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Should Nursing Home Residents be Screened for Thyroid Function?

Huzurevi Sakinlerini Tiroid Fonksiyonları Açısından Taramaya Gerek Var mı?

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Abstract

Purpose: Thyroid dysfunctions, especially subclinical forms, which are more frequently seen in older populations, have been linked to increased morbidity and mortality. In the literature, there are few reports of thyroid functions among nursing home residents. Our aim was to investigate whether nursing home residents constitute a priority group for the evaluation of thyroid function.
Material and Method: Hundred and ninety-two participants were enrolled in the study, 108 of them were nursing home participant (NP) and 84 were dwelling participants (CP). All of the participants were evaluated in terms of thyroid functions and thyroid ultrasonography.
Results: In the NP group, 89.8% were euthyroid, 3.7% were found to have subclinical hypothyroidism, 0.9% had overt hypothyroidism, 4.6% had subclinical hyperthyroidism, and 0.9% had overt hyperthyroidism. The corresponding rates in CP group were 83.3%, 9.5%, 0.0%, 7.1%, and 0.0%, respectively. At least one thyroid nodule was present in 64.2% and 78.3% of subjects of NP and CP groups, respectively.
Discussion: There was no statistical difference between the two groups in terms of distribution of thyroid dysfunction and thyroid nodules. According to our results, living in nursing home has not any important effect on thyroid dysfunction or nodule.
Keywords: Nursing home participant, thyroid disorders, elderly people

Öz

Amaç: Yaşlı hastalarda, sık görülen ve özellikle subklinik seyreden tiroid disfonksiyonu, morbidite ve mortalite artışına neden olur. Huzurevi sakinlerinde tiroid fonksiyonlarını değerlendiren az sayıda çalışma vardır. Tiroid fonksiyonlarını değerlendirmede huzurevi sakinlerinin öncelikli grup olup olmadıklarını araştırmayı amaçladık.
Gereç ve Yöntem: Çalışmaya 108'i huzurevinde, 84'ü kendi evinde yaşayan 192 kişi dahil edildi. Katılımcıların tiroid fonksiyonları ve ultrasonografileri değerlendirildi.
Bulgular: Huzurevi grubundakilerin (HG) %89,8'inde ötiroidi, %3,7'sinde subklinik hipotiroidi, %0,9'unda aşikar hipotiroidi, %4,6'sında subklinik hipertiroidi, %0,9'unda aşikar hipertiroidi saptandı, kendi evinde yaşayanlarda (KY) bu oranlar sırasıyla %83,3, %9,5, %0,0, %7,1 ve %0,0 idi. HG'dekilerin %64,2'sinde, KY'nin %78,3'ünde nodüler tiroid hastalığı saptandı.
Tartışma: Tiroid fonksiyon bozukluğu ve nodüler tiroid hastalığı açısından her iki grup arasında istatistiksel anlamlı fark yoktur. Bulgularımız huzurevinde yaşamanın tiroid fonksiyonu ve tiroid nodulü üzerine önemli bir etkisi olmadığını düşündürmektedir.
Anahtar kelimeler: Huzur evi, tiroid fonksiyon bozukluğu, yaşlı kişiler

Introduction

The prevalence of thyroid diseases increases with age; although they are generally undiagnosed (1). It has been reported that thyroidal uptake of iodine was reduced in elderly individuals leading to decreased daily production of thyroxine (T_4) and triiodothyronine (T_3) (2). Triiodothyronine degradation rate also decreases with age. Thus, the overall concentrations of T_4 and T_3 do not appear to change (3) and basal serum concentration of thyroid-stimulating hormone (TSH) is usually normal in elderly people (4). The lack of overt clinical appearance of hypo-hyperthyroidism in elderly people increases the need for an attentive clinician to suspect for the diagnosis; because aging symptoms are similar to some thyroid disease symptoms (5).
Overt hypothyroidism is reported in 1% to 20% and overt hyperthyroidism is seen in 0.5% to 3% of elderly people (6). In nursing home residents, these rates are 0.5% and 1%, respectively (7).
Thyroid dysfunctions may lead to several clinical sequelae. Clinical and subclinical hyperthyroidism may cause atrial fibrillation and low bone mineral density (BMD), while clinical and subclinical hypothyroidism may be associated with coronary artery disease, increased total cholesterol and LDL cholesterol levels, hepatosteatosis, neuropsychiatric diseases, and cardiovascular mortality (8,9,10,11,12).
The prevalence of palpable thyroid nodules ranges between 1% and 9% in adults (13). It is lower among young population than in elderly; and increases progressively with age. The prevalence of nodular goiter markedly increases when ultrasonography is used. 75% of population over the age of 80 years has thyroid nodules on ultrasound examination. Most of these thyroid nodules are benign

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and the incidence of thyroid cancer is low. About 5% of nodules are malignant, although this percentage tends to increase over the recent decades (14,15).

Several studies have showed that nursing home residents should be screened for thyroid functions due to the presence of several risk factors, including older age, comorbidities and increased usage of drugs (16,17). In this study; our aim was to investigate whether nursing home residents constitute a priority group for the evaluation of thyroid function.

Materials and Methods

Study Design and Patients

In this cross-sectional study, residents of two nursing homes in Çorum were included. Individuals taking amiodarone or lithium and those with a history of thyroid disease and receiving related therapy were excluded. Two hundred twenty three participants were screened for this study. Thirty one of them were excluded due to exclusion criteria, and remaining 192 participants were enrolled in the study. Of these, 108 (77 male, 31 female) were staying at a nursing home (NP group), and 84 (45 male, 39 female), who were living at their own home, constituted the CP (Community-dwelling participants) group.

This study was approved by the ethics committee and the institutional review board of Ankara Numune Education and Research Hospital, and informed consent was obtained from each participant.

Laboratory Analysis

Serum samples were obtained from each subject in the fasting state, between 08:00 a.m and 09:00 a.m. for TSH, free thyroxine (fT_4) and free triiodothyronine (fT_3) assays by chemiluminescent immunoassay (Cobas E6000, Roche Diagnostic, Germany). The normal serum TSH reference range was 0.27-4.2 uIU/ml, and the reference range for fT_4 and fT_3 was 0.8-2.7 ng/dl and 2.1-4.4 pg/ml, respectively.

Overt hypothyroidism is defined by low serum fT_3 (<2.1 pg/ml) and fT_4 levels (<0.8 ng/dl) in the presence of increased TSH levels (>4.2 uIU/ml), and subclinical hypothyroidism is defined as normal fT_3 and fT_4 levels in the presence of high TSH levels. Overt hyperthyroidism is defined as low TSH levels (<0.27 uIU/ml) together with increased fT_3 (>4.4 pg/ml) and fT_4 levels (>2.7 ng/dl), and subclinical hyperthyroidism is defined as normal fT_3 and fT_4 levels in the presence of low TSH levels (18). Ultrasonography examinations of the patients were performed in the endocrinology department by an endocrinologist at Hitit University Medical Faculty, using Aplio 500 ultrasonography device (Toshiba America Medical Systems, California, USA) with a 14 MHz linear probe.

Statistical Analysis

Statistical analysis was performed using the IBM SPSS 20.0 (IBM Inc., Chicago, IL, USA) software. The suitability of the normal distribution of the data was performed using the Shapiro-Wilk test. Two independent samples t-tests and the Mann-Whitney U-tests were used for comparison between the groups for quantitative variables; and the chi-square test was used for qualitative variables. Spearman's correlation coefficient was used to investigate the association between two continuous variables. Data was expressed as frequency and percentage, mean and standard deviation. A p value of less than 0.05 was considered statistically significant.

Results

The demographic features, thyroid function and ultrasonographic features of the study population are summarized in Table 1 and Table 2.

The NP and CP groups were similar with regard to age (77.9±0.7 vs. 76.2±0.3 years, respectively; p=0.07). The NP group had a lower BMI than the CP group (25.7±0.4 vs. 28.4±0.4, respectively; p<0.01). Any kind of thyroid dysfunction was present in 10.2% and 16.7% of the NP and CP groups, respectively. In the NP group, 89.8% were euthyroid, 3.7% had subclinical hypothyroidism, 0.9% had overt hypothyroidism, 0.9% were with overt hyperthyroidism and 4.6% had subclinical hyperthyroidism; respective rates in CP group were 83.3%, 9.5%, 0.0%, 0.0% and 7.1%. There was no statistical difference between the two groups in terms of distribution of thyroid dysfunction (p=0.46). There was no correlation between age and TSH levels in either groups (p>0.05) (Table 3). When the thyroid functions were re-evaluated after removal of the patients who were on drugs that could affect the TSH, fT_3 and fT_4 assays (e.g. dopamine agonists, corticosteroids, carbamazepine), there was still no significant difference between the groups in terms of the distribution of thyroid dysfunction (p=0.32).

There was no significant correlation between BMI and thyroid disorders (subclinical hypothyroidism, subclinical hyperthyroidism, overt hypothyroidism, overt hyperthyroidism, nodular goiter and multinodular goiter) in either groups (p>0.05). Ultrasonography was performed in 95 participants in NP, 61 (64.2%) of them had thyroid nodule; 24 (25.3%) had solitary nodule (NG), and 37 (38.9%) had multinodular goiter (MNG). Among 83 CP group participants, 65 (78.3%) had thyroid nodules, 19 (22.9%) had NG, 46 (55.4%) had MNG. The two groups were similar with regard to both presence and number of thyroid nodules (p>0.05).

Discussion

This is the first study to evaluate thyroid function and ultrasonography in nursing home population in Turkey. Any kind of thyroid dysfunction was present in 10.2% of the NP, and 16.7% of the CP groups. Most of the participants in either group had subclinical abnormality, thus, they may generally be diagnosed by screening programs due to vague or no clinical symptoms.

There are some physiological changes in the thyroid gland with age. Most studies have showed that minimal changes occur in the circulating fT_4 levels in the blood. Thyroid iodine uptake decreases with age and this decrease in iodine uptake is accompanied by a decrease in T_4 secretion. At the same time, fT_4 degradation also decreases, resulting in not any change in fT_4 concentrations in the serum eventually (19).

Although several studies have reported age-related decreases in serum fT_3 levels, particularly after 90 years of age, others have found no significant decrease between the fifth and the ninth decade (20,21,22). TSH levels in the elderly have been reported

to be slightly higher than in younger individuals (23). Higher TSH levels may be related to thyroid autoimmunity which increases with age. Consequently, the normal range of TSH should not differ between younger and older people (24). We did not find a correlation between age and TSH levels in our study. The relationship between age and TSH levels is still controversial. Cappola et al. (25) have demonstrated that TSH levels increase with age, however, according to the Society of Endocrinology and Metabolism of Turkey thyroid guideline, TSH levels may decrease with age (26). In our study, all the age groups had almost similar TSH values. Our participant number was not sufficient to evaluate changes in TSH levels with age.

In the geriatric population, the prevalence of thyroid diseases is high and some thyroid abnormalities may have subtle or atypical presentation (27). Overt hyperthyroidism is being recognized with increasing frequency in the elderly. Graves' disease is the most common cause of the hyperthyroidism in all age groups, however, the proportion of toxic multinodular goiter increases with age due to the higher prevalence of thyroid nodules in the elderly (28). In a study, overt hyperthyroidism prevalence for elderly subjects was reported at 0.5-2.3%1 while data of Anïa Lafuente et al. (17) revealed no overt hyperthyroidism in nursing home residents. In this study, we found overt hyperthyroidism in 0.5% of our participants.

Subclinical hyperthyroidism prevalence is between 1% and 5% in the elderly (27). Marrakchi et al. (28) have showed that patients with subclinical hyperthyroidism have two to three-fold higher rates of atrial fibrillation than euthyroid controls. Subclinical hyperthyroidism may also be associated with low BMI (29). Therefore, elderly patients with subclinical hyperthyroidism should be considered in terms of diseases of the skeletal and cardiovascular systems.

The prevalence of overt hypothyroidism is approximately 0.5% in individuals over age 65 (30). The most common cause of hypothyroidism in elderly people is autoimmune thyroid failure, especially Hashimoto's disease (31). The diagnosis of overt hypothyroidism is simple in young people with typical symptoms of fatigue, increased sensitivity to cold, constipation, dry skin,

Table 1. The demographic features, thyroid function and ultrasonographic features of the study population

	NP (n=108)	CP (n=84)	p
Age (year)	77.9±0.7	76.2±0.3	0.07
Male/Female	77/31	45/38	
BMI(kg/m^2)	25.7±0.4	28.4±0.4	**<0.001**
Euthyroid	89.8%	83.3%	0.62
Subclinical hypothyroidism	3.7%	9.5%	0.11
Subclinical hyperthyroidism	4.6%	7.1%	0.46
Normal Thyroid ultrasonography	28.4%	20.5%	0.25
Nodular goiter	25.3%	22.9%	0.73
Multinodular goiter	38.9%	55.4%	0.08
TSH	1.7±1.9	1.8±1.7	0.23
fT_3	2.9±0.6	3.0±0.4	**0.01**
fT_4	1.3±0.2	1.6±0.8	0.11
Diabetes Mellitus	13.1%	15.4%	0.36
Hypertension	46.2%	54.2%	0.22
Dementia	18.3%	5.2%	**0.01**
CAD	21.7%	12.8%	0.52
Parkinson Disease	5.4%	2.4%	0.43
Rheumatoid Arthritis	2.3%	1.2%	0.64
COPD	13.6%	11.7%	0.82

NP: Nursing home participant, CP: Community-dwelling participants,
CAD: Coronary artery disease, COPD: Chronic obstructive pulmonary disease),
FT_3: Free triiodothyronine, FT_4: Free thyroxine, TSH: Thyroid-stimulating hormone
Bold p-values indicate statistically significant (p<0.05)

Table 2. Thyroid function of the study population.

NP (n=108)				CP (n=84)			
	TSH	fT_3	fT_4		TSH	fT_3	fT_4
Euthyroid	1.4±0.8	2.8±0.3	1.2±0.1	Euthyroid	1.5±0.7	3.0±0.4	1.5±1.6
Overt hypothyroidism	12.2±0.4	1.8±0.2	0.5±0.2	Overt hypothyroidism	-	-	-
Subclinical hypothyroidism	6.7±2.2	2.5±0.5	1.1±0.1	Subclinical hypothyroidism	6.0±1.2	2.8±0.2	1.2±0.1
Overt hyperthyroidism	0.01±0.0	6.5±1.2	3.2±0.3	Overt hyperthyroidism	-	-	-
Subclinical hyperthyroidism	0.04±0.0	3.2±0.8	1.4±0.2	Subclinical hyperthyroidism	0.08±0.0	3.4±0.4	1.4±0.3

NP: Nursing home participant; CP: Community-dwelling participants, TSH: Thyroid-stimulating hormone

Table 3. Age and Thyroid-stimulating hormone levels correlations

Age range (years)	TSH levels (µU/mL)	p	r
65-70 (n=51)	1.7±1.2	0.41	0.12
71-75 (n=44)	1.8±1.5	0.85	0.02
76-80 (n=48)	1.8±1.7	0.25	0.17
>80 (n=49)	1.4±1.3	0.67	0.06

TSH: Thyroid-stimulating hormone

muscle weakness, muscle aches, tenderness and stiffness, slower heart rate, depression, and impaired memory, however, most of these complaints may be considered a constituent of normal aging process, and therefore, sometimes diagnosis of the hypothyroidism may be delayed in elderly people.

In this study, the most common thyroid disorder was subclinical hypothyroidism in nursing participants and the total study population. Subclinical hypothyroidism is more common than overt hypothyroidism (32). The prevalence of subclinical hypothyroidism in men and women over the age of 74 years were 16% and 21%, respectively (33). Subclinical hypothyroidism is significantly associated with cognitive impairment, risk of developing atherosclerosis, increased total cholesterol, triglycerides and very low-density cholesterol levels, increased risk for hip and non-spine fracture (34,35,36,37).

The incidence of thyroid nodules increases with age. Ultrasound studies have reported that the prevalence of thyroid nodules in elder populations was between 40% and 60% (38). In our study, 77.3% of all participants (71.7% of NP, and 83.3% of CP) had thyroid nodule. The prevalence of thyroid carcinomas in elderly people is similar to that in younger patients in terms of many features, but there is a shift in histological type from the more indolent (papillary) to the more aggressive (Hurthle cell, Medullary, anaplastic) (39). Thus, thyroid nodules should be evaluated more carefully in terms of malignancy in elderly people. The study has some limitations: thyroid needle biopsy was not performed and, thyroid autoimmune antibody levels were not assayed.

Conclusions

Thyroid disorders are common diseases in the population. Subclinical thyroid diseases show silent clinical features in elderly, therefore, the diagnosis in elderly people may be delayed. Screening programs may be considered for early detection of thyroid abnormalities in elderly populations. Our data suggest that frequency and clinical features of these diseases are similar in elderly people regardless of being nursing home residents or community dwelling.

Ethics

Ethics Committee Approval: The study were approved by the Ankara Numune Research and Training Hospital of Local, Ethics Committee, Informed Consent: Consent form was filled out by all participants, Peer-review: Internal peer-reviewed.

Authorship Contributions

Concept: Ferit Kerim Küçükler, Design: Ferit Kerim Küçükler, Data Collection or Processing: Ferit Kerim Küçükler, Yasin Şimşek, Analysis or Interpretation: Ferit Kerim Küçükler, Yasin Şimşek, Serdar Güler, Literature Search: Ferit Kerim Küçükler, Yasin Şimşek, Writing: Ferit Kerim Küçükler, Yasin Şimşek, Serdar Güler, Conflict of Interest: No conflict of interest was declared by the authors, Financial Disclosure: The authors declared that this study received no financial support.

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