Original Article

SONOGRAPHIC EVALUATION OF THYROID LESIONS IN PATIENTS WITH ABNORMAL THYROID FUNCTION TEST IN AKTH

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ABSTRACT

Context: Thyroid lesions are highly prevalent, particularly among individuals with abnormal thyroid function tests, with increasing incidence in older people and a higher frequency in females. Thyroid ultrasound is a valuable imaging tool for characterizing lesions and assessing malignancy risk using the Thyroid Imaging Reporting and Data System (TIRADS).

Aim: To evaluate sonographic thyroid lesions in patients with abnormal thyroid function tests at Aminu Kano Teaching Hospital, Kano, Nigeria.

Methods: This cross-sectional comparative study recruited patients from endocrinology clinics based on recent abnormal thyroid function test results. Sonographic assessment of thyroid parenchyma was performed and lesions were classified using TIRADS. Data were analyzed with SPSS version 23.

Results: A total of 270 participants were enrolled, including 45 males (16.7%) and 225 females (83.3%). The most common age group was 31–40 years, with a statistically significant difference in mean age between males and females ($p \leq 0.05$). Thyromegaly was observed in 73% of participants, while 27% had normal thyroid size. Hyperthyroidism was documented in 218 patients (80.7%) and hypothyroidism in 52 (19.3%). Among hyperthyroid patients, TIRADS 2 was most common (73.7%), followed by TIRADS 3 (21.7%). In hypothyroid individuals, TIRADS 2 (55.8%) and TIRADS 1 (36.5%) predominated. Differences in TIRADS distribution between both groups were statistically significant ($p < 0.001$).

Conclusion: Thyroid lesions are more common in females, thyromegaly is frequent, and TIRADS 2 is the predominant classification in both hyperthyroid and hypothyroid patients.

Keywords: Thyroid ultrasound; TIRADS; Hyperthyroidism; Hypothyroidism; Thyroid lesion

INTRODUCTION

Thyroid lesions have been defined by the American Thyroid Association (ATA) as "discrete lesions within the thyroid gland, radiologically distinct from surrounding thyroid parenchyma".[1] They are clinically important primarily due to their malignant potential. For this reason, the initial evaluation should always include a history and physical examination focusing on features suggestive of malignancy.[2]

Thyroid nodules are more common in women than men; The incidence of thyroid nodules increases with age. Almost 30% of women above the age 30years will have thyroid nodules and must women will have developed thyroid nodules by the age of 50. More than 90% of all thyroid nodules are benign. The incidence of thyroid nodules increases with age and most. The prevalence of thyroid nodules on ultrasound in most studies is 19-50 %.[1,3–5] Various methods of thyroid evaluation are available ranging from laboratory investigations to imaging modalities. They provide important information regarding thyroid function and presence of features suspicious for or of malignancy respectively.

Thyroid Imaging Reporting and Data System, is a system which is used to standardize the reporting of thyroid Ultrasonography studies so that the finding can be understood by clinicians. The system also stratifies the risk of malignancy of a lesion based on the Ultrasonography features. This will even be more helpful in settings where Fine Needle Aspiration Cytology (FNAC) not readily available and so decisions are based to a great extent on the USS features of the lesions and TIRADS classification as this implies the potential risk for malignancy.[6] Ultrasonography is one of the important imaging modalities for thyroid gland evaluation and characterization.[9] Previous studies have investigated the ability of thyroid USS to differentiate between benign and malignant lesions to avoid the unnecessary use of invasive procedures.[15]

This study is aimed at characterising thyroid lesions using high resolution ultrasound among patients with abnormal thyroid function test, at Aminu Kano Teaching Hospital in North Western Nigeria.

MATERIALS AND METHOD

The study was a cross-sectional comparative study conducted on adult patients attending thyroid clinic at Animu Kano Teaching hospital over a period of six months

Equipment

SSI 8000 SonoScape Shenzhen China, 2008 using 5-10 MHz Linear array transducer for optimum imaging using.

Technique of thyroid gland ultrasound scan

The procedure was explained to the patient and informed consent was given and duly signing or thumb printing the consent form. The Biodata was recorded.

Patients were positioned on the examination couch, with the neck extended and adequate exposure of the neck obtained. After applying coupling gel, longitudinal and transverse images both lobes of the thyroid were obtained.

Transverse scans are used to measure the anterior-posterior diameter which represents the depth of the gland and medio- lateral diameter which represent the width of each thyroid lobe respectively.

Scans in the longitudinal plane were used to measure the cranio-caudal diameter which represents the length of the thyroid gland. The total volume of the gland was calculated as the summation of the volume of the two lobes (excluding the isthmus) using ellipsoid formula (W x H x L x 0.52). [45]

To avoid observer differences and ensure accuracy in thyroid volume measurement, an average of three values was taken and recorded by the radiologists.

Thyroid function test (TFT) is routinely done in patients with suspected thyroid disease attending the thyroid clinic and recent TFT results obtained within the last month in the

hospital (AKTH) are used for the study. Data were analysed using the SPSS for windows version 21 and p-value less than 0.05 was considered statistically significant.

Ethical Approval

Prior to the commencement of the study, ethical approval was obtained from the Ethics and Research Committee of Aminu Kano Teaching Hospital (AKTH), on the 30th August 2019, with the reference number NHREC/21/08/2008/AKTH/EC/2589.

RESULT

A total of 270 participants comprising of 45males (16.7%) and 225females (83.3%) participated in the study with an age range of 18 – 69 years. The male participants age range from 23 – 63 years with a mean age of 36.9±9.2years while the female participants were aged between 18 – 69 years with a mean age of 37.0±12.1

The modal age group among the study participants was 31 – 40 years as illustrated in Fig. 1. There was a statistically significant difference between the mean ages of the male and female participants ($p \leq 0.05$).

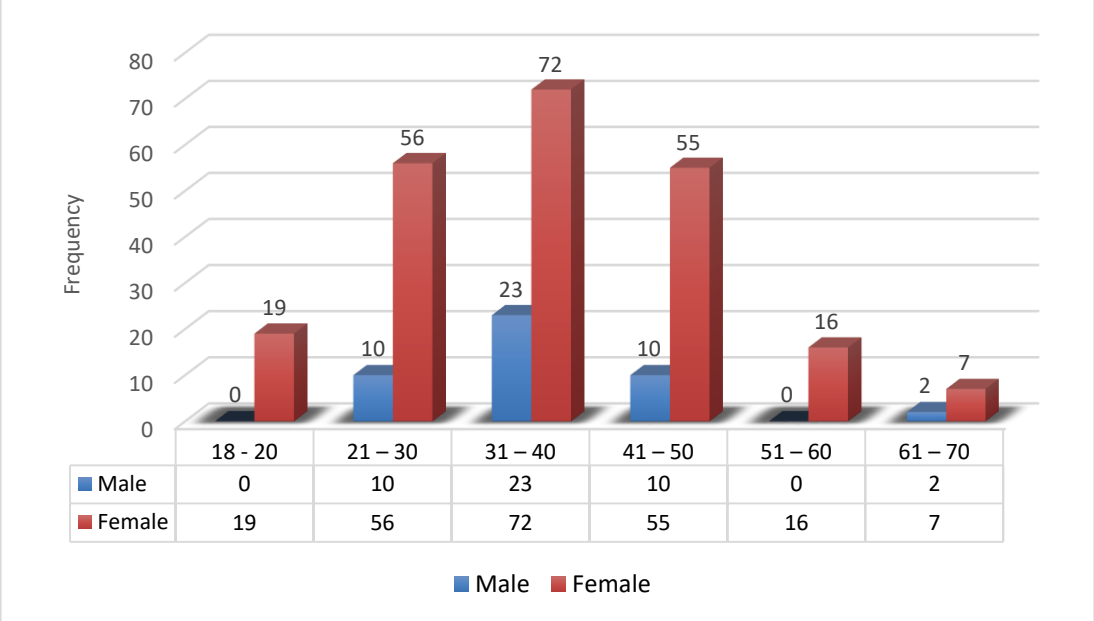
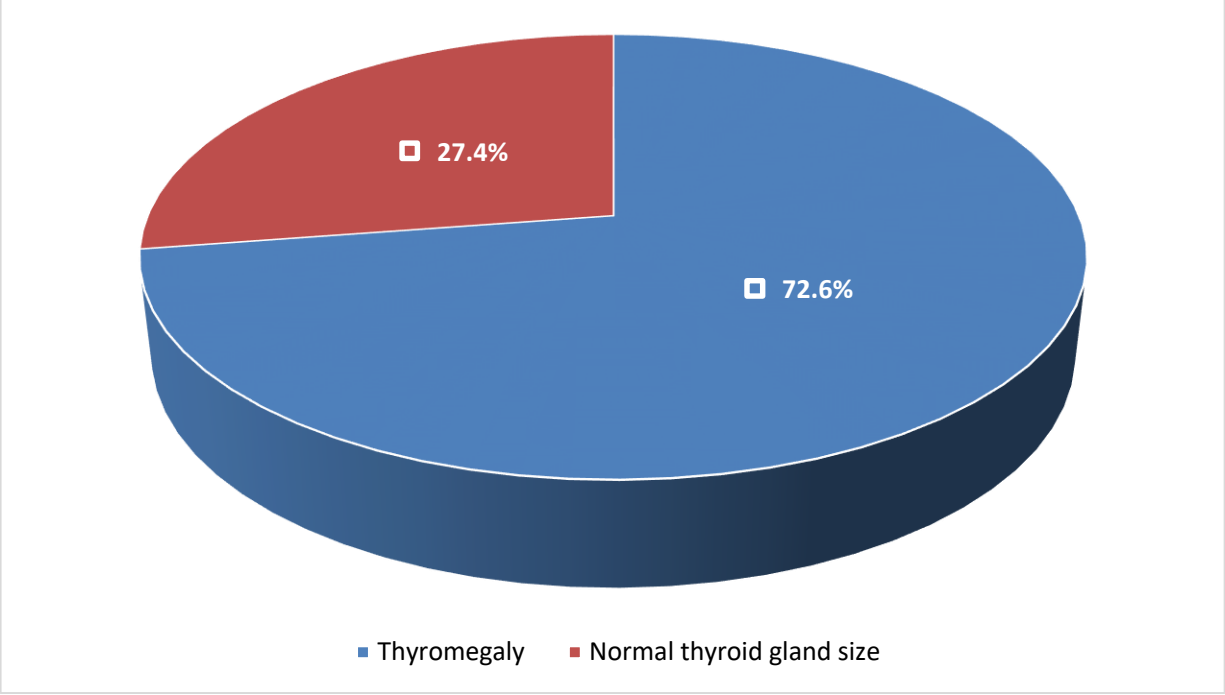


Fig 1. Bar chart showing the age distribution among study subjects

Prevalence of parenchymal lesions

The outcome of parenchymal lesions as presented in tabled 1 show that 30 patients had cystic lesions that were regular (28 females, 2 males), and 70 had regular solid lesions (55 females, 15 males). Among the solid lesions, 32 had a gland with homogenous parenchymal echogenicity (31 females, 1 male), while 238 had heterogeneous parenchymal echogenicity (194 females, 44 males). A small proportion of patients had calcifications, 5 patients had micro calcification (4 females, 1 male), and 2 female patients had macro calcification. Gland vascularity was also assessed and 80 patients had normal gland vascularity (71 females, 9 males) while 190 were found to have a gland with hyper vascularity (154 females, 36 males). All these different observations were found to be statistically significant with $p<0.001$.



The figure 2 above shows the sonographic characteristics of the study participants with 72.6% having thyromegaly and 27.4% with normal gland size.

Table 1. Prevalence of parenchymal lesion

Variables		n = 270		Total	p-value
		Male	Female		
CYSTIC LESION	Regular	2	28	30	<0.001
	Irregular	0	0	0	-
SOLID LESION	Regular	15	55	70	<0.001
	Irregular	0	0	0	-
ECHOGENICITY	Homogenous	1	31	32	<0.001
	Heterogeneous	44	194	238	<0.001
CALCIFICATION	Micro	1	4	5	<0.001
	Macro	0	2	2	<0.001
VASCULARITY	Reduced	0	0	0	-
	Normal	9	71	80	<0.001
	Hypervascularity	36	154	190	<0.001

Significant at ≤0.05

Characteristics of the lesions using tirad grading

In this study, the outcome of thyroid lesions using TIRADS showed the highest number of patients having TIRAD 2 (190/270), followed by TIRAD 3 (51/270), then TIRADS 1 (28/270) with only 1 patient (a male) found to have TIRADS 4 thyroid lesion. None of the patients in this study was

found with TIRADS 5 thyroid lesion. The study also showed highest prevalence of thyroid lesions among the female patients. All these findings were statistically significant at p=0.01.

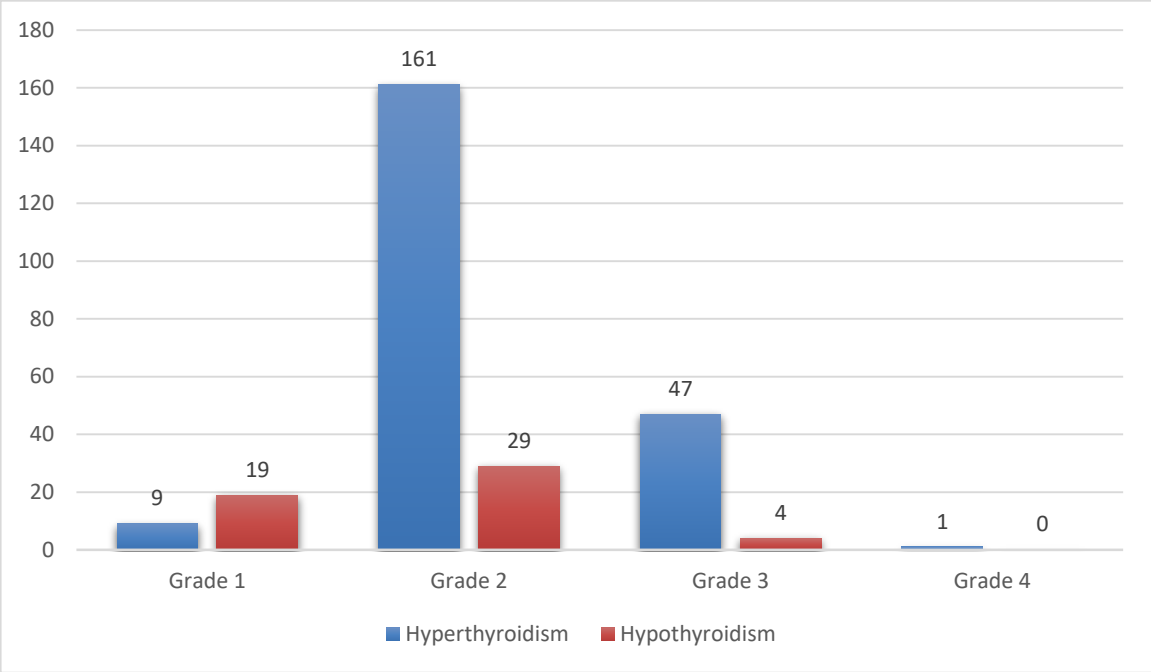


Figure 3. Showing sonographic characteristics of patients using TIRADS Grading

Among the study participants, 80.7% had hyperthyroidism while 19.3% had hypothyroidism base on serum thyroid function test results. In those with hyperthyroidism, a high number of them 73.7% showed TIRADS 2 sonographic characteristics, followed by 21.7% with TIRADS 3, 4.1% with TIRADS 1 and 0.5% with TIRAD 4 characteristics. Similarly, in patients with hypothyroidism, a higher number of the patients 29 (55.8%) showed TIRADS 2 characteristics, followed by 19 (36.5%) with TIRADS1, 4 (7.7%) with TIRADS 3 and none having TIRADS 4 characteristics. None of the study participants was found to have TIRADS 5 (Fig 3). The differences in TIRADS grading between patients with hyperthyroidism and hypothyroidism were all statistically significant with p<0.001.

DISCUSSION

There were 270 patients in the study, with the age range 18 - 69years. There was higher prevalence of thyroid lesions in the female gender in this study than males which is

similar to a study by Olusola and Anthonia in South Western Nigeria. [27,33,50)] This study revealed a statistical difference in volume of the two lobes, which was higher in the right lobe than the left lobe, with a statistical difference of 3.5mls in females and 1.1mls in males. The study showed that 72.6% participants had thyromegaly, while 24.7% had normal size thyroid volume. This was concordant with the studies done locally and internationally. [4,33,50]

The prevalence of solid thyroid lesions was higher than cystic lesions. Thirty patients had regular cystic lesions 11.1%, 70 had regular solid lesions 25.9%. This is in agreement with the study done in Ibadan South West Nigeria, Thailand, China and Korea. [28,31,32,33] Contrary to the findings of this study, a study done in the USA indicates higher prevalence of cystic thyroid lesions. [30] This could probably be due to geographic or genetic differences and also inadequate data related to thyroid diseases in the locality of the current study area.

The majority of the participants with solid thyroid lesions had heterogeneous (mixed echogenic) parenchymal echoes 88.1% while those with homogeneous parenchyma were 11. 9%. Similar findings were reported by Park M, et al in Seoul, Korea. [53]

Microcalcifications within solid lesions were commoner than microcalcifications. However, these lesions did not have other suspicious sonographic features for malignancy. Furthermore, it is not all thyroid lesions with micro calcification would end up with malignancy as documented in Korea and Iran. [38,41]

Following Doppler interrogation, it was found that majority of patients had hyper vascular gland. Almost all the glands with increased vascularity were diagnosed with hyperthyroidism. Likewise, those with normal gland vascularity were hypothyroid. This correlated well with the studies conducted in Egypt by Rajab HD and the one by Pernille in Denmark. [52,53] This indicates that those with hyperthyroidism are more than those with hypothyroidism. This is similar to the studies conducted by Golbert L in Czechia and Vejbjerg P in Denmark which recorded hyperthyroidism with higher percentage. [42,43,44]

Using TIRADS majority of lesions encountered in this study were designated TIRADS 2 (Benign) (190/270), followed by TIRADS 3 (Probably benign. TIRADS 4 were the least common None of the patients in this was found with TIRADS 5 (Highly suspicious) thyroid lesion. None of the

patients in this study was found to have TIRADS 5 (highly suspicious) thyroid lesions. These findings correlate well with those studies carried out in Ibadan Nigeria and other parts of the world. [6,7,33, 54]

The study has shown that both hyperthyroid and hypothyroid patients were having TIRADS 2 grading as the most common sonographic findings. This was similar to the study conducted recently in India where Grade II TIRADS was the commonest among their participants. [54]

CONCLUSION

This study has shown that Thyroid lesions are more common in females than males with higher prevalence of solid thyroid lesions than cystic lesions**.** There is positive correlation between the lower TSH (Hyperthyroidism) and thyromegaly with increased vascularity, which is the reverse in the case of hypothyroidism with higher TSH value. TIRADS has a higher sensitivity and specificity in identifying the thyroid lesions and parenchymal changes. TIRADS 2 is the commonest grading in both male and female in this study.

RECOMMENDATIONS

1. High resolution Ultrasound scan of the thyroid gland with Doppler facility can be used to determine patients with likely abnormal thyroid function indirectly, especially in a resource poor environment where no TFT available. However, it does not replace TFT.
2. There is need for more studies related to this research in our locality which will also hopefully incorporate it with the newer imaging modalities such as scintigraphy and elastography.

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