


RESEARCH ARTICLE



Prevalence of subclinical hypothyroidism in adults visiting primary health-care setting in Riyadh

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ABSTRACT

Background and objectives: Subclinical hypothyroidism is an asymptomatic condition with normal thyroxin and raised thyroid stimulating hormone (TSH) level. The objective of the study was to determine the prevalence of subclinical hypothyroidism in primary health care (PHC) settings in Riyadh and explore the relationship of TSH level with age, gender, family history, body mass index, and co-morbid conditions.

Subjects and methods: A cross-sectional study of adult visitors to nine satellites PHC clinics in military housing in Riyadh was carried out. TSH concentration and free T4 levels were measured. Data were collected by nurses and physicians during routine clinical practice in primary care. 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 340 out of 394 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 PHC visitors. TSH levels were found to be significantly higher ($p = .047$) in elderly population of ≥ 60 years and those with family history of thyroid disease. Non-significant upward trends were noted in TSH levels with hyperlipidemia and increasing blood pressure. No overt hyperthyroidism or hypothyroidism was found in our study sample.

Conclusion: Subclinical hypothyroidism has a prevalence of 10% of adults visiting PHC's. TSH levels are higher in the elderly, which warrants screening of those aged 60 years and above.

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1. Introduction

Subclinical hypothyroid is a biochemical 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; however, in most instance, patients are asymptomatic and findings are incidental [1,2].

Consequences of subclinical hypothyroidism are less established than overt hypothyroidism. Although elevated TSH in older adults was found to be associated with decreased mortality [3], there is a great body of literature that suggests many negative effects of elevated TSH on health. It was found to be associated with cardiac dysfunction [4], higher low-density lipoprotein cholesterol [5]. Some studies even found association with depression and cognitive dysfunction [6] although the evidence for this is not conclusive [7].



A substantial number of patients with subclinical hypothyroidism eventually develop overt hypothyroidism each year at the rate of 4.3–8%, with the elderly having a higher predisposition [8–10]. Subclinical hypothyroidism has been found to be associated with type 1 diabetes mellitus and possibly

with autoimmune diseases [11]. Two percent of pregnant women also have subclinical hypothyroidism [12]. In two population-based studies, the prevalence of subclinical hypothyroidism ranged between 7.5–8.5% in women and 4.4% in men [13,14]. Subclinical hypothyroidism prevalence increases in women with increasing age and is more common in elderly females (7–18%) than males (2–15%) [15,16].

In a study carried out on 257 Saudi women visiting outpatient clinics in a Jeddah university hospital, 35% were found to have subclinical hypothyroidism [17].

In a study carried out in Saudi Arabia on type 2 diabetics, 20% were found to have clinical or subclinical hypothyroidism [18].

Existing insufficient data on subclinical hypothyroidism has prompted some professional medical bodies to advocate screening and treating cases identified [19]. This study aimed to determine the prevalence of subclinical thyroid dysfunction in Saudi visitors of primary health care (PHC) setting, and exploring relationship between serum TSH levels and risk factors associated with hypothyroidism, including family history, age, gender, clinical symptoms, co-morbid conditions, and serum thyroxine level.

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2. Methodology

The participants in the study were from the population visiting nine satellite primary care clinics in a large military residential housing compound of Ministry of National Guard – Health Affairs, in Riyadh. Over 30,000 adults are served by these primary care clinics. Patients visit these clinics as needed, and usually walk-in without any booked appointments. Typically 25 adult patients are seen by a physician each day in the clinic. A total of 28 physicians participated in collecting the data during routine care. Three or four visitors were invited each day by the nurse to participate in the study. Subjects were included if they were 18 years or older, had no history of thyroid disease or thyroid surgery, reason for consultation was not related to thyroid illness, and were not on any thyroid medications. Pregnant women and patients on medications that may affect thyroid function, e.g., amiodarone, lithium or steroids, were excluded from the study.

A sample of 380 was obtained for a population size of 30,000, based on an assumed prevalence rate of 10% of subclinical hypothyroidism, in Saudi adult population with a desired precision of ± 0.03 and confidence interval of 95%, using test for single proportion in Epi-Tools software. This estimate was adjusted up to 400 for possible data losses.

Candidates for the study were identified by the nurse and confirmed by the physician in clinic. Informed consent was obtained and a questionnaire was filled out by the physician.

The questionnaire included variables such as age, gender, reason for consultation, and past medical history including radiation therapy, symptoms of thyroid disease: cold or heat intolerance, weight loss or gain, fatigue, amenorrhea, infertility, and diarrhea or constipation. In addition, medication history, current and of past 12 months 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 covering blood pressure (BP) measurement, weight, height, and signs of thyroid: goiter, exophthalmos, and myxoedema were recorded. The completed questionnaires were sent directly to the data entry clerk on a weekly basis by the clinic nurse.

Blood samples were drawn for serum TSH and free T4 levels. There were no restrictions on eating or requests to discontinue medication before testing, and samples were obtained during normal office hours. Serum TSH, and free T4, were measured by chemi-luminescent immunoassay. Serum TSH had a laboratory reference range of 0.35–4.94 mU/L. The

laboratory reference range for free T4 was 9.0–19.0 pmol/L. Laboratory data were extracted from the medical information system of the hospital and added to the data collection form.

Descriptive analysis was carried out, estimating mean, standard deviation (SD), for variables such as age, TSH level, T4 level, body mass index (BMI), weight, height, systolic & diastolic BP. Frequencies and percentages for calculated for the categorical variables.

Subjects were further categorized according to measurements of serum TSH and free T4 levels as follows [20,21]:

(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), and (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. Analysis was carried out on SPSS 19.

3. Results

Of the 542 patients invited, 400 indicated willingness to participate. Higher participation rates were observed among females, and in the younger age groups.

Of the 394 study subjects with no history of thyroid disease, 186 were males and 208 females, with a mean age of 41 ± 12 SD years (range 18–89 years). Of these individuals, 340 submitted laboratory samples, 298 were euthyroid, 35 (10.3%) had subclinical hypothyroidism, and 7 (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 sample of primary care visitors, only 20% had normal BMI, while over 40% were overweight and 40% were obese. One-third of the participants was not using iodized salt.

Eighty-seven percent of subjects ($n = 298/340$) were euthyroid as indicated by their serum TSH concentration (median serum TSH 2.5 mU/L, interquartile range (IQR) 0.6–4.7; median-free T4 13.3 pmol/L, IQR 12–14.3). Seven subjects (2.1%, $p = .001$) had subclinical hyperthyroidism (median-free T4 15.4 pmol/L, IQR 13.6–17). A total of 35 subjects (10.3%, $p = .001$) had subclinical hypothyroidism (median serum TSH 6.8 mU/L, IQR 6.0–8.8; median-free T4 12.6 pmol/L, IQR

Table 1. TSH levels and participant characteristics (n = 394).

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	
	No	%
Gender		
Male	186	47.1
Female	208	52.9
Use iodized salt		
Yes	266	67.6
No	128	32.4
Body mass group		
Low <18.5	7	1.8
Normal 18.5–24.9	67	17.4
Over weight 25–29.9	148	38.5
Obese 30+	162	42.2
TSH level (mU/L) (N = 340)		
High >4.94	35	10.3
Normal 0.35–4.94	298	87.6
Low <0.35	7	2.1

11.5–13.6), and 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%, of those visiting PHC clinics.

No factors such as 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, increasing BP, and higher TSH levels >4.94 mU/L (Table 2). 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) although on cross tabulation no statistically significant difference was noted between high TSH and elderly (15.4%) and the high TSH and non-elderly (9.9%).

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,

Table 2. History and physical findings and TSH level (N = 340).

Characteristics	TSH level				Chi-sq <i>P</i> -value	OR CI
	Normal		High			
	No	%	No	%		
Hyperlipidemia						
Yes	79	84.9	14	15.1	3.14	1.9
No	226	91.5	21	8.5	0.076	.92–3.93
Family history						
Yes	17	77.3	5	22.7	3.94	2.8
No	288	90.6	30	9.4	0.047	.94–8.19
Hypertension (N = 332)						
Normal BP	131	92.3	11	7.7	2.27	
Pre-HTN	136	89.5	16	10.5	0.32	
HTN	32	84.2	6	15.8		

p = .001) (Figure 1). 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) (Figure 2). No statistically significant relationship was found between BMI, weight, height, diastolic blood pressure (DBP), systolic blood pressure (SBP), and TSH groups. A non-significant upward trend was also noted between mean BMI and increasing TSH levels.

4. Discussion

This cross-sectional primary care-based 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, BP, BMI, and some other factors. The prevalence of subclinical hyperthyroidism was 2.1%, and subclinical hypothyroidism was 10.3% in this study. These percentages are comparable with those reported in some other studies [9,13,15,22], yet are higher than those reported by others [8,23,24]. Estimates of subclinical hypothyroidism prevalence vary by the type of population accessed, i.e., sampled from community, hospital, nursing home or primary care, concurrent comorbidity and the TSH assay, and cut-off values used [25].

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 our study, we found a trend of increasing BP: normal, pre-HTN, and HTN to be associated with abnormally high TSH levels, although this association was not statistically significant. We had an unusually higher percentage of pre-hypertensives in our study sample. This finding is partially consistent with findings of Busselton Thyroid Study, which concluded that subclinical hypothyroidism is not associated with hypertension [19]. However, in another study on women, subclinical hypothyroidism was found to be associated with diastolic hypertension, hypertriglyceridemia, and increase in BMI [26]. 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 [23,27] and 8% of elderly men [11]. The prevalence in women over age 80 years is lower, about 6% [25]. In our study, 15.4%

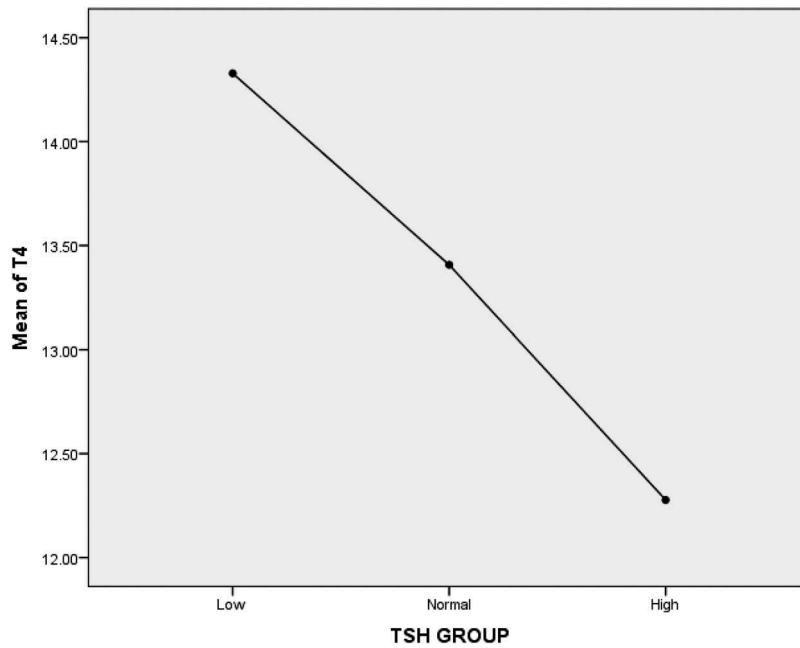


Figure 1. TSH groups and mean T4.

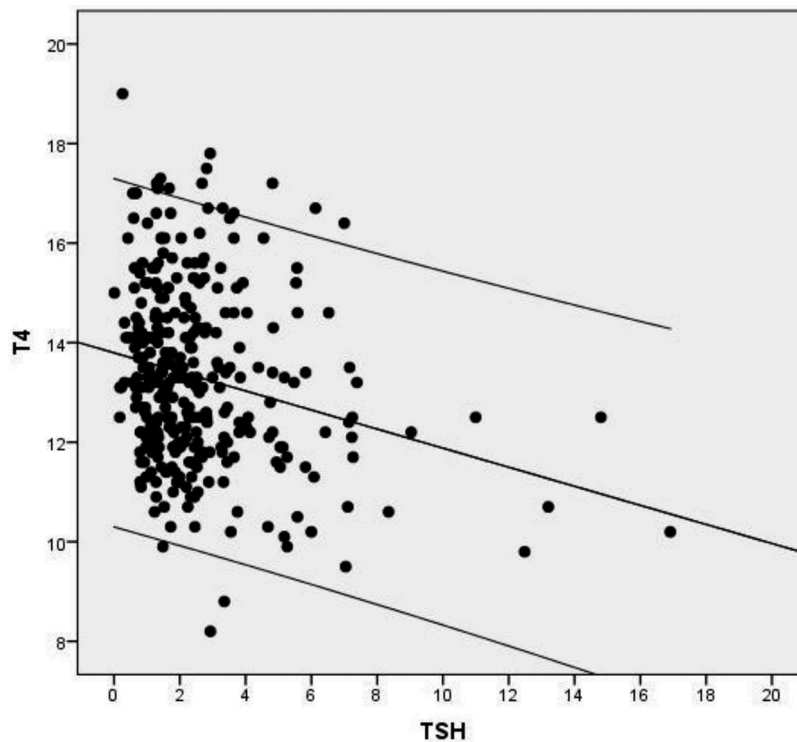


Figure 2. TSH levels and T4 relationship.

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 study was done in a housing area serving a limited population, and sample size may not have been sufficient for estimating prevalence. Population was drawn from visitors to PHC, and not from general population. An unusually higher percentage of hypertensives, pre-hypertensives, and overweight/obese were in the study sample, which could be due

to a systematic sampling error. Another limitation is that TSH readings were not verified by a second follow-up reading to rule out laboratory errors and confirm the abnormality. Recall bias cannot be ruled out regarding some aspects of history-related data.

In conclusion, it can be said that more studies with larger sample size drawn, from general population with urban and rural settings added, is needed to determine prevalence of subclinical hypothyroidism in the Saudi Arabian population. The present study highlights the importance of such study and need for

initiating thyroid screening in primary care settings among adults, particularly elderly >60 years old.

Disclosure statement

The authors have nothing to disclose and/or declare any possible conflict of interest regarding the article, organizational or/and professional affiliations.

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