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Thyroid ultrasound and thyroid function findings in 3029 hospital employees: a short report

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► ***Short report***

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ABSTRACT

Background: Evidence on thyroid ultrasound findings among hospital employees remains limited. This study investigated the detection rate and related characteristics of thyroid ultrasound abnormalities and thyroid function indices among employees of a tertiary hospital. ***Materials and Methods:*** This retrospective short report reviewed thyroid color Doppler ultrasound and thyroid function test results from 3029 employees of a tertiary hospital in Chengdu, China, in 2017. Employees with a previous history of thyroid disease or thyroid surgery were excluded. Detection rates of thyroid ultrasound abnormalities were compared by sex and age group. Thyroid function indices were compared between ultrasound-normal and ultrasound-abnormal groups. ***Results:*** Thyroid ultrasound abnormalities were detected in 1889 employees, with an overall detection rate of 62.4%. The detection rate was higher in women than in men, 66.0% versus 50.8%, and increased with age: 48.8% in employees aged ≤30 years, 67.6% in those aged 30–60 years, and 83.4% in those aged ≥60 years. Compared with the ultrasound-normal group, the ultrasound-abnormal group had lower serum FT3 and FT4 levels and higher TSH, TPOAb, and TgAb levels. FT3 and FT4 decreased with age, whereas TSH increased with age. ***Conclusion:*** Thyroid ultrasound abnormalities were common among hospital employees and were associated with sex, age, and thyroid function indices. Combined ultrasound and thyroid function testing may help identify thyroid disorders in this occupational population.

INTRODUCTION

Thyroid diseases are common endocrine disorders and include both functional abnormalities and structural changes, such as thyroid nodules, goiter, thyroiditis, and thyroid malignancy. With the wider use of high-resolution ultrasonography in routine health examinations, thyroid abnormalities are increasingly detected at an early or asymptomatic stage. Thyroid ultrasound is non-invasive, widely available, and sensitive for identifying structural thyroid changes [1, 2].

Several epidemiological studies have reported an increasing detection rate of thyroid abnormalities in physical examination populations in China [3, 4]. However, hospital employees represent a special occupational population. They may experience long working hours, irregular schedules, psychological stress, and potential exposure to medical environments. These factors may influence endocrine and immune function. Previous reports have suggested that thyroid abnormalities may be common among medical staff, but evidence from large hospital employee cohorts remains limited [5-7].

The novelty of this study lies in its focus on a large occupational cohort of hospital employees and in the combined assessment of thyroid ultrasound findings and thyroid function indices. This study aimed to determine the detection rate of thyroid ultrasound abnormalities among 3029 hospital employees, compare the detection rate by sex and age group, and explore the association between ultrasound abnormalities and thyroid function results.

MATERIALS AND METHODS

Study design and participants

This was a retrospective observational short report. Data were obtained from routine health examination records of employees at a tertiary hospital in Chengdu, China, between January 2017 and January 2018. Employees who underwent both thyroid color Doppler ultrasound and thyroid function testing during the study period were included. Employees with a previous history of thyroid disease or thyroid surgery were excluded. The final analysis included 3029 employees.

Ethical considerations

This study was approved by the Ethics Committee of West China Hospital, Sichuan University (approval No. 2023 Ethics Review (1697), approval date: March 15, 2023). The requirement for informed consent was waived because this was a retrospective study using anonymized health examination data.

Thyroid ultrasound examination

Thyroid ultrasound examinations were performed

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using a Philips HD11XE ultrasound system with a 9–12 MHz linear probe (Philips Healthcare, Netherlands). During the examination, participants were placed in the supine position with full exposure of the neck. Routine scanning was performed to assess thyroid size and morphology. The position, size, internal echo, boundary, calcification, cystic change, capsule, lymph nodes, and blood flow distribution of thyroid lesions were recorded. Ultrasound findings were classified as normal or abnormal according to the Chinese guidelines for the diagnosis and treatment of thyroid diseases and the initial diagnosis made by ultrasound physicians [1].

Thyroid function testing

Venous blood samples were collected for thyroid function testing. Thyroid-stimulating hormone (TSH), free triiodothyronine (FT3), free thyroxine (FT4), anti-thyroid peroxidase antibody (TPOAb), and anti-thyroglobulin antibody (TgAb) were measured using a Cobas e 602 electrochemiluminescence immunoassay analyzer with corresponding assay kits (Roche Diagnostics, Netherlands).

Statistical analysis

Continuous variables are presented as mean ± standard deviation, and categorical variables are presented as number and percentage. Differences in categorical variables were analyzed using the chi-square test. Differences in thyroid function indices between the ultrasound-normal and ultrasound-abnormal groups were analyzed using the independent-samples t-test. Comparisons among age groups were performed using one-way analysis of variance. A two-sided P value <0.05 was considered statistically significant. Statistical analyses were performed using SPSS version 17.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Demographic characteristics and ultrasound abnormality rate

A total of 3029 hospital employees were included, including 729 men and 2300 women. The mean age was 39.5 ± 15.5 years, with an age range of 19 to 98 years. Thyroid ultrasound abnormalities were detected in 1889 employees, with an overall detection rate of 62.4%. The detection rate was significantly higher in women than in men, 66.0% versus 50.8% (P<0.001). The detection rate also increased significantly with age, from 48.8% in employees aged ≤30 years to 67.6% in those aged 30–60 years and 83.4% in those aged ≥60 years (P<0.001; table 1).

Composition of thyroid ultrasound abnormalities

Among the 1889 employees with abnormal ultrasound findings, nodular goiter was the most common finding, accounting for 46.85%, followed by heterogeneous thyroid echogenicity, accounting for 41.72%. Other findings included unilateral thyroid nodules, solid nodules, adenomatous nodules, calcified foci, adenoma, cervical lymphadenopathy, and nodules suspicious for malignancy (table 2). Representative anonymized ultrasound images are shown in figure 1.

Table 1. Demographic characteristics and thyroid ultrasound findings among 3029 hospital employees.

Variable	Total, n	Ultrasound abnormal, n (%)	Ultrasound normal, n (%)	P value
Total	3029	1889 (62.4)	1140 (37.6)	—
Sex				<0.001
Male	729	370 (50.8)	359 (49.2)	
Female	2300	1519 (66.0)	781 (34.0)	
Age group				<0.001
≤30 years	1171	571 (48.8)	600 (51.2)	
30–60 years	1461	987 (67.6)	474 (32.4)	
≥60 years	397	331 (83.4)	66 (16.6)	

Note: Data are presented as n (%). P values were calculated using the chi-square test.

Table 2. Composition of thyroid ultrasound abnormalities among 1889 employees.

Ultrasound finding	Number of cases, n	Composition ratio, %
Heterogeneous thyroid echogenicity	788	41.72
Nodular goiter	885	46.85
Nodular goiter with adenomatous nodules	16	0.85
Solid nodule	26	1.38
Unilateral thyroid nodule	122	6.46
Calcified focus	3	0.15
Adenoma	3	0.15
Nodules suspicious for malignancy	2	0.11
Cervical lymphadenopathy	9	0.48
Other findings	35	1.85
Total	1889	100.00

Note: Percentages were calculated using 1889 employees with abnormal thyroid ultrasound findings as the denominator.

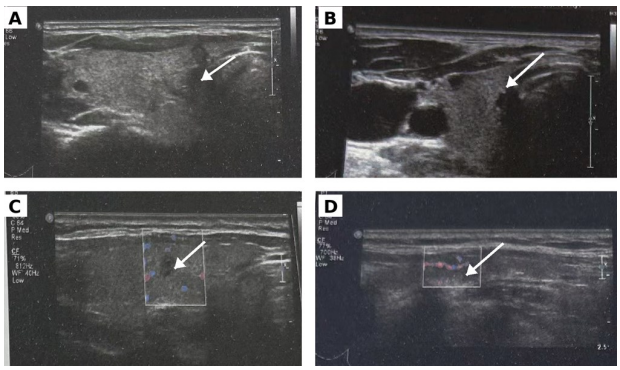

Figure 1. Representative anonymized thyroid ultrasound images. Arrows indicate representative regions of interest or abnormal thyroid lesions. A: heterogeneous thyroid echogenicity; B: thyroid nodule; C: color Doppler ultrasound image of a nodular lesion; D: nodular lesion with visible blood-flow signal. Please replace these panels with original anonymized images from the 2017 dataset if available.

Thyroid function results

Compared with the ultrasound-normal group, the ultrasound-abnormal group had significantly lower FT3 and FT4 levels and significantly higher TSH,

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TPOAb, and TgAb levels (all P<0.05; table 3). When stratified by age group, FT3 and FT4 levels decreased with age, whereas TSH levels increased with age (all P<0.05). No significant differences in TPOAb or TgAb levels were observed among age groups (P>0.05; table 3).

Table 3. Thyroid function indices according to thyroid ultrasound result and age group.

Group	n	FT3 (pmol/L)	FT4 (pmol/L)	TPOAb (IU/mL)*	TgAb (IU/mL)*	TSH (mIU/L)
Ultrasound-normal group	1140	5.03 ± 0.86	16.87 ± 2.65	19.48 ± 37.31	44.98 ± 109.55	2.90 ± 1.69
Ultrasound-abnormal group	1889	4.84 ± 0.65†	16.44 ± 2.35†	57.71 ± 106.33†	161.15 ± 346.41†	3.50 ± 2.63†
Age ≤30 years	1171	5.04 ± 0.73	16.94 ± 2.46	40.20 ± 82.33	125.37 ± 301.25	3.05 ± 2.49
Age 30–60 years	1461	4.89 ± 0.75‡	16.47 ± 2.52‡	43.27 ± 89.43	107.67 ± 260.78	3.25 ± 2.01‡
Age ≥60 years	397	4.59 ± 0.63‡§	16.07 ± 2.20‡§	52.74 ± 104.44	129.92 ± 333.65	4.18 ± 2.74‡§

Note: Data are presented as mean ± standard deviation. FT3, free triiodothyronine; FT4, free thyroxine; TPOAb, anti-thyroid peroxidase antibody; TgAb, anti-thyroglobulin antibody; TSH, thyroid-stimulating hormone. †P<0.05 compared with the ultrasound-normal group. ‡P<0.05 compared with the age ≤30 years group. §P<0.05 compared with the age 30–60 years group.

DISCUSSION

In this retrospective short report, thyroid ultrasound abnormalities were detected in 62.4% of hospital employees. The detection rate was higher in women than in men and increased with age. Employees with abnormal thyroid ultrasound findings also showed differences in thyroid function indices compared with those with normal ultrasound findings.

The detection rate in the present study was higher than that reported in some general physical examination populations [8-10]. This difference may be related to the occupational characteristics of hospital employees, including irregular work schedules, psychological stress, night shifts, and greater awareness of health examinations. However, because this was a single-center retrospective study, direct comparisons with other populations should be interpreted cautiously.

The higher detection rate among women is consistent with previous reports showing that thyroid disorders are more common in women [11-13]. Possible explanations include sex hormone differences, autoimmune susceptibility, and genetic factors. The increasing detection rate with age may reflect cumulative structural changes, degenerative changes, and declining compensatory reserve of the thyroid gland [14].

In this study, ultrasound abnormalities were associated with lower FT3 and FT4 levels and higher TSH, TPOAb, and TgAb levels. These findings suggest that structural thyroid changes may coexist with functional or autoimmune abnormalities. Therefore, thyroid ultrasound and thyroid function testing may provide complementary information in occupational health screening. Previous studies in elderly populations have reported inconsistent findings regarding the relationship between thyroid nodules and thyroid function [15, 16], indicating that population characteristics and screening methods may influence the observed associations.

The age-related changes in thyroid function observed in this study are partly consistent with previous studies showing that FT3 and FT4 may decline with age, while TSH may increase in older adults [17-20]. These findings support the need to interpret thyroid function results in relation to age and clinical context rather than relying only on a single laboratory value.

This study has several limitations. First, it was a retrospective single-center study, and the findings may not be generalizable to other hospitals or occupational groups. Second, the study did not include information on body mass index, iodine intake, family history, occupational radiation exposure, psychological stress, night-shift frequency, or lifestyle factors. Third, ultrasound-suspected malignant lesions were not confirmed by pathological examination in this analysis; therefore, they should not be interpreted as confirmed thyroid cancer. Fourth, the causal relationship between ultrasound abnormalities and thyroid function changes could not be determined.

CONCLUSION

Thyroid ultrasound abnormalities were common among hospital employees, particularly among women and older employees. Ultrasound abnormalities were also associated with differences in thyroid function indices. Combined thyroid ultrasound and thyroid function testing may be useful in routine occupational health examinations for hospital employees.

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Conflicts of interest: The authors declare that they have no conflicts of interest.

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