

Research Article

Ultrasound screening of thyroid pathology in primary medical care in Bulgaria

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Summary

Thyroid diseases are common and, in most cases, can be safely and effectively detected and treated in primary medical care. This article aimed to analyze and evaluate the rate of thyroid ultrasonographic abnormalities in a primary medical care practice in Bulgaria. The research was conducted from 2016 to 2021. A random cohort of patients undergone annual preventive screening was included. Demographic information (age and sex) was collected. The descriptions of the ultrasonographic findings were standardized based on the following parameters: deviations in shape, size, position of the thyroid gland, deviations from normal parenchymal echogenicity (hyper-, hypo-, and heteroechogenic parenchyma), presence and size of detectable formations, and presence of calcifications. The total number of participants in this study was 3 178. Of these, 60% (1 907/3 178) were women and 40% (1 271/3 178) were men. The average age of participants was 40.1 ± 11.3 years, and there was no significant difference between the males and females. Deviations from normal ultrasonographic findings were observed in 36.2% (1 151/3 178), with a frequency increasing with age. Detectable formations were seen in 19.7% (625/3 178) of the patients, and those larger than 1 cm accounted for 4.4% (139/3 178) of all cases and 22.2% of all formations (139/625). Calcifications were found in 0.5% (15/3 163). Over 1/3 of the performed thyroid ultrasounds revealed abnormalities. Thyroid ultrasonographic abnormalities were significantly more common in women compared to men, and their frequency increased with age.

Key words: Primary medical care, thyroid gland, ultrasound

Introduction

Thyroid diseases are common and, therefore, safely and effectively detected and successfully treated in primary medical care (Todd 2009). However, much of the pathology does not always present with characteristic symptoms, which leads to delays in diagnosis, treatment, and, in some cases, lack of diagnosis. The most commonly used imaging method to detect thyroid diseases is ultrasonography. This method remains underrated in daily primary medical practice



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in Bulgaria and is not routinely used. This article aims to analyze and evaluate the frequency of thyroid ultrasonographic abnormalities in primary medical care in Bulgaria.

Materials and methods

The research was conducted from 2016 to 2021, covering a random cohort (all of whom have undergone annual preventive screening). The participants were Group Practice for Primary Medical Care MCC „My Doctor“ patients. Demographic information (age and sex) was collected. The study was performed using a SonoScape A5 sonograph. The descriptions of the ultrasonograms were standardized based on the following parameters:

1. deviations in shape, dimension, and position of the thyroid gland;
2. deviations from normal parenchymal echogenicity (hyper-, hypo-, and hyperechogenic parenchyma);
3. presence of detectable formations (yes/no);
4. size of detectable formations (in mm);
5. presence of calcifications (yes/no).

In cases of deviations in the shape, dimensions, and position of the thyroid gland, as well as deviations from normal parenchymal echogenicity (hyper-, hypo-, and hyperechogenic parenchyma), detectable formations and/or calcifications, the ultrasonography was classified as abnormal.

Data was analyzed using RStudio v. 2022.02.3/R 4.2.2. Continuous variables are presented as average \pm standard deviation. Categorical variables are presented as frequency. The t-test for data with normal distribution and the Mann-Whitney test were used for data with non-normal distribution to assess the difference between groups. Statistical significance was considered at $p < 0.05$.

Results

The total number of participants in this research was 3 178. Of these, 1 907 (60%) were women, and 1 271 (40%) were men. The average age of participants is 40.1 ± 11.3 and does not differ significantly between men and women (respectively 40.2 vs. 40.0).

Deviation from normal ultrasonographic findings was observed in 36.2% (1 151/3 178) of the subjects we investigated. Detectable formations were detected in 19.7% (625/3 178) of the patients, and those greater than 1 cm in size accounted for 4.4% (139/3 178) of all cases and 22.2% of all formations (139/625). Calcifications were found in 0.5% (15/3 163). Thyroid ultrasonographic abnormalities were significantly more common in women compared to men (42.3% vs. 27.1%, $p < 0.0001$). Their frequency increased with age: it was 18.3% at the age <25 , 28.5% at the age between 25–35, 34.6% at the age between 35–45, 44.2% at the age between 45–55, 55.0% at the age between 55–65, and 62.8% at the age >65 (Fig. 1).

The frequency of detectable formations, as well as oversized formations (>1 cm), also increased with age (Table 1, Figs 2, 3).

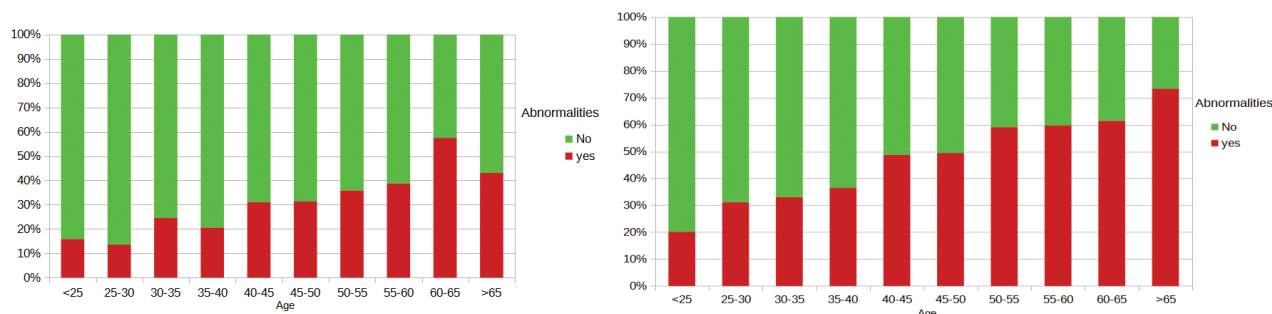


Figure 1. Frequency of ultrasonographic abnormalities (in red) according to age and sex (left - women, right - men).

Table 1. Frequency of ultrasonographic abnormalities according to age and sex.

| Age group | Deviations | Detectable formations | Detectable formations >1sm. | Calcifications |
|--------------------|------------|-----------------------|-----------------------------|----------------|
| aged <25 | | | | |
| Total: | 18.40% | 8.90% | 0.60% | 0% |
| Female: | 20.20% | 9.00% | 1.10% | 0% |
| Male: | 15.90% | 8.70% | 0% | 0% |
| aged 25–30 | | | | |
| Total: | 24.70% | 14.70% | 3.50% | 0% |
| Female: | 31.10% | 18.30% | 4.90% | 0% |
| Male: | 13.70% | 8.40% | 1.10% | 0% |
| aged 30–35 | | | | |
| Total: | 30.10% | 16.10% | 3.50% | 0.30% |
| Female: | 33.10% | 18.70% | 4.00% | 0.50% |
| Male: | 24.50% | 11.10% | 2.40% | 0% |
| aged 35–40 | | | | |
| Total: | 29.90% | 15.20% | 2.30% | 0.10% |
| Female: | 36.50% | 18.50% | 3.10% | 0% |
| Male: | 20.60% | 10.60% | 1.30% | 0.30% |
| aged 40–45 | | | | |
| Total: | 41.10% | 20.50% | 4.70% | 0.70% |
| Female: | 48.70% | 26.10% | 6.10% | 0.60% |
| Male: | 31.10% | 13.30% | 2.90% | 0.80% |
| aged 45–50 | | | | |
| Total: | 41.70% | 26.00% | 5.40% | 0.60% |
| Female: | 49.40% | 33.10% | 5.10% | 0.60% |
| Male: | 31.30% | 16.40% | 6.00% | 0.70% |
| aged 50–55 | | | | |
| Total: | 49.30% | 27.60% | 5.30% | 0% |
| Female: | 59.10% | 34.10% | 6.80% | 0% |
| Male: | 35.90% | 18.80% | 3.10% | 0% |
| aged 55–60 | | | | |
| Total: | 51.20% | 34.70% | 7.40% | 1.70% |
| Female: | 59.70% | 40.30% | 5.60% | 1.40% |
| Male: | 38.80% | 26.50% | 10.20% | 2.00% |
| aged 60–65 | | | | |
| Total: | 59.80% | 34.00% | 13.40% | 2.10% |
| Female: | 61.40% | 35.10% | 10.50% | 1.80% |
| Male: | 57.50% | 32.50% | 17.50% | 2.50% |
| aged >65 | | | | |
| Total: | 62.80% | 31.70% | 11.70% | 1.40% |
| Female: | 73.40% | 41.50% | 14.90% | 1.10% |
| Male: | 43.10% | 13.70% | 5.90% | 2.00% |

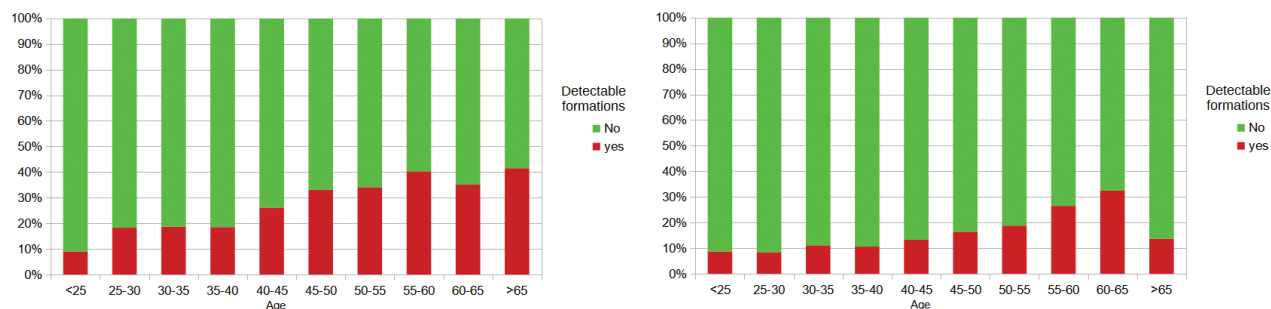


Figure 2. Frequency of detectable formations (in red) according to age and sex (left - women, right - men).

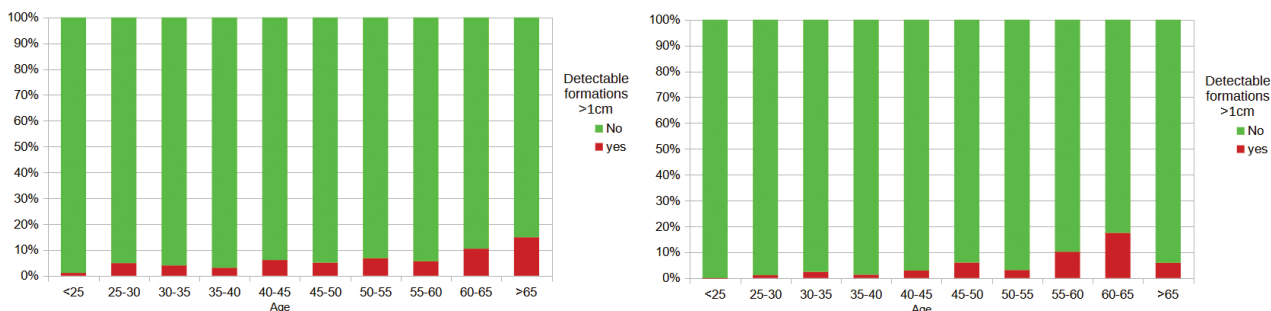


Figure 3. Frequency of detectable formations >1 cm (red) according to age and sex (left - women, right - men).

The fluctuations in men aged >65 were most likely due to the small number of participants in their group (n = 44).

Discussion

This research identified deviations from normal ultrasonographic findings in 36.2%, and they were significantly more common in women and the aging group. Notably, the presence of deviations is not always related to pathology. The frequency of thyroid disease is 5–10% worldwide (Kharchenko et al. 2010), affecting people of all age groups and is higher among older patients and women. (Moini et al. 2020) The probable reason for this is the level of estrogen-causing thyroid disorders reportedly prevailing in postmenopausal women (Nyström et al. 2011).

Thyroid ultrasonography is a widely used, non-invasive, harmless, and cost-effective method for imaging the gland and detecting pathology (Genc et al. 2016). It is characterized by relatively high resolution, good image correlation with true thyroid dimensions, no ionizing radiation or iodine-containing contrast agent, and lower cost than other imaging techniques.

However, ultrasonography is not routinely used in primary medical care, though the procedure is harmless, quick, and does not affect the gland. Using it in primary medical care would combine physical examination and imaging, which in certain cases could avoid unnecessary diagnostic procedures and lead to prompt diagnosis (Genc et al. 2016)

On-site ultrasonography, for example, during a routine check-up performed by a general practitioner, can increase the efficiency of health care, reducing the specialists' workload and the need for additional consultations, thus fulfilling the triage role. On-site ultrasonography can also lead to improved quality of care delivery and patient satisfaction (Genc et al. 2016).

On the one hand, administering thyroid ultrasonography improves the quality of daily medical care through faster, more accurate, and timely diagnosis and increases the worth of the examination. On the other hand, implementing new technologies and practices expands the physicians' competence and skills (Genc et al. 2016).

Despite the benefits of routinely performing thyroid ultrasonography, some disadvantages should be noted. Firstly, the lack of sufficient training of doctors and standardized recommendations (guidelines) leads to overdiagnosis and the resort to costly investigations such as computed tomography (CT), magnetic resonance imaging (MRI), fine needle aspiration (FNA), which in some cases are unnecessary (Inman et al. 2017).

By following a proper ultrasonographic methodology with clearly defined standards regarding the characteristics of thyroid nodules and the associated risk of developing carcinoma, using FNA can be reduced by up to 90% while keeping a low risk of undiagnosed malignancy (Smith-Bindman et al. 2013).

Not only can ultrasonography in primary medical practice reduce unnecessary endocrinology consultations, but it can also reduce FNA implementation. Furthermore, it is also associated with lowering medical expenses. Thus, optimizing ultrasonography in primary medical practice, particularly thyroid ultrasonography, would positively affect the entire healthcare system.

Conclusion

Deviations from normal ultrasonographic findings in our study accounted for 36.2% of the studied patients. Thyroid ultrasonographic abnormalities were significantly more common in females than males, and frequency increased with aging. Implementing thyroid ultrasonography as a routine procedure in primary medical practice may reduce healthcare expenses and, as a whole, positively affect the healthcare system.

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