



## Research Article

# Investigation of the distribution of thyroid dysfunction in the geriatric patient population in Corum province

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### Abstract

**Objectives:** The aim of this study was to identify and analyze the incidence of thyroid dysfunction in geriatric patients in Corum province, Turkey.

**Methods:** The results of thyroid-stimulating hormone (TSH), free thyroxine (FT4), and free triiodothyronine (FT3) tests, as well as the demographic characteristics of 220 randomized patients were retrospectively investigated. Patients who had a total or partial thyroidectomy surgery and those receiving any medical thyroid treatment were not included in the study. The patients were divided into 5 groups: subclinical hypothyroidism, hypothyroidism, euthyroid, subclinical hyperthyroidism, and hyperthyroidism.

**Results:** In the group, 114 were male and 106 were female. The mean age of the male and female patients was 74±7 years and 75±7 years, respectively. The entire study group had a median TSH of 0.94 µIU/mL (25<sup>th</sup>-75<sup>th</sup> percentile, interquartile range [IQR] 0.33-1.86 µIU/mL), a median FT4 of 1.14 ng/dL (IQR: 1.02-1.33 ng/dL), and a median FT3 of 2.73 pg/mL (IQR: 2.25-3.11 pg/mL). For male patients, the median TSH was 0.87 µIU/mL (IQR: 0.36-1.66 µIU/mL), the median FT4 was 1.14 ng/dL (IQR: 1.02-1.29 ng/dL), and the median FT3 was 2.74 pg/mL (IQR: 2.18-3.15 pg/mL), while for female patients the median TSH was 0.95 µIU/mL (IQR: 0.20-2.21 µIU/mL), the median FT4 was 1.17 ng/dL (IQR: 1.06-1.38 ng/dL), and the median FT3 was 2.72 pg/mL (IQR: 2.31-3.10 pg/mL). Of the males, 1.8% had subclinical hypothyroidism, another 1.8% had hypothyroidism, 72.8% were euthyroid, 19.3% had subclinical hyperthyroidism, and 4.4% had hyperthyroidism. Among the females, there were findings of 2.8% subclinical hypothyroidism, 1.9% hypothyroidism, 64.2% euthyroid, 26.4% subclinical hyperthyroidism, and 4.7% hyperthyroidism. No statistically significant difference was observed when the diagnosis incidence was compared according to gender (p=0.696).

**Conclusion:** Independent of gender, the geriatric patient population had a high incidence of subclinical hyperthyroidism, which often has a delayed diagnosis. This can complicate the prompt diagnosis of other metabolic diseases. As thyroid function affects the metabolism of the entire body, thyroid hormone status should be investigated when considering other metabolic diseases in geriatric patients. Excluding thyroid dysfunction could save time in making an accurate diagnosis and providing treatment. Furthermore, since thyroid diseases are influenced by environmental iodine, regional thyroid disease incidence studies should be performed.

**Keywords:** Geriatrics, hyperthyroidism, hypothyroidism

According to the World Health Organization, the geriatric patient group comprises patients aged 65 years and older [1]. Thyroid gland diseases are one of the most common en-

docrinological diseases encountered in this group. In the general population, hypothyroidism is observed in 1% to 7%, and subclinical hypothyroidism is observed at a rate of 14% to 18%;

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**Submitted Date:** February 22, 2019 **Accepted Date:** March 28, 2019 **Available Online Date:** June 12, 2019

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hypothyroidism is the most common thyroid function disorder in geriatric patients [2, 3]. Hyperthyroidism is observed at a rate of 0.5% to 6% in geriatric patients and affects mainly the cardiovascular system (atrial fibrillation, congestive heart failure) and bones (increased bone cycle, osteopenia) [4].

The incidence of goiter, an enlarged thyroid gland, has been reported to reach 70% in the aging population in regions with iodine deficiency [5]. Yet the diagnosis and treatment of thyroid diseases, particularly in geriatric patients, can be difficult. The symptoms and values may not be the same as those typically seen in young adults. This may be further complicated by comorbidities, which often leads to delayed diagnosis and more serious disease progression, making treatment more difficult. It has been recommended that all individuals in the geriatric age group be screened for thyroid dysfunction since these symptoms and findings may remain hidden [6].

The aim of the present study was to identify and analyze the incidence of thyroid dysfunction in patients over 65 years of age in Corum province, Turkey.

## Materials and Methods

The demographic and laboratory results of patients aged over 65 years living in Corum province, Turkey, who presented at Hitit University Corum Erol Olcok Education and Research Hospital for any reason were used in the study. Permission was granted for the study by the Hitit University Non-Interventional Research Ethics Committee, dated and numbered 29/01/2019-43. The results of thyroid-stimulating hormone (TSH), free thyroxine (FT4), and free triiodothyronine (FT3) tests as well as demographic characteristics of 220 randomized patients were retrospectively investigated. Patients with total or partial thyroidectomy surgery and those receiving any medical thyroid treatment were excluded from the study. Thyroid function tests (TFT) were measured using the electrochemiluminescence method on a Siemens Advia Centaur XP model immunoassay autoanalyzer (Siemens Healthineers, Erlangen, Germany). The normal intervals for TFT at this center are TSH 0.35–5.50  $\mu$ IU/mL, FT4 0.89–1.76 ng/dL, and FT3 2.30–4.20 pg/mL. Hypothyroidism was defined as FT4 <0.89 ng/dL and TSH >5.50  $\mu$ IU/mL, with subclinical hypothyroidism defined as normal free hormone levels and a TSH >5.50  $\mu$ IU/mL. Hyperthyroidism was defined as

FT4 >1.76 ng/dL and TSH <0.35  $\mu$ IU/mL, while subclinical hyperthyroidism was defined as normal free hormone levels and TSH <0.35  $\mu$ IU/mL. Patients were divided into 5 groups: subclinical hypothyroidism, hypothyroidism, euthyroid, subclinical hyperthyroidism, and hyperthyroidism.

## Statistical analysis

All of the statistical analyses were performed using the IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp.; Armonk, NY, USA). Demographic and biochemical features were presented as continuous or categorical variables, as appropriate. The Kolmogorov-Smirnov test was used to assess normality. Variables were presented as median (25<sup>th</sup>-75<sup>th</sup> percentile, interquartile range [IQR]) since they were not normally distributed. Comparisons between groups were performed using the Mann-Whitney U test. A chi-square test was used to evaluate the differences between categorical variables. All reported p values were 2-tailed, and values less than 0.05 were considered statistically significant.

## Results

Of the patients included in the study, 106 were female (48.1%) and 114 were male (51.9%). The mean age of male patients was 74 $\pm$ 7 years, while the mean age of the female patients was 75 $\pm$ 7 years. The study group had an overall median TSH of 0.94  $\mu$ IU/mL (IQR: 0.33-1.86  $\mu$ IU/mL), a median FT4 of 1.14 ng/dL (IQR: 1.02-1.33 ng/dL), and a median FT3 of 2.73 pg/mL (IQR: 2.25-3.11 pg/mL). For male patients, the median TSH was 0.87  $\mu$ IU/mL (IQR: 0.36-1.66  $\mu$ IU/mL), the median FT4 was 1.14 ng/dL (IQR: 1.02-1.29 ng/dL), and the median FT3 was 2.74 pg/mL (IQR: 2.18-3.15 pg/mL), while for female patients the median TSH was 0.95  $\mu$ IU/mL (IQR: 0.20-2.21  $\mu$ IU/mL), the median FT4 was 1.17 ng/dL (IQR: 1.06-1.38 ng/dL), and the median FT3 was 2.72 pg/mL (2.31-3.10 pg/mL). The TFT median values of all of the patients and gender groups are presented in Table 1. The Mann-Whitney U test was used to evaluate the results according to gender. Of the males in the study, 1.8% were found to have subclinical hypothyroidism, 1.8% had hypothyroidism, 72.8% were euthyroid, 19.3% had subclinical hyperthyroidism, and 4.4% had hyperthyroidism. Among the female patients,

**Table 1. Descriptive data, TSH, FT4, FT3 and levels according to gender**

Parameters	Gender			P
	All patients (n=220)	Male (n=114)	Female (n=106)	
Age (years)	73 (69-80)	73 (68-79)	73 (69-80)	0.699
TSH ( $\mu$ IU/mL)	0.94 (0.33-1.86)	0.87 (0.36-1.66)	0.95 (0.20-2.21)	0.891
FT4 (ng/dL)	1.14 (1.02-1.33)	1.14 (1.02-1.29)	1.18 (1.07-1.38)	0.196
FT3 (pg/mL)	2.73 (2.25-3.11)	2.74 (2.18-3.15)	2.72 (2.31-3.10)	0.801

FT3: Free triiodothyronine; FT4: Free thyroxine; TSH: Thyroid-stimulating hormone. Median 25<sup>th</sup>-75<sup>th</sup> percentile, interquartile range. p<0.05: Statistically significant. \*Mann-Whitney U test.

**Table 2. Incidence of thyroid function disorder in geriatric patients according to gender**

Diagnosis	Gender			P
	All patients (n=220)	Female (n=106)	Male (n=114)	
Subclinical hypothyroidism (years), n (%)	5 (2.3)	3 (2.8)	2 (1.8)	0.696
Hypothyroidism, n (%)	4 (1.8)	2 (1.9)	2 (1.8)	
Euthyroid, n (%)	151 (68.6)	68 (64.2)	83 (72.8)	
Subclinical hyperthyroidism, n (%)	50 (22.7)	28 (26.4)	22 (19.3)	
Hyperthyroidism, n (%)	10 (4.5)	5 (4.7)	5 (4.4)	

FT3: Free triiodothyronine; FT4: Free thyroxine; TSH: Thyroid-stimulating hormone. p<0.05: Statistically significant. \* Chi-square test.

the results were 2.8% subclinical hypothyroidism, 1.9% hypothyroidism, 64.2% euthyroid, 26.4% subclinical hyperthyroidism, and 4.7% hyperthyroidism. No significant difference was observed when the diagnosis incidence was compared according to gender (p=0.696). Table 2 illustrates the percentages of thyroid dysfunction identified in this geriatric patient population. A chi-square test was used to analyze diagnosis type and incidence according to gender.

## Discussion

After excluding patients with total or partial thyroidectomy surgery and those receiving any medical thyroid treatment, the TFT of 220 randomly chosen patients were assessed. It was determined that 151 patients were classified as euthyroid (68.6%), 50 (22.7%) had subclinical hyperthyroidism, 10 (4.5%) had hyperthyroidism, 5 (2.3%) had subclinical hypothyroidism, and 4 (1.8%) had hypothyroidism. The results indicated that 31.4% of these patients over the age of 65 years had a thyroid function disorder.

The symptoms of subclinical hyperthyroidism in the geriatric patient population can be subtle and mistaken for other conditions or simply the process of aging, which can lead to neglect and delay of hyperthyroidism treatment. This may contribute to the high rate of detection in the elderly population. Furthermore, geographic regional characteristics play a role in thyroid dysfunction.

When our study results are compared with research in the literature [7-9], the thyroid function disorder rate is high. It has been reported that the prevalence of thyroid disease is approximately 3.5- to 12-fold higher in women than in men [10, 11]. In this study, 35.8% of the female patients and 27.1% of males were determined to have a thyroid function disorder.

The prevalence of hypothyroidism increases with age. The original Whickham Survey performed in the UK found overt hypothyroidism in 0.14% of females and <0.1% of males in the general population [12]. A US study in Colorado found that in every decade of life, hypothyroidism was more common in women and that rate increased in each decade after the age of 34 years [13]. In another study, patients aged over 65 years

were shown to have a subclinical hypothyroidism rate of 3.5%, with FT3 and TSH levels decreasing with age in euthyroid patients [14]. A study assessing 906 patients over the age of 65 years found overt hypothyroidism in 1.55% and subclinical hypothyroidism in 2.65% [15]. Similarly, our findings among the women were 1.8% overt hypothyroidism and 2.3% subclinical hypothyroidism.

The presence of hypothyroidism in geriatric patients may present with cognitive function disorders related to memory, attention, and concentration. Severe hypothyroidism may occur as depression and dementia. It may also be accompanied by reduced cardiac beat volume and heart rate, atherosclerotic disease, endothelial dysfunction, and disrupted coagulation parameters. However, once euthyroid values are established, these findings can generally be reversed [16].

Subclinical hypothyroidism can cause negative cardiac effects in young people, but one report found that this correlation was weak in the more elderly (<75 years), and it was not evident in very elderly patients (>80-85 years). It has not been clearly differentiated whether an increase in TSH level is specific to age or linked to a mild increase in underlying thyroid disease. As a result, the authors recommended that age-specific TSH values be used for this patient group [6]. Hyperthyroidism is a very important health problem in the elderly population. Typical symptoms of hyperthyroidism, such as palpitations, sweating, and shaking, may not be observed in the geriatric group. Patients often present with non-specific symptoms, like fatigue and weight loss [11, 17].

The prevalence of hyperthyroidism in the elderly population has been reported to be 0.5% to 6% [4, 11]. The incidence and prevalence of subclinical hyperthyroidism increases with age [13]. One study observed a subclinical hyperthyroidism rate of 7.8% in patients over the age of 65, while the rate was only 1.9% for patients below the age of 65 [14]. Another report found that the rate varied from 0.6% to 16% [18]. In our study, the hyperthyroidism rate was 4.5%, while the subclinical hyperthyroidism rate was 22.7%. While the hyperthyroidism rate in this study is similar to that observed in other studies, the subclinical hyperthyroidism rate was comparatively high. As in other studies, we found that the subclinical hyperthyroidism rate was higher in females [8, 19]. Atrial fibrillation (AF) and

atrial arrhythmia are known potential cardiac complications of hyperthyroidism. A study by Henrik et al. [20] stated that the incidence of AF was clearly greater in patients older than 60 years with TSH <0.1  $\mu$ U/mL. In patients with TSH <0.1  $\mu$ U/mL, treatment is recommended to reduce the risk of progression to overt hyperthyroidism, as well as greater risk of cardiovascular and total mortality, AF, and fractures. Those with TSH 0.1-0.4  $\mu$ U/mL in the presence of heart disease, diabetes, renal failure, previous stroke or transient ischemic attack, stroke, coronary artery disease, or peripheral artery disease are recommended to begin thyroid treatment [21].

The high incidence of hyperthyroidism, and especially subclinical hyperthyroidism, seen in patients over the age of 65 may be related to the number of symptomatic patients who are referred to our hospital. A high incidence of subclinical hyperthyroidism is consistent with other studies [8, 13, 14, 18, 19].

Similarities and differences in the results of this study compared with those seen in the literature may be related to a number of factors. The design of the each study and the characteristics of the patient population, as well as variations in laboratory measurement methods and immunoassay reagents may have influenced the results. This includes ethnic and regional characteristics as well as geographical conditions, climate, and nutritional habits, which are known to affect thyroid function. In regions where thyroid dysfunction is endemic, this is an important issue for public health, and particularly for geriatric patients.

Our study only examined the distribution of thyroid dysfunction in the geriatric population living in a specific geographical region; no evaluation was performed regarding the distribution of thyroid dysfunction in other age groups.

## Conclusion

The large and often undiagnosed incidence of subclinical hyperthyroidism in the geriatric patient population, independent of gender, may make diagnosis of other metabolic diseases more difficult or delay diagnosis. As thyroid function affects the body's metabolism in a variety of ways, a hormone assessment should be performed when evaluating other metabolic diseases in geriatric patients. Excluding thyroid function disorders when researching other metabolic diseases in this population of patients will save time in making an accurate diagnosis and providing the appropriate treatment.

**Acknowledgements:** This study was presented as an oral presentation at the Aksemseddin 3<sup>rd</sup> International Symposium on Human Society and Sports Sciences, held in Çorum, Turkey, on September 12-16, 2018.

**Conflict of interest:** None declared.

**Ethics Committee Approval:** Permission was granted for the study by the Hitit University Non-Interventional Research Ethics Committee, dated and numbered 29/01/2019-43.

**Financial Disclosure:** The authors report they did not receive any financial support.

**Peer-review:** Externally peer-reviewed.

**Authorship contributions:** Concept – M.S., A.K.; Design – M.S., H.K.; Supervision – M.S., H.K.; Materials – M.S., H.K.; Data collection &/or processing – M.S., A.K.; Analysis and/or interpretation – M.S., H.K.; Literature search – M.S., H.K., A.K.; Writing – M.S., A.K.; Critical review – M.S., A.K., H.K.

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