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Evaluation of Thyroid Diseases using Ultrasound among Adult Saudi Patients

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Abstract: *This retrospective study was conducted at Jeddah national hospital in Jeddah in the period from Jan 2019 to April 2019, to evaluate thyroid diseases using ultrasound imaging.*

The study was done by collecting 50 ultrasound reports of patients all of them have thyroid problems in a different region. From our results, we found that the most affected age group was (20-30) represented the highest percentage 12 (24%) while the age group (60-70) represented the lowest percentage 8 (16%). The patients female affected more than male patients with percentage (62%) and (38%) respectively, the Thyroid lymph nodes represented the highest percentage 15(30%) while the Thyroid adenomas and thyroid carcinoma represented the lowest percentage 2 (4%). T3 high represented the highest percentage of 15(34%) while the T3 low and T4 low inform represented the lowest percentage of 3 (6%), 3(6%) respectively.Finally, we found: the thyroid cancer has a strong correlation and highly significant with T3 high and T3 high at level 0.006,0.002 respectively.

Keywords: *thyroid diseases, ultrasound, T3 hormone, Thyroid lymph nodes.*

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I. Introduction

Thyroid diseases have a high prevalence among populations. Most thyroid diseases are benign and just need medical treatment and follow up. Those that need surgical intervention must be identified. Clinical and laboratory assessment is not sufficient for the identification of the nature of thyroid diseases. So imaging is mandatory for these cases.[1]

The US is the most widely used application for the diagnosis of thyroid diseases. It is safe, cheap, time-saving and has high sensitivity and specificity for thyroid lesion characterization. It can characterize most of the thyroid lesions and detect small-sized nodules less than 3 mm. It can evaluate the other nearby neck structures, specifically, lymph nodes, carotid arteries, and jugular veins and other major salivary glands. The application of color and power Doppler modes adds a great advantage to evaluate thyroid gland vascularity. This can assess the disease progression, specifically with Graves ' disease and thyroiditis. [2]

Additionally, it can detect vascularity within septations included within thyroid cystic lesions which helps in differentiation between benign and malignant cysts.US is superior for post-operative follow up.US is useful for fine needle aspiration and True cut needle biopsy guidance. However, US, Still, operator dependent, poorly identify the retrosternal and laryngeal extension and lack of sensitivity and specificity for some cases. [1,2]

For these reasons, the correlation between thyroid US, lab assessment, FNA, and true cut needle biopsy will raise the accuracy of the diagnosis of thyroid diseases for about 100 %. [2,3]

A person may have one or several different types at the same time , Hypothyroidism (low function) caused by not having enough free thyroid hormones ,Hyperthyroidism (high function) caused by having too much free thyroid hormones, most commonly a goiter (enlargement of the thyroid gland) , Tumors which can be benign (not cancerous) or cancerous , and Abnormal thyroid function tests without any clinical symptoms.

People who have symptoms of thyroid disease should undergo an early examination and ultrasound is the ideal solution for screening and security and should be treated quickly. If the disease is untreated, the disease can lead to heart problems, osteoporosis. But early detection is routine, and because the disease responds well to treatment, the patients' expectations are usually positive. If treated with surgery, there is a very slight risk to the vocal cords because of their proximity to the thyroid gland.[3,4]

II. Materials and Methods

2.1Material

2.1.1Area and duration

This study was carried out in Jeddah national hospital in Jeddah, which started at Jan 2019 to Apr 2019.

2.1.2 Sample study

Descriptive and analysis study, 50 patients came to the radiology department and done ultrasonic imaging to investigate thyroid disease. Patients were selected conveniently. The study includes both genders with their ages ranged between 20-70 years.

Inclusion criteria: Patient in age group > 20 < 70 years and patient with abnormal laboratory test.

Exclusion criteria: Patient in age group < 20 > 70 years and patients with normal thyroid function test.

2.1.3 Machine used

Thyroid US was performed by a Hitachi Ultrasound machine scanner with a 5 to 13 MHz bandwidth transducer.

2-2 Methods

2-2-1 Sonographic Technique

The thyroid gland ultrasound examination has been playing an important role in the evaluation of it is pathologies, mainly due to its feasibility, low cost, absence of morbidity, besides the high resolution of the most modern equipment.

The diagnostic medical sonographer will explain your procedure and answer any questions you may have. You will be asked to lie on the examination table with a pillow or bolster under your shoulders and your head extended back. [5]

A warm gel will be applied to your neck. The gel helps the sound waves to get from the machine to your body more easily. The thyroid gland is then imaged in transverse and longitudinal views with a high-frequency (10–15 MHz) linear transducer.

A transducer, a small device, is placed over your neck. There is no pain involved; however, you may feel mild pressure from the transducer. Your procedure will take approximately 30 to 45 minutes. [6,7,8]

2.2.2 Statistical analyses

By using SPSS program version16 all data and variables are analyzed. Descriptive statistics, including frequency and percentages, were calculated. ANOVA test was applied to test the significance, the *p*-value of less than 0.005 was considered to be statistically significant.

III. Results

All collected data analyzed and tabulated in tables and graphs as follows:

Table no 1: Frequency distribution of the patient's gender

Gender	Frequency	Percentages%
Male	19	38%
Female	31	62%
Total	50	100.0

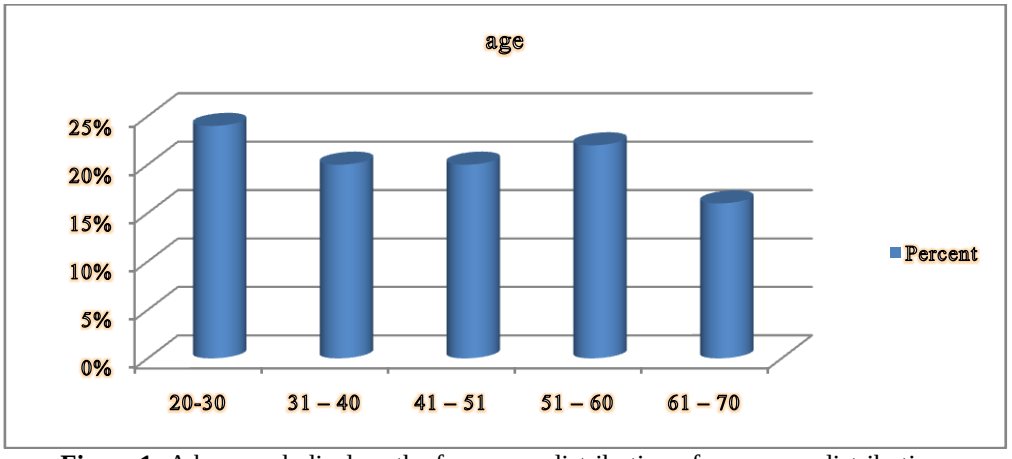

Fig no 1: A bar graph displays the frequency distribution of age group distribution.

Table no 2: Frequency distribution of thyroid pathology.

Diagnostic u/s finding	Right lobe	Left lobe	Both lobs	Total	Percentage
Thyroiditis	1	5	3	9	18%
Thyroid lymph nodes	9	4	2	15	30%
Graves disease	2	1	2	5	10%
Colloid Cyst	4	4	0	8	16%
Goiter	5	2	2	9	18%
Thyroid adenomas	1	1	0	2	4%
Thyroid carcinoma	0	2	0	2	4%
Total	22	19	9	50	100%
Percentage	44%	38%	18%	100%	

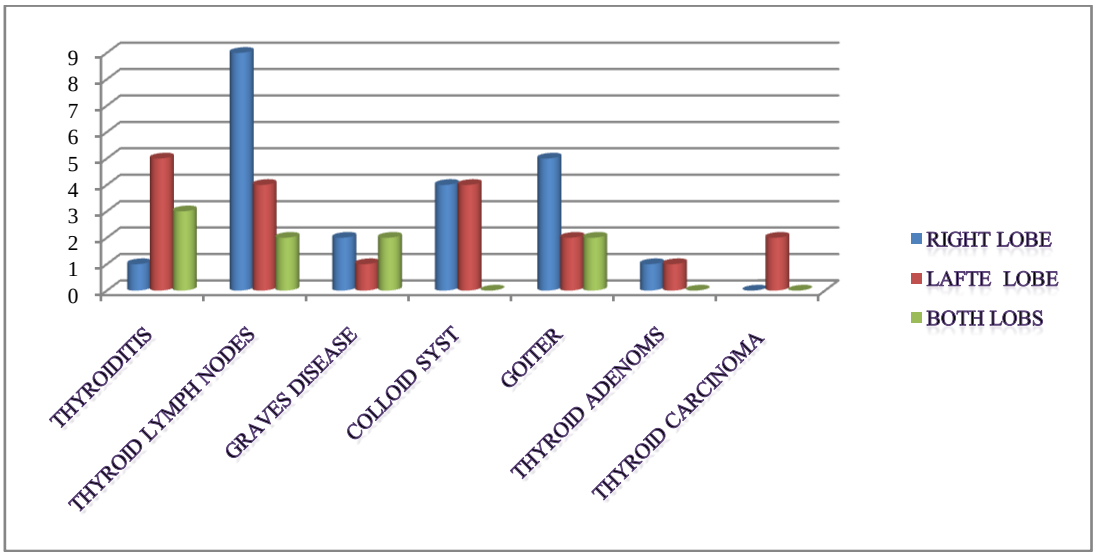

Fig no 2: Study graph distribution of thyroid pathology sites

Table no 3: Frequency distribution of thyroid hormone.

Diagnosis	T3 low	T4 low	TSH low	T3 high	T4 high	TSH High	Total
Thyroiditis	2	5	2	0	0	0	9
Thyroid lymph nodes	0	0	0	7	5	3	15
Graves disease	0	0	0	2	2	1	5
Colloid Cyst	0	0	0	3	3	2	8
Goiter	0	0	0	4	2	3	9
Thyroid adenomas	1	1	0	0	0	0	2
Thyroid carcinoma	0	0	1	1	0	0	2
Percentage	6%	12%	6%	34%	24%	18%	50

Correlations									
		Thyroid carcinoma	Thyroid adenomas	Goiter	Colloid Cyst	Graves disease	Thyroid lymph nodes	Thyroiditis	Thyroid carcinoma
Pain	Pearson Correlation	1	.662	.236	-.249	.359	.820*	.820*	.662
	Sig. (2-tailed)		.105	.23	.590	.429	.024	.034	.105
	N	7	7	7	7	7	7	7	7
Weight gain	Pearson Correlation	.662	1	.762*	-.613	.726	.782*	-.288	1
	Sig. (2-tailed)	.105		.047	.143	.38	.038	.531	
	N	7	7	7	7	7	7	7	7
Depression	Pearson Correlation	.820*	.762*	1	-.622	.723	-.613	-.112	.762*
	Sig. (2-tailed)	.024	.047		.136	.066	.143	.811	.047
	N	7	7	7	7	7	7	7	7
Weight loss	Pearson Correlation	-.249	-.613	-.622	1	-.890	.143	.812*	-.613
	Sig. (2-tailed)	.590	.143	.136		.041	7	.027	.143

	N	7	7	7	7	7	.782*	7	7
Slow heart rate	Pearson Correlation	.359	.872*	.723	-.675	1	.723	-.219	.782*
	Sig. (2-tailed)	.429	.048	.066	.096		.066	.637	.038
	N	7	7	7	7	7	7	7	
Sweating	Pearson Correlation	.147	-.288	-.112	.812*	-.219	-.288	1	-.238
	Sig. (2-tailed)	.752	.531	.811	.027	.637	.531		.531
	N	7	7	7	7	7	7	7	7
	*. Correlation is significant at the 0.05 level (2-tailed).								

Table no 4: Frequency distribution of correlation between symptoms and thyroid finding

Table no 5: The correlation between thyroid diseases and the age of the patient is highly significantly correlated at level 0.001.

Correlations			
		Age	Thyroid diseases
age	Pearson Correlation	1	.999**
	Sig. (2-tailed)		.001
	N	4	4
Thyroid disease	Pearson Correlation	.999**	1
	Sig. (2-tailed)	.001	
	N	4	4
**. Correlation is significant at the 0.01 level (2-tailed).			

Table no 6: Statistic of correlation between thyroid pathology and hormone levels.

Correlations							
		T4l	T3l	TSHl	T3h	T4h	TSHh
Thyroiditis	Pearson Correlation	1	-487	-520	.844**	.958**	-.500
	Sig. (1-tailed)		.134	.116	.008	.000	.127
LN	Pearson Correlation	.958**	1	.731*	-.616	-.576	-.592
	Sig. (1-tailed)	.000		.031	.071	.088	.081
Graves disease	Pearson Correlation	-.531	.731*	1	.844**	.694**	-.592
	Sig. (1-tailed)	.110	.031		.008	.003	.081
Colloid cyst	Pearson Correlation	-.520	-.616	-.531	1	.945**	.922**
	Sig. (1-tailed)	.116	.071	.110		.001	.002
Goiter	Pearson Correlation	-.487	-.576	-.576	.945**	1	.895**
	Sig. (1-tailed)	.134	.088	.088	.001		.006
Thyroid adenomas (MNG)	Pearson Correlation	-.500	-.592	-.592	..256	1	.867**
	Sig. (1-tailed)	.127	.081	.081	.002		.006
Thyroid carcinoma	Pearson Correlation	-.500	-.592	-.592	.922**	.867**	1
	Sig. (1-tailed)	.127	.081	.081	.002	.006	
**. Correlation is significant at the 0.01 level (1-tailed). *. Correlation is significant at the 0.05 level (1-tailed). LN. lymph nodes/h. hormone/ l. level							

IV. Discussion

The thyroid gland ultrasound examination has been playing an important role in the evaluation of it is pathologies, mainly due to its feasibility, low cost, absence of morbidity, besides the high resolution of the most modern equipment.[10]

Table (1) explain the distribution of gender among 50 studies reports the female represented highest percentage 31(62 %) while the male represented lowest percentage 19 (38%) A similar study conducted by (Pellegriti G, et al 2013) showed same results suggest, that The study is aimed to investigate the pathogenesis underlying the increased prevalence of thyroid nodule (TN) in different levels of metabolic syndrome (MetS) components and analyze the relationships between TN and MetS components.[9] A total of 6,798 subjects, including 2201 patients with TN, were enrolled in this study. Anthropometric, biochemical, thyroid

ultrasonographic, and other metabolic parameters were all measured. There was a sex difference in the prevalence of TN (males 26.0%, females 38.5%, resp.)[10,11]

Figure (1) explain the distribution of age groups (years) among 50 studies reports : the age group (20-30) represented the highest percentage 12 (24%) while age group (61-70) represented lowest percentage 8 (16%) This study is partially consistent with that the results are A similar study was conducted by (Petersen G, et al 2001)The prevalence of thyroid disease and the concentration of thyroid hormones and thyrotropin were studied in a random population sample of 1154 women, aged 50–72 years, with special reference to the effect of age and smoking.[11] The prevalence of spontaneous hypothyroidism was 3.3% (previously unknown overt and mild disease 1.3%) and the prevalence of hyperthyroidism was 2.5% (previously unknown disease 0.2%). Clinically suspected hyper or hypothyroidism (very weak to strong) was recorded in 288 women but was only verified in three cases. The prevalence of visible and palpable thyroid enlargement was 2.1% and 13–14%, respectively. Total thyroxine concentrations increased and free tri-iodothyronine levels decreased significantly with age ($P < 0.001$). The serum thyrotropin concentrations were lower in smoking women than in non-smokers in the 50- and 58-year age groups ($P < 0.05$).[12,13]

Table (2) and figure (2) demonstrate the common side of the thyroid was right lobe side by percentage 22(44%) while the left lobe percentage 19(38%) and both lobe percentage 9(18%). Explain the distribution of U/S finding of the thyroid among 50 studies reports: the thyroid lymph nodes represented the highest percentage 15(30%) while the thyroid adenomas and thyroid carcinoma represented the lowest percentage 2 (4%).

Table (3) explain the distribution of thyroid diagnosis and hormones result among 50 studies reports: the T3 high represented the highest percentage 15(34%) while the T3 low and T4 low inform represented lowest percentage 2 (6%), 2(6%) prospectively. This result was similar to Another study was done by (Gerhard Hintze, et al 2012) to determine In569 unselected elderly subjects over 60 years from the general population of an iodine-deficient area, palpation and an ultrasound investigation of the thyroid were performed. Additionally, thyroid hormone values were determined in 466 of the 569 subjects (81.9%) and urinary iodine excretion in 491 subjects (86.3%). By palpation, no thyroid enlargement was noticed in 302 subjects (54.2%), goiter Ia in 98 (17.6%), goiter lb in 94 (16.9%), goiter II in 53(9.5%), and goiter III in 10(1.8%). The thyroid volumes (medians) by ultrasound were 18.6 ml in the entire group, in women (N=489) 19.2 ml, and men (N=80) 16.6 ml. One hundred and one subjects had a thyroid nodule (17.6%), 43 persons cystic lesions (7.6%). If, according to the literature, a goiter is defined as a thyroid enlargement of more than 18 ml in women and more than 25 ml in males, a goiter prevalence of 54.2% in females and of 22.5% in males was obtained. The goiter prevalence in the entire group was calculated as 49.7%. Thyroid hormone measurements showed in subjects with goiter a significant lower TSH value ($p<0.001$) and a higher thyroglobulin value ($p<0.001$). [14]

Table (4) We found very important relationships and significant between pain symptoms and thyroiditis at level 0.038 and also with Thyroid lymph nodes at 0.027, also between Weight loss and Graves disease at level 0.04 .we found many relations but not strong significant like the relation between Colloid cyst and Sweating.

Table (5) We found very important relationships and highly significant between a strong correlation between age and incident of thyroid disease at level 0.001, and also this result is consistence's with the result of (Zhaowei Meng, et al 2005) titled gender and age impacts on the association between thyroid function and metabolic syndrome in Chinese, which suggest that strong relationship between age and thyroid disease.[15]

Table (6) We found very important relationships and highly significant between a strong correlation between high T4, high T3 hormones and incident of thyroiditis at level 0.001, between low T4 hormones result and lymph nodule at level 0.001, graves disease is significant result with T3 high and T4 high at level 0.003 ,0.008 prospectively, also we have strong correlation and highly significant between colloid cyst and T4 high at level of 0.001 . and the high correlation between goiter with T3 high and TSH high, (MN) Thyroid adenomas inform highly significant with high TSH at level 0.006. The thyroid cancer has a strong correlation and highly significant with T3 high and T3 high at level 0.006,0.002 prospectively.[15]

V. Conclusion

The study showed that frequency of thyroid disease high in females (62%) than frequency of males (38%) of gender, also demonstrated the frequency distribution of patients age the study showed the most affected age group (20-30) years old frequency distribution (24%) than (51-60) years old (22%) the last group (61-70) frequency distribution (16%). We found the pathology the most common finding 30% was thyroid lymph nodes and found high incident goiter result among the thyroid pathology, the thyroid adenomas and thyroid cancer that informed the lowers percentage 4 %.

We found very important relationships and highly significant between a strong correlation between high T4, high T3 hormones and incident of thyroiditis at level 0.001, between low T4 hormones, result and lymph nodule at level 0.001, grave's disease is a significant result with T3 high and T4 high at level 0.003, 0.008 prospectively.

We found very important relationships and highly significant between a strong correlation between age and incident of thyroid disease at level 0.001 and also we found two relations between symptoms and thyroid finding Pain with the Thyroiditis at level 0.038 also with Thyroid lymph nodes at 0.027, also between Weight loss and Graves disease at level 0.04 .we found many relations but not strong significant like the relation between Colloid cyst and Sweating.

Finally, we found Ultrasonography is not always able to separate benign from malignant nodules with complete certainty, In suspicious cases, a tissue sample is often obtained by biopsy for microscopic examination. It is recognized that it offers little or no diagnostic information for thyroid disease.

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