

EVALUATING THE UTILITY OF ULTRASOUND EXAMINATION IN ASSESSING THYROID GLAND ABNORMALITIES IN SAUDI ARABIAN POPULATION

Hussain Almohiy,¹ Mohamed Adam,¹ Elgeili Adam,¹ Hassan M. Al-Musa²

¹ Radiology Department, College of Applied Medical Sciences, King Khalid University, Abha, Saudi Arabia

² Family & Community Medicine Department, College of Medicine, King Khalid University, Abha, Saudi Arabia

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ABSTRACT

OBJECTIVES: Ultrasound imaging was conducted to identify the thyroid gland abnormalities and its incidence rate among residents of Aseer region of the Kingdom of Saudi Arabia (KSA). **METHODS:** A non-intervention prospective study was designed. A total of 281 participants (age range from 7 to 80 years) were randomly selected at Aseer Region and Radiology department, King Khalid University (KKU) Kingdom of Saudi Arabia (KSA), from 8th to 16th March 2015. Data was collected by using demographic characteristics gathered through fixed questionnaires and the thyroid abnormalities detected using Ultrasonography (USG) within period of 7 days. The frequencies of specific thyroid findings were analyzed using statistical package for social sciences (SPSS). **RESULTS:** 40 (14.2%) cases of incidental thyroid abnormalities were observed of which 31 (11%) were cases of thyroid nodules, 25 (8.9%) were cases of cystic nodules, 6 (2.1%) were cases of solid nodules, 8 (2.5%) were cases of goiter and 1 (0.4%) was a case of Hashimoto's thyroiditis. Higher incidence rate of thyroid nodules was observed among 11-20 years old age group. A majority of nodules were benign in nature and were smaller (< 5 mm) in size. **CONCLUSION:** USG is an inexpensive and noninvasive diagnostic imaging tool to identify and classify thyroid abnormalities in a population. Hence USG should be routinely used in the long-term management of thyroid health of resident of Aseer region of KSA.

Key Words: Thyroid, Ultrasound, Aseer, Nodule, KSA

Introduction

We assessed the utility of ultrasound imaging in detecting abnormalities of thyroid gland in Aseer region of Kingdom of Saudi Arabia and documented the frequencies of specific ultrasound findings. Ultrasonography (USG) is extensively reported to be the most common and useful method of imaging thyroid gland and its abnormalities (1 and 3 only). USG is also helpful in distinguishing the characteristic of malignant from benign thyroid nodules.¹ Thyroid enlargement, like thyroid nodules, is detected more objectively by USG than physical examination. Indeed

in patients with a palpable diffuse goiter, USG provided vital metrics which are of diagnostic value. Nodules with suspicious ultrasound features should be considered for biopsy because the prevalence of cancer in an individual nodule in a goiter is independent of the number of USG identified nodules.^{2,3} The ultrasonic appearance of a thyroid nodule does not reliably differentiate a benign thyroid lesion and cancer but it gives strong clues regarding optimal clinical management. Screening of goiters for ultrasonic characteristics, such as enhanced posterior echoes, is reported to contribute to early diagnosis of lymphoma, facilitating early initiation of therapy.⁴ An abnormal USG pattern of the thyroid, characterized

Correspondence : Dr. Hussain Almohiy
Department of Radiological Sciences,
College of Applied Medical Sciences,
King Khalid University, Abha,
Saudi Arabia
Email: hmohiy@kku.edu.

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by diffuse low echogenicity was reported in autoimmune thyroid diseases, and its potential value in the diagnosis of Hashimoto's thyroiditis.⁵ However USG findings that are specifically pathognomonic for thyroid cancer are lacking. Although observed sporadically, USG evidence of vascular invasion may be the most reliable predictor of malignancy. The USG characteristics of nodules that are evaluated for identifying cancers include 1) the intensity of the echoes, 2) the sharpness of the boundary of the nodule, 3) the presence of a sonolucent "halo", 4) calcifications, and 5) internal structure: including vascularity and the shape (deeper or taller than wide in the transverse view).⁹ Although USG can provide useful clinical clues about the nature of a thyroid lesion, it does not clearly differentiate between a benign lesion and malignant form of cancer. However USG can be used for the following: 1) Depict accurate anatomy of the neck in thyroid region, 2) Elucidate cryptic findings on physical examination, 3) Identify the solid component of a complex nodule, 4) Screen the thyroid during epidemiologic investigations in the rural areas and 5) Identify patients who have ultrasonic thyroid patterns that suggest diagnoses such as thyroiditis. Nevertheless, extensive differences in USG characteristics are reported in several international studies, which may be due to differences in the population and race. Hence we designed this study to assess if any such differences are evident in USG among Saudi Arabian population from Aseer region and specifically evaluate the utility of ultrasound imaging in detecting abnormalities of thyroid gland in our study population.

Materials and Methods

A non-intervention prospective study spanning 7 days (from 8th to 16th March 2015) was designed at Radiology department of King Khalid University in the Aseer region of the Kingdom of Saudi Arabia (KSA). 281 participants with ages ranging from 7 to 80 years were randomly selected in 7 days for evaluation with ultrasound. The patient's referred to the center were approached and requested to participate in the study. Participants were initially scanned by routine sonographic evaluation using protocol established by Jurie-Philadelphia-USA, Burwin Ins-

titute of Ultrasound and Sanders RC Guide⁷ and the observations were recorded. The clients were examined in the supine position after applying a sonic coupling agent on the skin in the thyroid gland region.

Ultrasonography (USG)

Ultrasonographic examination was conducted using 7.5-11 MHz probes linear array transducer (GE Healthcare, Japan LOGIQ 3 and 10G E) by an expert ultrasonographer. Two or more images from each lobe (cross section and longitudinal section) from all participants were saved and the observations on abnormalities in thyroid gland were recorded.

Data processing and Statistical analysis

The USG data was compiled into an analysis sheet in SPSS. Logistic regression analysis was performed to assess prevalence of thyroid disorders and frequencies. Percentage prevalence, observations and correlations were compared using a Chi-square test.

Inclusion criteria

That all patients were Saudi Arabian nationality from Aseer region and all age.

Exclusion criteria

Non Saudi Arabian nationality.

Results

The prevalence of incidental thyroid abnormalities detected by ultrasonography (USG) was 14.2% (40 cases out of 281 participants). Out of the 281 participants, there were 31 (11%) cases of thyroid nodules, 25 (8.9%) cases of cystic nodules, 6 (2.1%) cases of solid nodules, 8 (0.002%) cases of goiter and 1 (0.003%) case of Hashimoto's thyroiditis.

(Tab. 1) shows the age based frequency distribution of cases with thyroid nodules. Thyroid cystic nodules and solid thyroid nodules were identified in 31 (11%) cases out of 281 participants. Highest frequency distribution of thyroid nodules was observed in the 11-20 years age group (38.71% incidence rate), which was followed by 31-40 years age group (16.13% incidence rate) and both 51-60 and 71-80 years age

Age in years	Nodule		Total
	Yes	No	
1 - 10 Years	0	5	5
11 - 20 Years	12	38	50
21 - 30 Years	1	55	56
31 - 40 Years	5	43	48
41 - 50 Years	3	39	42
51 - 60 Years	4	40	44
61 - 70 Years	2	21	23
71 - 80 Years	4	8	12
81 - 90 Years	0	1	1
Total	31	250	281

Table 1: Age and nodule frequency distribution.

groups (12.90% incidence rate). The other age groups had < 10% incidence rate.

The distribution based on the characteristics of the nodule is presented in (Tab. 2). Majority of the thyroid nodules observed were of single cystic nodule type, with an incidence rate of 58.06%. The rest of the nodule types had < 15% incidence rate.

Characteristic of the nodule	Nodule		Total
	Yes	No	
Normal	2	245	247
Goiter	4	4	8
Single cystic nodule with foci	1	0	1
Si. C. nodule	18	0	18
M. C. nodule	4	0	4
Enlarged L/N	1	0	1
Thyroiditis	0	1	1
Si.C.nodule and renal parenchymal disease	1	0	1
Total	31	250	281

Table 2: Distribution based on characteristic of the nodule.

The incidence rate of solid nodules was 2.1%, while the occurrence of cystic nodules was 8.9% (Tab. 3), hence the occurrence of cystic nodules was significantly higher in our study population.

	Frequency	Percent
Solid Nodule		
No	275	97.9 (P < 0.001)
Yes	6	2.1 (P < 0.001)
Total	281	100.0
Cystic Nodule		
No	256	91.1 (P < 0.001)
Yes	25	8.9 (P < 0.001)
Total	281	100.0

Table 3: Cystic and solid nodules distribution

More than 80% of the cystic and solid nodules were small in size, with a maximum diameter of 5 mm (Table 4). Thyroid solid cysts and thyroid nodules with a diameter of more than 5 mm were identified in 4 (1.4%) cases and 1 (0.4%) of the total participants respectively. Among both solid and cystic nodules <15% of them were over 5 mm size (Tab. 4). Other thyroid abnormalities observed were 8 (2.84%) cases of goiter and 1 (0.36%) case of Hashimoto's thyroiditis.

	Frequency	Percent
Solid Nodule		
No	275	97.9 (P < 0.001)
< 5mm	5	1.8 (P < 0.001)
> 5mm	1	0.4 (P < 0.001)
Total	281	100.0
Cystic Nodule		
No	256	91.1 (P < 0.001)
<5 mm	21	7.5 (P < 0.001)
> 5mm	4	1.4 (P < 0.001)
Total	281	100.0

Table 4: Solid and cystic nodule size

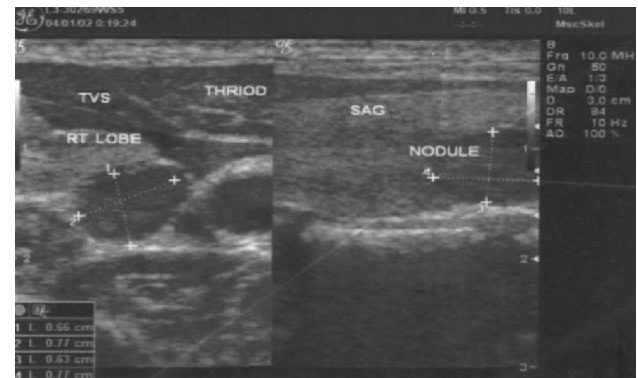


Figure 1: Single solid thyroid nodule on right lobe sagittal and transverse



Figure 2: Heterogeneous mild enlarged thyroid feature of thyroiditis.

Discussion

Thyroid disorders are among the commonest endocrine disorders reported worldwide. Most of the people at risk of developing thyroid disorders are from developing countries including KSA.⁸ Both over-secretion and under secretion of thyroid hormone can lead to the development of thyroid disorders. The thyroid disorder differs from each other in terms of their ease of diagnosis, accessibility to medical treatment and their relative visibility. Even a small swelling on thyroid would require appropriate medical intervention.³ While currently biochemical based diagnosis of thyroid disorder is extensively used, the availability of imaging modalities such as ultrasound, offers a very objective and efficient classification of thyroid disorders and estimating the prevalence rates in a larger population.

Currently reports on the prevalence of thyroid disorders in the population of Aseer region using ultrasonography (USG) examination are lacking, which led us to design this study. The analysis of the frequencies of thyroid disorders by ultrasound imaging would assist us in initiating appropriate and optimal long-term thyroid health management approaches for the residents of Aseer region of KSA.

A total of 281 participants were examined within one week from a single center. We observed 31(11%) cases thyroid nodule. 25 (8.9%) cases of cystic nodules and 6 (2.1%) cases of solid nodules. Significantly greater numbers of both cystic and solid nodules were less than 5mm in size, with only < 15% of all nodules to be over 5 mm in size. We also observed 8 (2.8%) cases of increased thyroid volume (goiter), 1 (0.4%) case of thyroiditis and 1 (0.4) case of enlarged L/N. To the best of our knowledge this is the first study evaluating the frequency distribution of various thyroid disorders in the Aseer region of KSA. Incidentally the age group of 11-20 years had the highest thyroid abnormalities. Further the nodular disorders of the thyroid gland were relatively common among our population with an overall prevalence of 4-7% in the general population, which is consistent with reports from other geographical location.⁸ A previous study has reported majority of the to be benign hyperplastic lesions, with only 5-20% of them being true neoplasm's.⁴ The findings from our and previous other studies on the texture and the size of

thyroid nodules support the benign nature of majority of thyroid lesions.⁹⁻¹⁰

A large-scale sample number was the strength of this study, even though the number was relatively small when compared with some other health management surveys. Nevertheless there are few limitations with this study. The current study could not include 0 to 2-year-old children. Also, the numbers of participants in the study were males only, and the numbers of participants were much smaller compared to the total population. The study could also not evaluate autoimmunity of the thyroid gland or iodine intake, both of which strongly influence the ultrasound imaging of the thyroid gland. Hence a further follow-up study is necessary to evaluate the prognosis of the thyroid disorders observed in this survey.

In adult patients the sensitivity of USG has been reported to be 85.1-95.1% and specificity to be 96-100% (18-20). These metrics when applied to our study, indeed support the utility of USG in identifying and classifying thyroid gland abnormalities in a population, which epidemiologically are vital in initiating health care measure to prevent thyroid gland disorders. Nevertheless further studies in a larger scale, are necessary to identify the factors responsible for thyroid gland disorders, specifically in the age group of 11-20 years before initiating optimal public health measures.

Limitation of the study

1. The number was relatively small when compared with some other health management surveys.
2. The current study could not include 0 to 2-year-old children.
3. The numbers of participants in the study were males only
4. The study could also not evaluate autoimmunity of the thyroid gland or iodine intake, both of which strongly influence the ultrasound imaging of the thyroid gland.
5. No FNA and cytological examination of thyroid nodules was done

Hence a further follow-up study is necessary to evaluate the prognosis of the thyroid disorders observed in this survey.

Conclusion

High resolution USG has become a very valuable diagnostic tool in the evaluation of thyroid disorders. Imaging particularly USG plays an important role classifying various thyroid gland abnormalities. Our study although a preliminary step towards indentifying thyroid gland abnormalities, would nevertheless assist in the long-term management of the thyroid health of residents of Aseer region using USG, which is an inexpensive, noninvasive and easily performable diagnostic imaging.

Conflict of Interest: The authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.

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