ejpmr, 2022,9(12), 379-383

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Research Article

ISSN 2394-3211

EJPMR

PREVALANCE OF SUBCLINICAL HYPOTHYROIDISM IN ADULTS IN DELHI

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Article Received on 18/10/2022 **Article Revised on 08/11/2022** **Article Accepted on 28/11/2022**

ABSTRACT

Background and objectives: Subclinical hypothyroidism is an asymptomatic condition with normal thyroxin and raised thyroid stimulating hormone (TSH) level. The prevalence of this condition varies according to the reference range for TSH and geographic or demographic factors.The objective of the study was to determine the prevalence of subclinical hypothyroidism and explore the relationship of TSH level with age, gender and the family history of thyroid disease. **Subjects and methods:** A cross-sectional study of adults was done in Ambedkar medical college from January 2019 to January 2020 in which TSH concentration and free T4 levels were measured. Descriptive analysis was performed on all variables in study, and relationships were explored using chi-square, *t*-test, analysis of variance, and linear regression. **Results:** A total of 680 adults out of 788 participants in the study gave blood samples. Subclinical hyperthyroidism was identified in 2.1% (p = .001) and subclinical hypothyroidism in 10.3% (p = .001) of the adults .TSH levels were found to be significantly higher (p = .047) in elderly population of ≥60 years and those with family history of thyroid disease. No overt hyperthyroidism or hypothyroidism was found in our study sample. **Conclusion:** Subclinical hypothyroidism has a prevalence of 10% of adults visiting Ambedhkar medical college. TSH levels are higher in the elderly, which warrants screening of those aged 60 years and above.

KEYWORDS: Prevalence, Risk factors, Subclinical hypothyroidism, Subclinical hyperthyroidism.

INTRODUCTION

Subclinical hypothyroidism is a diagnosis based on elevated thyroid stimulating hormone (TSH) level concentration and normal free T4. Patients can occasionally have symptoms of lethargy, anhedonia, and weight gain but mostly patients are asymptomatic and findings are incidental.[1,2] However, some studies have shown that the risk of cardiovascular disease increases in patients with abnormal TSH. Therefore, the burden of this condition should be verified in view of its high prevalence in the general population. There are studies that show many negative effects of elevated TSH on health. It was found to be associated with cardiac dysfunction [3,4] and higher low-density lipoprotein cholesterol.[5] Some studies even showed that subclinical hypothyroidism is association with depression and cognitive dysfunction.[6,7]

Many patients with subclinical hypothyroidism eventually develop overt hypothyroidism each year at the rate of 4.3–8%, with the elderly having a higher predisposition.[8,9,10] Subclinical hypothyroidism prevalence increases in women with increasing age and is more common in elderly females (7–18%) than males (2–15%).[11,12,13]

The treatment of subclinical hypothyroidism is considered if the patient is pregnant, has infertility, has associated symptoms, has a risk of cardiovascular disease, in old patients or has high risk of progression to overt hypothyroidism. The well-known risk factors of subclinical thyroid diseases or their progression are baseline TSH level, old age, female sex, and the presence of thyroid autoantibodies.

The prevalence of subclinical hypothyroidism varies with population, age, sex, race, region, and method of TSH measurement. TSH is heterogeneous with respect to both glycosylation and biological activity[14] and thus the normal reference range for TSH should be standardized.[15]

In the Whickham, England survey conducted in 1977 and including 2,779 people.[16] Subclinical hypothyroidism was defined as elevated serum TSH above the 97.5 percentile (6 mIU/L) in the absence of obvious clinical features of hypothyroidism. They also showed that TSH level was increased to greater than 6 mIU/L in 7.5% of females and 2.8% of males.[16] TSH level did not vary with age in men but increased markedly in women over the age of 45 years. The National Health and Nutrition

Examination Survey (NHANES) III, which was performed from 1988 to 1994, included 16,533 people without thyroid disease in the United States.[17] A reference population of 13,344 people was selected after excluding those who were pregnant, were taking androgens or estrogens, had thyroid antibodies or showed biochemical hyperthyroidism or hypothyroidism. The 2.5th and 97.5th percentiles of TSH were 0.45 and 4.12 mIU/L, respectively.[17] With the criteria of subclinical hypothyroidism at TSH level greater than 4.5 mIU/L, 4.3% of subjects were defined as having subclinical hypothyroidism.[17] The prevalence of subclinical hypothyroidism and the positivity of antithyroid antibodies were about twice in females, increased with age, and were about three times greater in whites than in blacks.[17]

Subclinical hypothyroidism showed a higher prevalence in women (6% to 10%) than in men (2% to 4%) in all previous studies. It has been reported in up to 20% of women older than 60 years.[18]

Age is one of the most important risk factors according to many studies.[19] A 13-year follow-up of the Busselton Health surveys revealed that the mean serum TSH increased from 1.49 to 1.81 mIU/L, whereas the level of free T4 remained unchanged.[20] An age-related TSH increase could be a normal physiologic response to compensate for the decrease in TSH biological activity due to age-related changes in TSH glycosylation[21] or decreased sensitivity of the thyroid gland to TSH is another possible mechanism.[22] As there is increased prevalence of thyroid autoantibodies with aging ,so there is importance of age-specific reference ranges of TSH.[23,24] Serum TPO Ab and Tg Ab are commonly found in patients with autoimmune thyroid disease.[25,26]

Another risk factor is the iodine intake. Excessive iodine intake could decrease thyroid function via a direct toxic effect[27] or via immunological alterations.[28]

With regard to other risk factors of subclinical hypothyroidism, racial differences,[29] cigarette smoking[30] cold environmental temperature and seasonal changes have also been suggested.

METHODOLOGY

Total 680 adults were studied who visited Ambedkar Medical College from Janury 2019 to January 2020. Patients taken were 18 years or older, with no history of thyroid disease or thyroid surgery and the reason for consultation was not related to thyroid illness. Pregnant women and patients on medications that may affect thyroid function, e.g., amiodarone, lithium or steroids, were excluded from the study.

Consent was taken and a form was filled which included variables such as age, gender, reason for consultation, past medical history and the symptoms of thyroid disease.In addition, medication history specifically about antithyroid drugs, thyroxine, amiodarone, steroids, and lithium, was obtained. Women were asked about pregnancy, lactation, and use of birth control pills. Family history of thyroid disease and use of iodized salt was documented, as well as physical examination including weight, height, and signs of thyroid disorder (goiter, exophthalmos, myxoedma) were recorded.

Blood samples were taken for serum TSH and free T4 levels which were measured by chemi-luminescent immunoassay. Serum TSH had a laboratory reference range of 0.35–4.94 mU/L while free T4 had a range of 9.0–19.0 pmol/L.

Descriptive analysis was carried out, estimating mean, standard deviation (SD), for variables such as age, TSH level, T4 level, body mass index (BMI), weight and height.Subjects were further categorized according to measurements of serum TSH and free T4 levels as follows:

(1) Overt hyperthyroidism (serum TSH < 0.35 mIU/L with raised free T4).
(2) Subclinical hyperthyroidism (serum TSH <0.35 mIU/L with normal free T4).
(3) Euthyroid (serum TSH 0.35–4.94 mIU/L with normal free T4).
(4) Subclinical hypothyroidism (serum TSH >4.94 mIU/L with normal free T4),
(5) Overt hypothyroidism (serum TSH >4.94 mIU/L with low free T4).

To explore relationships between variables, chi-square, *t*-test, analysis of variance, and linear regression were carried out.

RESULTS

Of the 788 study subjects with no history of thyroid disease, 372were males and 416 females, with a mean age of 41 + 12 SD years (range 18–89 years). Of these individuals, 680 submitted laboratory samples, 596 were euthyroid, 70 (10.3%) had subclinical hypothyroidism, and 14 (2.1%) had subclinical hyperthyroidism based on predefined cut-off values of TSH level. No overt hypothyroidism or hyperthyroidism was detected (Table 1). Interestingly, in our study only 17% had normal BMI, while over 39% were overweight and 42% were obese. One-third of the participants was not using iodized salt.

Table 1: TSH levels and participant characteristics (n-680).

Characteristics	Mean	± SD
Age (years)	41	± 11.96
Weight (kg)	77.37	± 16.59
Height (cm)	162.05	± 8.72

BMI (kg/m^2)	29.49	± 5.482

Characteristics	Mean	Percentage %
Male	372	47.1
Female	416	52.9
Use iodized salt		
Yes	532	67.6
No	256	32.4
Body mass group		
Low <18.5	13	1.9
Normal 18.5–24.9	118	17.4
Over weight 25–29.9	262	38.5
Obese 30+	287	42.2
Tsh level (mu/l) (*n* = 680)		
High >4.94	70	10.3
Normal 0.35–4.94	596	87.6
Low <0.35	14	2.1

Eighty-seven percent of subjects (n = 596/680) were euthyroid as indicated by their serum TSH concentration. 14 subjects (2.1%, p = .001) had subclinical hyperthyroidism and a total of 70 subjects (10.3%, p = .001) had subclinical hypothyroidism .No overt hyperthyroidism or hypothyroidism were detected.

The prevalence of subclinical hyperthyroidism among males was 2.5% and females was 1.7%, and prevalence of subclinical hypothyroidism among males was 9.8% and among females was 10.7%.

Other factors like BMI, co-morbid cardiovascular diseases, symptoms of hypothyroidism, iodized salt-intake, or use of birth control pills were statistically significantly associated with elevated TSH levels. Trends were noted with presence of hyperlipidemia, family history of thyroid disease, and higher TSH levels >4.94 mU/L. However, when age was re-categorized into two groups of ≥60 years and <60 years, the mean TSH levels were 3.34 and 2.48, respectively, t-statistic = 1.99, p = .047).

In the analysis by category of TSH, the correlation between TSH groups (low, normal, and high) and T4, statistically significant difference was noted in the mean values of T4 between the groups (F = 7.46, p = .001) .On further analysis using Tukey test, difference was noted between the low and high groups (p = .001), and normal and high groups (p = 0.016). On linear regression, a weak inverse relationship was found between TSH and T4 levels (R= −0.231, F = 17.4, p < .001). No statistically significant relationship was found between BMI, weight, height, and TSH groups. A non-significant upward trend was also noted between mean BMI and increasing TSH levels.

DISCUSSION

This cross-sectional study provides data on the prevalence of subclinical hypothyroidism and the relationship of TSH levels with age, gender, co-morbid conditions, family history of thyroid disease, iodized salt intake, BMI, and some other factors. The prevalence of subclinical hyperthyroidism was 2.1%, and subclinical hypothyroidism was 10.3% in this study.

In Europe, where iodine intake is variable, subclinical hypothyroidism is more prevalent in areas of iodine sufficiency.[8] In our study, however, in the participants who did not use iodized salt TSH levels were high (13.3%) compared to the participants who used iodide salt in their diet (8.9%), although this was not a statistically significant difference.

In one study on women, subclinical hypothyroidism was found to be associated with hypertriglyceridemia and increase in BMI.[31] In our study, we did find higher TSH level to be associated with presence of hyperlipidemia in the patients; however, this association was not statistically significant (p = .076). BMI showed no association with high TSH level in our study.

Subclinical hypothyroidism occurs in about 15% of women over the age of 60 years[32] and 8% of elderly men.[11] The prevalence in women over age 80 years is lower, about 6% .In our study, 15.4% of those 60 years and above had subclinical hypothyroidism, while only 9.9% of <60 years age had high TSH, and this was not statistically significant; however, mean TSH was significantly higher in elderly.

The present study highlights the need for initiating thyroid screening among adults, particularly elderly >60 years old.

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