 18.3% patients of metabolic syndrome had subclinical hypothyroidism and prevalence was similar in male and female patients. Results of our study also showed that prevalence was high in age group 46 to 60 years [18]. Cheserek et al did a research on 1150 university employees and concluded that subclinical hypothyroidism was associated with metabolic syndrome in male workers and not in females. This is in contrary to our study where prevalence of subclinical metabolic syndrome was equal in male and female patients having metabolic syndrome [19]. In a meta-analysis, Eftekharzadeh et al. studied the patients at risk of MetS in SCH, female patients were more

widespread in the SCH group, the observation that was consistent with the current study. Moreover, no substantial difference in MetS prevalence between SCH and euthyroid individuals was observed in the meta-analysis. Nevertheless, in the SCH group, central obesity was significantly higher. Another interesting observation seen in the meta-analysis that hypertriglyceridemia was more prevalent in the female patients of SCH subgroup. The study however concluded that despite some components of MetS being were more prevalent in SCH, the prevalence of MetS was not increased in SCH as per ATP III criteria [20]. Mehran L et al on the other hand studied spectrum of thyroid dysfunctions among MetS population along with SCH which were 5% of the total sample size. They inferred that compared to other groups, clinically patients with hypothyroidism had the maximum prevalence of MetS, abdominal obesity and hypertriglyceridemia which was statistically significant. MetS was more prevalent in male patients who were clinically hypothyroid which was contrary to our observation. Statistically insignificant association between overt hypothyroidism and MetS was calculated. In patients who had subclinical hypothyroidism with age exceeding 50 years, higher risk of Mets was observed, another finding which was conflicting to the current study [21]. Lee MK et al conducted an interesting observational study recently in which they studied the association of SCH with MetS in adolescent population. The prevalence of MetS was 2.5% in the overall study population with predominance of male subjects. The risk of MetS was equally distributed amongst SCH and euthyroid subjects. Nevertheless, the risk of abdominal obesity was more prevalent in SCH subjects in contrast to euthyroid subjects after adjusting for age, gender and body mass index among the components of MetS [22]. On the whole, the current study further endorsed the findings of most of the previous studies conducted to find the relationship between SCH patients with MetS. Some studies had conflicting results which can be observed due to sample size and study design.

Conclusion

In patients with metabolic syndrome, the presence of subclinical hypothyroidism was statistically significant. In patients having Metabolic Syndrome, thyroid function tests should be done for managing them appropriately.

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Department of Endocrinology, King edward Medical University, Pakistan