Role of Ultrasound in Thyroid Pathologies

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Abstract: *This is a retrospective study of thyroid patients referred for ultrasound for the period of 2007to 2009 at different hospitals and dispensaries in the Kingdom of Saudi Arabia (Eastern area).*
Importance of the study is ; to create a reliable reference for the role of ultrasound in thyroid pathologies in King Saudi Arabia.
Study aimed to detect the Ultrasonic Differential Diagnosis of Thyroid pathologies.
This study was carried out on 303 patients of various types of thyroid diseases in King Saudi Arabia.232 (77 %) were female patients and 71(23 %) were males.
Along this series there were 25 % of enlarged thyroid gland which act as the most common ultrasound findings of thyroid disorders followed by, 23 % solitary thyroid nodules, 10 % multinodular goiters, 8 % simple cyst, 7 % nonpalpable thyroid nodules, 4 % goiter and Hashimoto's thyroiditis.
The most common ultrasound findings of thyroid gland enlarged of thyroid.
The least common is nodal enlargement, adenoma, thyroiditis, microcalcifications, small size thyroid, multiple thyroid nodules, thyroglossal cyst and Graves disease.
Out of this study we believe more that ultrasound should be the first-line test owing to its safety and availability.
Keywords- *Sonographic ,Thyroid Gland, Thyroid Pathology , Ultrasound.*

I. Introduction

Thyroid US is the imaging method of choice for the evaluation of thyroid gland structure, and FNAC, as the most accurate test for nodule diagnosis, has reduced the need for scanning and for thyroidectomy, thereby reducing the health-care costs significantly.

US results alone cannot be accepted as true positives in terms of malignancy. However, the procedure's usefulness is considerable, if combined with the clinical data and laboratory test results. As thyroid nodules are rare disorders the use of US examination is not contraindicated on economic grounds. Moreover, it helps to complete the diagnostic protocol of a thyroid nodule and subsequently to choose the best mode of treatment. US is a safe and widely available technique, and I therefore recommend it strongly as the first-line screening diagnostic test in all pediatric patients with thyroid nodules. This should be followed by further imaging-directed tests (SC (invariably in patients with suppressed TSH) and FNAC or direct FNAC in cystic (unechogenic) lesions).

Preoperative US examination of thyroid nodules not only provides information on their size, echogenecity, echo structure and location but also contributes significantly to the differential diagnosis of benign vs. malignant tumors. It is a simple, inexpensive and radiation-free method of examination of great sensitivity and specificity and is complementary to FNAC.Color-Doppler sonography may be helpful in hyper functioning nodules (hot on SC and usually benign on histology), indicating an intensive vascular flow within a highly vascularized lesion, and no visible flow through the remaining, suppressed thyroid gland. Color-Doppler sonography is also valuable in distinguishing a cystic lesion (with no vascular flow) from a solid neoplasm (with intranodular flow).Cystic degeneration occurring in previously solid lesions does not determine the diagnosis, whether benign or malignant. If there is no vascular network within the nodule, the nodule is painful on palpation and the patient has a fever, then a suppurative thyroiditis is suspected. US-guided FNAC, with a subsequent cytological examination and culture of the aspirated material, helps to identify a bacterial cause of the nodule.

US plays an important role in the diagnostic work-up of thyroid nodules. However, there are still doubts as to whether it is a sufficiently accurate method in the differentiation between benign and malignant lesions and therefore some deny its usefulness. On the other hand, authors from regions affected by radioactive fallout are convinced that systematic US screening is a significant tool for the early detection of thyroid carcinoma due to the many indicators of the malignant process which may be detected.

1.1. Area of study:
Different Hospital and Dispensary for e.g.:
☞ Dammam Central Hospital.
☞ Fahad King Specialist Hospital.

☞ Algatif Central Hospital
☞ Almana Group of Hospital.
☞ Mouwasat Hospital
☞ Medical Dammam Dispensary.

1.2. Patients and methods:
In order to be lying out, this research shall follow the scientific methods to collect the related information from different sources such as references, textbooks, Internet service, scientific magazines and data collection sheet. The study will be done in the hospitals mentioned above; the study will evaluate different patients, using real time machines with 7 MHz linear array.

1.3. Population sample
The target populations for this research all thyroid ultrasound patients.

1.4. Instrumentation
Different types to ultrasound machines with 7 MHz probe.

1.5. Facilities available at hospital:
Almana General Hospitals consist of four private hospitals in the Eastern province of Saudi Arabia, their capacity are 500 beds and equipped with 2 CT scans and one shimadzu ,6 Ultrasound Machines, two Ultramark 4, one Ultra mark 5 and one Ultra mark 9, one Apogee 800 and one Medison.

II.   The facilities available in this study also include:
☞ 2- Voluson 730 (GE Kretz) V 730 3D\4D
☞ Philips ATL   HDI. 3000
☞ GE. Logic 9
☞ Philips EN Visor.
☞ ALOKA SSD – 500

III.   Methodology:
The way followed to collect the data in this study was data collecting sheet

IV.   Results
TABLES AND GRAPHS
Table (4-1): The sex distribution in between 303 cases with different sexes through this study illustrated in the table below:

Patient's sex	Number of patients	Percentages
Male	71	23 %
Female	232	77 %
Total	303	100 %

Summarize

Case Processing Summary(a)

						Cases
	Included		Excluded			Total
	N	Percent	N	Percent	N	Percent
NoOfPatients	3	100.0%	0	.0%	3	100.0%
Percentage	3	100.0%	0	.0%	3	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentage
	1	71.00	.23
	2	232.00	.77
	3	303.00	1.00
Total	N	3	3
	Mean	202.0000	.6667
	Std. Deviation	118.87388	.39526
	Range	232.00	.77
	Std. Error of Skewness	1.225	1.225

a Limited to first 100 cases.

Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	3	71.00	303.00	202.0000	118.87388
Percentage	3	.23	1.00	.6667	.39526
Valid N (listwise)	3				

T-Test
One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	3	202.0000	118.87388	68.63187
Percentage	3	.6667	.39526	.22821

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	2.943	2	.099	202.00000	-93.2991	497.2991
Percentage	2.921	2	.100	.66667	-.3152	1.6486

Two-stage Least Squares Analysis
Model Description

		Type of Variable
Equation 1	Percentage	Dependent
	NoOfPatients	predictor & instrumental

MOD_8

Model Summary

Equation 1	Multiple R	1.000
	R Square	1.000
	Adjusted R Square	1.000
	Std. Error of the Estimate	.004

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Equation 1	**Regression**	.312	1	.312	15436.794	.005
	Residual	.000	1	.000		
	Total	.312	2			

Coefficients

		Unstandardized Coefficients		Beta	T	Sig.
		B	**Std. Error**			
Equation 1	**(Constant)**	-.005	.006		-.830	.559
	NoOfPatients	.003	.000	1.000	124.245	.005

Graph:(4-1)- The chart below demonstrate the number of patients presented for thyroid gland ultrasound with different sex through this study in The Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
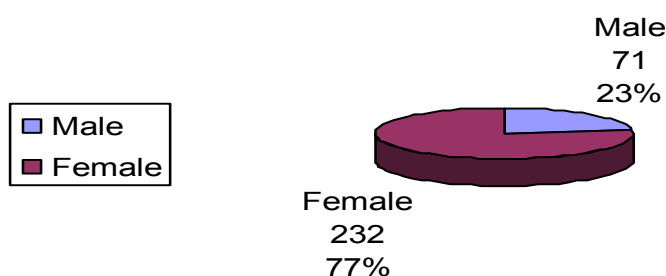
Patients Sexes

Table (4-2): Distribution of age groups among 303 patients scanned in ultrasound centers through this study in The Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Age groups	Number of patients	Percentage
(0 – 10) years	6	2 %
(10 – 20) years	23	8 %
(20 – 30) years	48	16 %
(30 – 40) years	82	27 %
(40-50) Years	84	27 %
(50-60) Years	37	12 %
(60-70) Years	16	5 %
(70-80) Years	5	2 %
(80-90) Years	2	1%
Total	303	100%

Summarize

Case Processing Summary(a)

	Included		Excluded		Cases Total	
	N	Percent	N	Percent	N	Percent
NoOfPatients	10	100.0%	0	.0%	10	100.0%
Percentage	10	100.0%	0	.0%	10	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentage
	1	6.00	.02
	2	23.00	.08
	3	48.00	.16
	4	82.00	.27
	5	84.00	.27
	6	37.00	.12
	7	16.00	.05
	8	5.00	.02
	9	2.00	.01
	10	303.00	1.00
Total	N	10	10
	Mean	60.6000	.2000
	Std. Deviation	90.30098	.29732
	Range	301.00	.99
	Std. Error of Skewness	.687	.687

a Limited to first 100 cases.

Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	10	2.00	303.00	60.6000	90.30098
Percentage	10	.01	1.00	.2000	.29732
Valid N (listwise)	10				

One-Sample Statistics   **T-Test**

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	10	60.6000	90.30098	28.55568
Percentage	10	.2000	.29732	.09402

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	2.122	9	.063	60.60000	-3.9974	125.1974
Percentage	2.127	9	.062	.20000	-.0127	.4127

Two-stage Least Squares Analysis

Model Description

		Type of Variable
Equation 1	Percentage	Dependent
	NoOfPatients	predictor & instrumental

MOD_9

Model Summary

Equation 1		
	Multiple R	1.000
	R Square	1.000
	Adjusted R Square	1.000
	Std. Error of the Estimate	.004

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	.795	1	.795	61561.086	.000
	Residual	.000	8	.000		
	Total	.796	9			

Coefficients

		Unstandardized Coefficients		Beta	T	Sig.
		B	Std. Error			
Equation 1	(Constant)	.000	.001		.347	.737
	NoOfPatients	.003	.000	1.000	248.115	.000

Graph:(4-2)- The chart below demonstrate the distribution of age groups among 303 patients scanned in ultrasound centers through this study in The Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
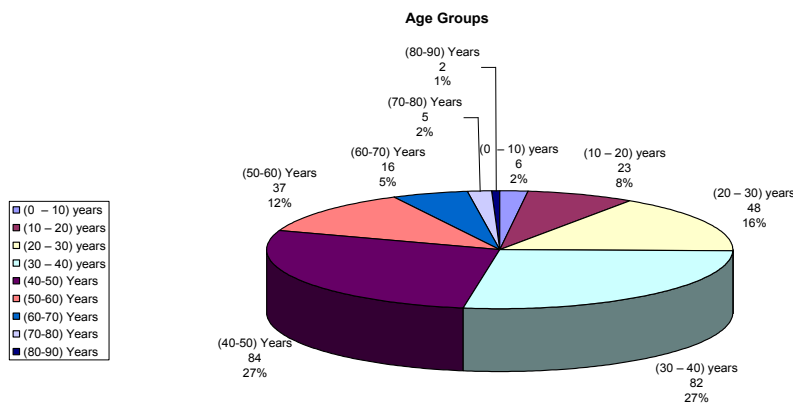

Table (4-3): Symptoms and signs in 303 patients investigated in ultrasound centers through this study in the Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Patient condition	Number of patients	Percentage
Symptomatic	224	74 %
A symptomatic	79	26 %
Total	303	100 %

Summarize

Case Processing Summary(a)

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
NoOfPatients	3	100.0%	0	.0%	3	100.0%
Percentage	3	100.0%	0	.0%	3	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentage
	1	224.00	.74
	2	79.00	.26
	3	303.00	1.00
Total	N	3	3
	Mean	202.0000	.6667
	Std. Deviation	113.60898	.37541
	Range	224.00	.74
	Std. Error of Skewness	1.225	1.225

a Limited to first 100 cases.
Descriptive
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	3	79.00	303.00	202.0000	113.60898
Percentage	3	.26	1.00	.6667	.37541
Valid N (listwise)	3				

T-Test
One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	3	202.0000	113.60898	65.59217
Percentage	3	.6667	.37541	.21674

One-Sample Test

				Test Value = 0		
				Mean	95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Difference	Lower	Upper
NoOfPatients	3.080	2	.091	202.00000	-80.2203	484.2203
Percentage	3.076	2	.091	.66667	-.2659	1.5992

Two-stage Least Squares Analysis
Model Description

		Type of Variable
Equation 1	Percentage	Dependent
	NoOfPatients	predictor & instrumental

MOD_10

Model Summary

Equation 1	Multiple R	1.000
	R Square	1.000
	Adjusted R Square	1.000
	Std. Error of the Estimate	.001

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	**Regression**	.282	1	.282	450997.314	.001
	Residual	.000	1	.000		
	Total	.282	2			

Coefficients

		Unstandardized Coefficients		Beta	t	Sig.
		B	**Std. Error**			
Equation 1	**(Constant)**	-.001	.001		-.753	.589
	NoOfPatients	.003	.000	1.000	671.563	.001

Graph:(4-3)- The chart below demonstrate the signs in 303 patients investigated in ultrasound centers through this study in the Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

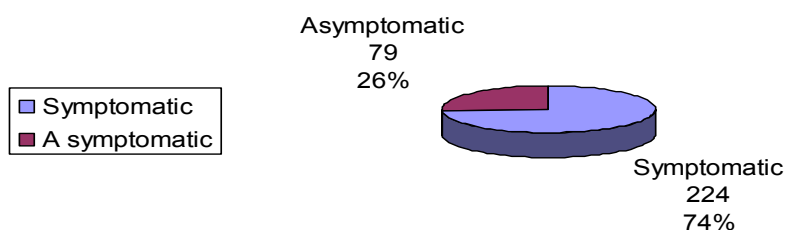## Symptomatic and a symptomatic patients

Table (4-4): Different signs and symptoms through (224 Symptomatic patients) scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to April 2009.

Symptoms	Number of patients	Percentage
Pain	75	32 %
Tenderness	11	5 %
Compression of the respiratory tract	7	3 %
Problems with swallowing or inappropriate fixation of the neck	11	5 %
Vocal fold paralysis	2	1 %
Neck swelling	35	15 %
Hyperthyroidism	45	19 %
Hypothyroidism	10	4 %
Goiter	28	12 %
Enlarge thyroid	1	0 %
Thyroid nodule	9	4 %
Sweating	1	0 %
Nervousness and anxiety	1	0 %
Fullness of neck	1	0 %
Thyroiditis	1	0 %
Following tiny nodule	1	0 %
Adenomyopathy elevated T3, T4 and TSH	1	0 %
Graves's disease	1	0 %
Total	241	100 %

Summarize
Case Processing Summary(a)

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
NoOfPatients	19	100.0%	0	.0%	19	100.0%
Percentage	19	100.0%	0	.0%	19	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentage
	1	75.00	.32
	2	11.00	.05
	3	7.00	.03
	4	11.00	.05
	5	2.00	.01
	6	35.00	.15
	7	45.00	.19
	8	10.00	.04
	9	28.00	.12
	10	1.00	.00
	11	9.00	.04
	12	1.00	.00
	13	1.00	.00
	14	1.00	.00
	15	1.00	.00
	16	1.00	.00
	17	1.00	.00
	18	1.00	.00
	19	241.00	1.00
Total	N	19	19
	Mean	25.3684	.1053
	Std. Deviation	55.77555	.23263
	Range	240.00	1.00
	Std. Error of Skewness	.524	.524

a Limited to first 100 cases.

Descriptive
Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	19	1.00	241.00	25.3684	55.77555
Percentage	19	.00	1.00	.1053	.23263
Valid N (listwise)	19				

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	19	25.3684	55.77555	12.79579
Percentage	19	.1053	.23263	.05337

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	1.983	18	.063	25.36842	-1.5145	52.2514
Percentage	1.972	18	.064	.10526	-.0069	.2174

Two-stage Least Squares Analysis

Model Description

		Type of Variable
Equation 1	Percentage	dependent
	NoOfPatients	predictor & instrumental

MOD_11

Model Summary

Equation 1	Multiple R	1.000
	R Square	1.000
	Adjusted R Square	1.000
	Std. Error of the Estimate	.004

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	.974	1	.974	57061.779	.000
	Residual	.000	17	.000		
	Total	.974	18			

Coefficients

		Unstandardized Coefficients		Beta	t	Sig.
		B	Std. Error			
Equation 1	(Constant)	-.001	.001		-.504	.621
	NoOfPatients	.004	.000	1.000	238.876	.000

Graph:(4-4)- The next chart demonstrate the different signs and symptoms through (224 Symptomatic patients) scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
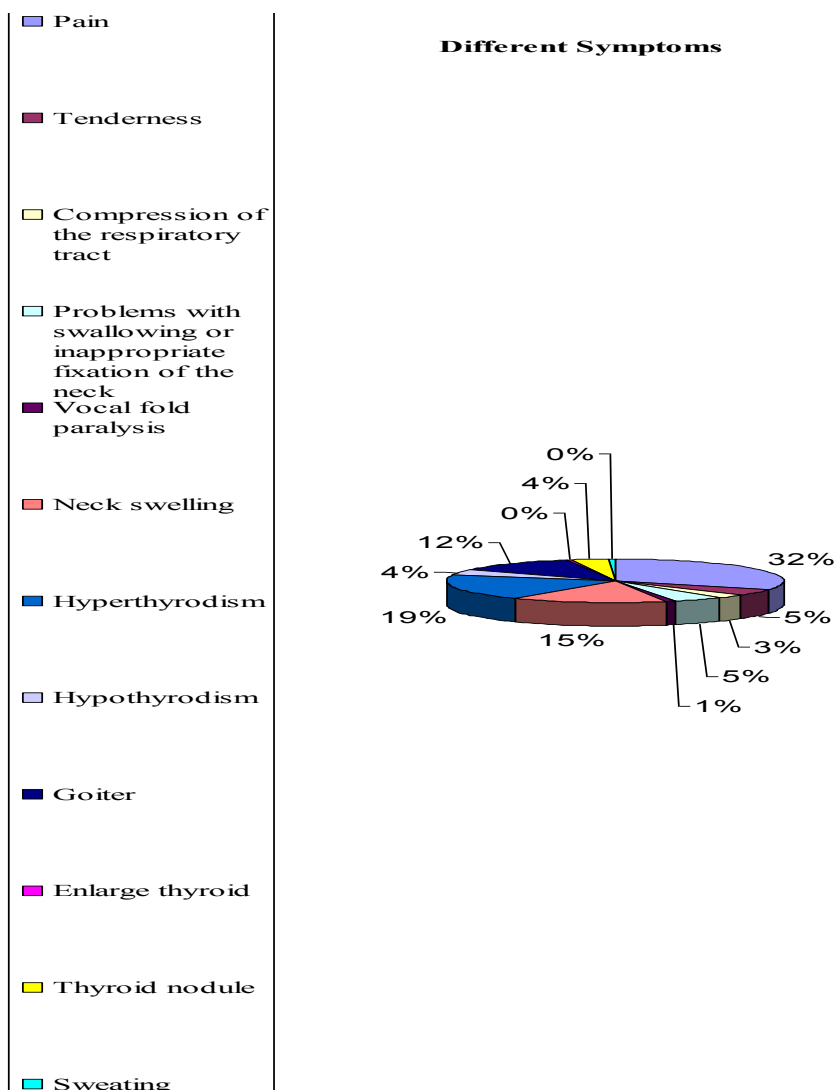
Different Symptoms

Legend:
- Pain
- Tenderness
- Compression of the respiratory tract
- Problems with swallowing or inappropriate fixation of the neck
- Vocal fold paralysis
- Neck swelling
- Hyperthyrodism
- Hypothyrodism
- Goiter
- Enlarge thyroid
- Thyroid nodule
- Sweating

Pie chart values: 32%, 5%, 3%, 5%, 1%, 15%, 19%, 4%, 12%, 0%, 4%, 0%

Table (4-5): Ultrasound findings through 303 patients scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Ultrasound findings	Number of patients	Percentage
Thyroid enlargement	147	25 %
Solitary thyroid nodules	131	23 %
Multinodular goiters	55	10 %
Cyst	45	8 %
Nonpalpable thyroid nodules	42	7 %
Goiter	23	4 %
FNAC	23	4 %
Hashimoto's thyroiditis (HT)	18	3 %
A solid hypoechoic appearance	14	2 %
Nodal enlargement	12	2 %
Adenoma	11	2 %
Increase vascularity	9	2 %
Average size of gland	9	2 %
Thyroiditis	7	2 %
Microcalcifications	6	1 %
Small size thyroid	6	1 %
Intranodular vascular pattern	5	1 %
Multiple thyroid nodules	5	1 %
Thyroglossal cyst	4	1 %
Graves disease	3	1 %
Irregular or blurred margins	2	0 %
Swelling	2	0 %

Mediastinum extension	1	0 %
Intranodular vascular spots	1	0 %
Isoechoic area	1	0 %
Hypovascularity	1	0 %
Complex mass	1	0 %
Lipoma	1	0 %
Hyperplasia	1	0 %
Hyperthyroidism	1	0 %

Summarize

Case Processing Summary(a)

							Cases
		Included			**Excluded**		**Total**
	N	**Percent**		**N**	**Percent**	**N**	**Percent**
NoOfPatients	30	100.0%		0	.0%	30	100.0%
Percentage	30	100.0%		0	.0%	30	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentage
	1	147.00	.25
	2	131.00	.23
	3	55.00	.01
	4	45.00	.08
	5	42.00	.07
	6	23.00	.04
	7	23.00	.04
	8	18.00	.03
	9	14.00	.02
	10	12.00	.02
	11	11.00	.02
	12	9.00	.02
	13	9.00	.02
	14	7.00	.02
	15	6.00	.01
	16	6.00	.01
	17	5.00	.01
	18	5.00	.01
	19	4.00	.01
	20	3.00	.01
	21	2.00	.00
	22	2.00	.00
	23	1.00	.00
	24	1.00	.00
	25	1.00	.00
	26	1.00	.00
	27	1.00	.00
	28	1.00	.00
	29	1.00	.00
	30	1.00	.00
Total	**N**	30	30
	Mean	19.5667	.0310
	Std. Deviation	35.38720	.06019
	Range	146.00	.25
	Std. Error of Skewness	.427	.427

a Limited to first 100 cases.

Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	30	1.00	147.00	19.5667	35.38720
Percentage	30	.00	.25	.0310	.06019
Valid N (listwise)	30				

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	30	19.5667	35.38720	6.46079
Percentage	30	.0310	.06019	.01099

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	3.029	29	.005	19.56667	6.3529	32.7805
Percentage	2.821	29	.009	.03100	.0085	.0535

Two-stage Least Squares Analysis

Model Description

		Type of Variable
Equation 1	Percentage	dependent
	NoOfPatients	predictor & instrumental

MOD_12

Model Summary

Equation 1	Multiple R	.966
	R Square	.934
	Adjusted R Square	.931
	Std. Error of the Estimate	.016

ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
Equation 1	Regression	.098	1	.098	393.295	.000
	Residual	.007	28	.000		
	Total	.105	29			

Coefficients

		Unstandardized Coefficients				
		B	Std. Error	Beta	t	Sig.
Equation 1	(Constant)	-.001	.003		-.350	.729
	NoOfPatients	.002	.000	.966	19.832	.000

Graph:(4-5)- The next chart demonstrate the ultrasound findings through 303 patients scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
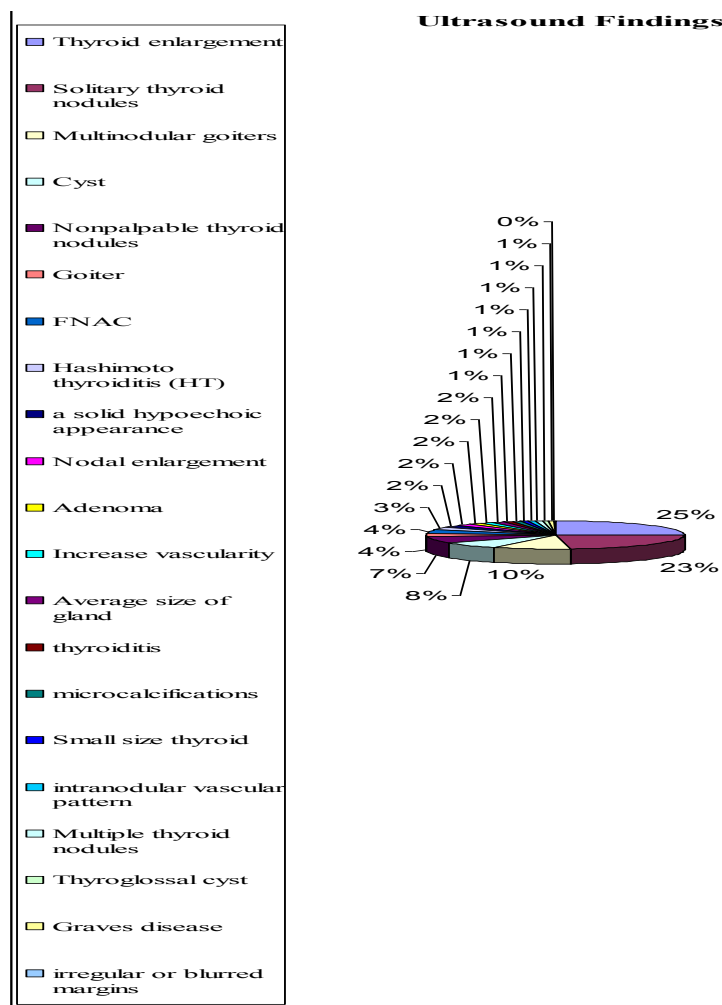
Ultrasound Findings

Legend:
- Thyroid enlargement
- Solitary thyroid nodules
- Multinodular goiters
- Cyst
- Nonpalpable thyroid nodules
- Goiter
- FNAC
- Hashimoto thyroiditis (HT)
- a solid hypoechoic appearance
- Nodal enlargement
- Adenoma
- Increase vascularity
- Average size of gland
- thyroiditis
- microcalcifications
- Small size thyroid
- intranodular vascular pattern
- Multiple thyroid nodules
- Thyroglossal cyst
- Graves disease
- irregular or blurred margins

Pie chart percentages: 0%, 1%, 1%, 1%, 1%, 1%, 1%, 1%, 2%, 2%, 2%, 2%, 3%, 4%, 4%, 7%, 8%, 10%, 23%, 25%

Table (4-6): Symptoms and signs in 172 symptomatic female patients investigated in ultrasound centers through this study in the Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Symptoms	Number of patients	Percentage
Pain	57	32 %
Hyperthyroidism	36	20 %
Neck swelling	22	12 %
Goiter	22	12 %
Problems with swallowing or inappropriate fixation of the neck	10	5 %
Tenderness	9	5 %
Compression of the respiratory tract	7	4 %
Hypothyroidism	8	4 %
Thyroid nodule	6	3 %
Vocal fold paralysis	2	1 %
Thyrotoxic	2	1 %
Enlarge thyroid	1	0 %
Sweating	1	0 %
Nervousness and anxiety	1	0 %
Fullness of neck	1	0 %
Thyroiditis	1	0 %
Adenomyopathy elevated T3, T4 and TSH	1	0 %
Graves's disease	1	0 %

Summarize

Case Processing Summary(a)

							Cases
		Included			Excluded		Total
	N	Percent	N	Percent	N	Percent	
NoOfPatients	18	100.0%	0	.0%	18	100.0%
Percentage	18	100.0%	0	.0%	18	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentage
	1	57.00	.32
	2	36.00	.20
	3	22.00	.12
	4	22.00	.12
	5	10.00	.05
	6	9.00	.05
	7	7.00	.04
	8	8.00	.04
	9	6.00	.03
	10	2.00	.01
	11	2.00	.01
	12	1.00	.00
	13	1.00	.00
	14	1.00	.00
	15	1.00	.00
	16	1.00	.00
	17	1.00	.00
	18	1.00	.00
Total	N	18	18
	Mean	10.4444	.0550
	Std. Deviation	15.13555	.08611
	Range	56.00	.32
	Std. Error of Skewness	.536	.536

a Limited to first 100 cases.

Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	18	1.00	57.00	10.4444	15.13555
Percentage	18	.00	.32	.0550	.08611
Valid N (listwise)	18				

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	18	10.4444	15.13555	3.56748
Percentage	18	.0550	.08611	.02030

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	2.928	17	.009	10.44444	2.9177	17.9712
Percentage	2.710	17	.015	.05500	.0122	.0978

Two-stage Least Squares Analysis
Model Description

		Type of Variable
Equation 1	Percentage	dependent
	NoOfPatients	predictor & instrumental

MOD_13

Model Summary

Equation 1		
	Multiple R	1.000
	R Square	.999
	Adjusted R Square	.999
	Std. Error of the Estimate	.002

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	.126	1	.126	28836.588	.000
	Residual	.000	16	.000		
	Total	.126	17			

Coefficients

		Unstandardized Coefficients		Beta	t	Sig.
		B	Std. Error			
Equation 1	(Constant)	-.004	.001		-7.288	.000
	NoOfPatients	.006	.000	1.000	169.813	.000

Graph:(4-6)- The next chart demonstrate the different signs and symptoms through (172 Symptomatic female patients) scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Different symptoms through 172 female patients

Legend:
- Pain
- Hyperthyrodism
- Neck swelling
- Goiter
- Problems with swallowing or inappropriate fixation of the neck
- Tenderness
- Compression of the respiratory tract
- Hypothyrodism
- Thyroid nodule
- Vocal fold paralysis
- Thyrotoxic
- Enlarge thyroid

Pie chart values: 32%, 20%, 12%, 12%, 5%, 5%, 4%, 4%, 3%, 1%, 1%, 1%
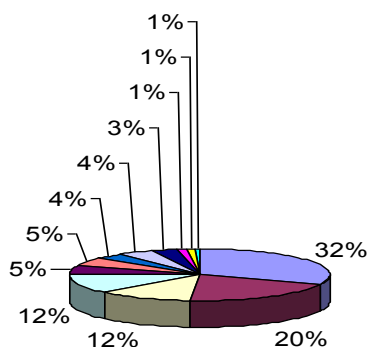
Table (4-7): Symptoms and signs in 52 symptomatic male patients investigated in ultrasound centers through this study in the Kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Symptoms	Number of patients	Percentage
Pain	18	31 %
Neck swelling	13	23 %
Hyperthyroidism	9	16 %
Goiter	6	11 %
Thyroid nodule	4	7 %
Tenderness	2	4 %
Hypothyroidism	2	4 %
Problems with swallowing or inappropriate fixation of the neck	1	2 %
Post operative	1	2 %
Total	56	100 %

Summarize

Case Processing Summary(a)

	Included		Excluded		Cases	Total
	N	Percent	N	Percent	N	Percent
NoOfPatients	10	100.0%	0	.0%	10	100.0%
Percentahe	10	100.0%	0	.0%	10	100.0%

a Limited to first 100 cases.

Case Summaries(a)

		NoOfPatients	Percentahe
	1	18.00	.31
	2	13.00	.23
	3	9.00	.16
	4	6.00	.11
	5	4.00	.07
	6	2.00	.04
	7	2.00	.04
	8	1.00	.02
	9	1.00	.02
	10	56.00	1.00
Total	N	10	10
	Mean	11.2000	.2000
	Std. Deviation	16.72523	.29732
	Range	55.00	.98
	Std. Error of Skewness	.687	.687

a Limited to first 100 cases.

Descriptives

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	10	1.00	56.00	11.2000	16.72523
Percentahe	10	.02	1.00	.2000	.29732
Valid N (listwise)	10				

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	10	11.2000	16.72523	5.28898
Percentahe	10	.2000	.29732	.09402

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	2.118	9	.063	11.20000	-.7645	23.1645
Percentahe	2.127	9	.062	.20000	-.0127	.4127

Two-stage Least Squares Analysis
Model Description

		Type of Variable
Equation 1	Percentahe	dependent
	NoOfPatients	predictor & instrumental

MOD_14

Model Summary

Equation 1	Multiple R	1.000
	R Square	1.000
	Adjusted R Square	1.000
	Std. Error of the Estimate	.005

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	.795	1	.795	36405.263	.000
	Residual	.000	8	.000		
	Total	.796	9			

Coefficients

		Unstandardized Coefficients		Beta	T	Sig.
		B	Std. Error			
Equation 1	(Constant)	.001	.002		.509	.624
	NoOfPatients	.018	.000	1.000	190.802	.000

Graph:(4-7)- The next chart demonstrate the different signs and symptoms through (52 Symptomatic male patients) scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
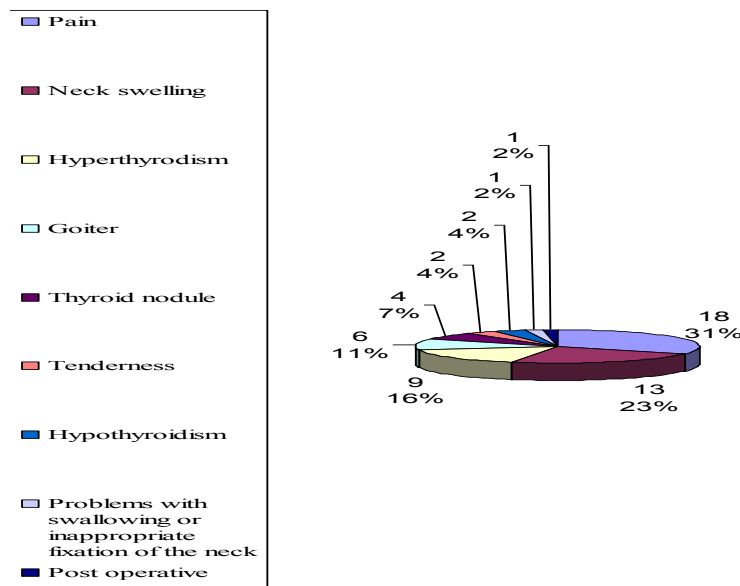
Table (4-8): Ultrasound findings through 232 female patients scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
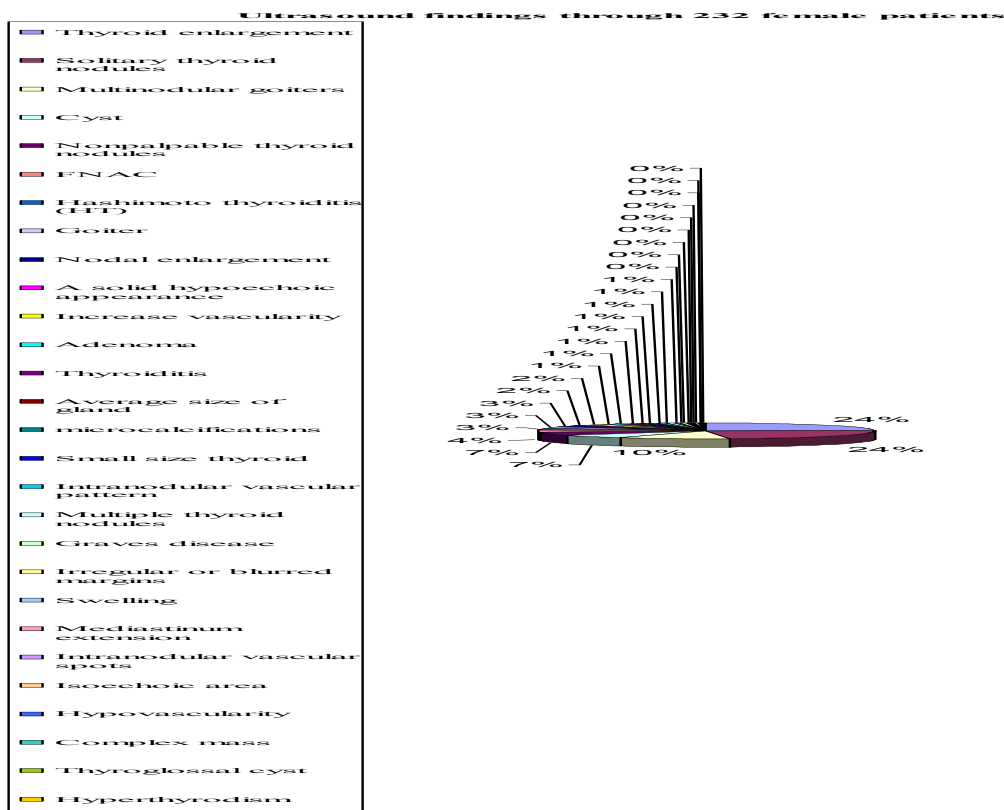
Ultrasound finding	Number of patients	Percentage
Thyroid enlargement	110	24 %
Solitary thyroid nodules	106	24 %
Multinodular goiters	47	10 %
Cyst	32	7 %
Nonpalpable thyroid nodules	31	7 %
FNAC	20	4 %
Hashimoto thyroiditis (HT)	15	3 %
Goiter	14	3 %
Nodal enlargement	12	3 %
A solid hypoechoic appearance	9	2 %
Increase vascularity	9	2 %
Adenoma	6	1 %
Thyroiditis	6	1 %
Average size of gland	5	1 %
Microcalcifications	4	1 %
Small size thyroid	4	1 %
Intranodular vascular pattern	4	1 %
Multiple thyroid nodules	3	1 %
Graves's disease	3	1 %
Irregular or blurred margins	2	0 %
Swelling	2	0 %
Mediastinum extension	1	0 %
Intranodular vascular spots	1	0 %
Isoechoic area	1	0 %
Hypovascularity	1	0 %
Complex mass	1	0 %
Thyroglossal cyst	1	0 %
Hyperthyroidism	1	0 %

Case Processing Summary(a)   **Summarize**

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
NoOfPatients	28	100.0%	0	.0%	28	100.0%
Percentage	28	100.0%	0	.0%	28	100.0%

a Limited to first 100 cases.

Case Summaries(a)

	NoOfPatients	Percentage
1	110.00	.24
2	106.00	.24
3	47.00	.10
4	32.00	.07
5	31.00	.07
6	20.00	.04
7	15.00	.03
8	14.00	.03
9	12.00	.03
10	9.00	.02
11	9.00	.02
12	6.00	.01
13	6.00	.01
14	5.00	.01
15	4.00	.01
16	4.00	.01

	17	4.00	.01
	18	3.00	.01
	19	3.00	.01
	20	2.00	.00
	21	2.00	.00
	22	1.00	.00
	23	1.00	.00
	24	1.00	.00
	25	1.00	.00
	26	1.00	.00
	27	1.00	.00
	28	1.00	.00
Total	N	28	28
	Mean	16.1071	.0346
	Std. Deviation	28.26507	.06304
	Range	109.00	.24
	Std. Error of Skewness	.441	.441

a Limited to first 100 cases.

Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	28	1.00	110.00	16.1071	28.26507
Percentage	28	.00	.24	.0346	.06304
Valid N (listwise)	28				

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	28	16.1071	28.26507	5.34160
Percentage	28	.0346	.06304	.01191

One-Sample Test

				Test Value = 0		
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	3.015	27	.006	16.10714	5.1471	27.0672
Percentage	2.908	27	.007	.03464	.0102	.0591

Two-stage Least Squares Analysis
Model Description

		Type of Variable
Equation 1	Percentage	dependent
	NoOfPatients	predictor & instrumental

MOD_15

Model Summary

Equation 1	Multiple R	.999
	R Square	.998
	Adjusted R Square	.998
	Std. Error of the Estimate	.003

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	.107	1	.107	14616.936	.000
	Residual	.000	26	.000		
	Total	.107	27			

Coefficients

		Unstandardized Coefficients		Beta	t	Sig.
		B	Std. Error			
Equation 1	(Constant)	-.001	.001		-2.111	.045
	NoOfPatients	.002	.000	.999	120.901	.000

Graph:(4-8)- The next chart demonstrate the ultrasound findings through 232 female patients scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Table (4-9): Ultrasound findings through 71 male patients scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.

Ultrasound findings	Number of patients	Percentage
Thyroid enlargement	37	27 %
Solitary thyroid nodules	25	18 %
Cyst	13	10 %
Nonpalpable thyroid nodules	11	8 %
Goiter	9	7 %
Multinodular goiters	8	6 %
A solid hypoechoic appearance	5	4 %
Adenoma	5	4 %
Average size of gland	4	3 %
FNAC	3	2 %
Thyroglossal cyst	3	2 %
Hashimoto thyroiditis (HT)	3	2 %
Microcalcifications	2	1 %
Small size thyroid	2	1 %
Multiple thyroid nodules	2	1 %
Intranodular vascular pattern	1	1 %
Thyroiditis	1	1 %
Lipoma	1	1 %
Hyperplasia	1	1 %
Total	136	100%

Summarize

Case Processing Summary(a)

							Cases
		Included			Excluded		Total
	N	Percent	N	Percent	N	Percent
NoOfPatients	20	100.0%	0	.0%	20	100.0%
Percentage	20	100.0%	0	.0%	20	100.0%

a Limited to first 100 cases.

Case Summaries(a)

	NoOfPatients	Percentage
1	37.00	.27
2	25.00	.18
3	13.00	.13
4	11.00	.11
5	9.00	.09
6	8.00	.08
7	5.00	.05
8	5.00	.05
9	4.00	.04
10	3.00	.03
11	3.00	.03
12	3.00	.03
13	2.00	.02
14	2.00	.02
15	2.00	.02
16	1.00	.01
17	1.00	.01
18	1.00	.01
19	1.00	.01
20	136.00	1.00

Total	N	20	20
	Mean	13.6000	.1095
	Std. Deviation	30.20526	.22004
	Range	135.00	.99
	Std. Error of Skewness	.512	.512

a Limited to first 100 cases.

Descriptive

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NoOfPatients	20	1.00	136.00	13.6000	30.20526
Percentage	20	.01	1.00	.1095	.22004
Valid N (listwise)	20				

T-Test

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
NoOfPatients	20	13.6000	30.20526	6.75410
Percentage	20	.1095	.22004	.04920

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
NoOfPatients	2.014	19	.058	13.60000	-.5365	27.7365
Percentage	2.226	19	.038	.10950	.0065	.2125

Two-stage Least Squares Analysis

Model Description

		Type of Variable
Equation 1	Percentage	dependent
	NoOfPatients	predictor & instrumental

MOD_16

Model Summary

Equation 1	Multiple R	.999
	R Square	.998
	Adjusted R Square	.998
	Std. Error of the Estimate	.010

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	.918	1	.918	8580.256	.000
	Residual	.002	18	.000		
	Total	.920	19			

Coefficients

	Unstandardized Coefficients		Beta	t	Sig.
	B	Std. Error			
Equation 1 (Constant)	.011	.003		4.134	.001
NoOfPatients	.007	.000	.999	92.630	.000

Graph:(4-9)- The next chart demonstrate the ultrasound finding through 71 male patients scanned in ultrasound departments through this study in the kingdom of Saudi Arabia (Eastern area) August 2007 to May 2009.
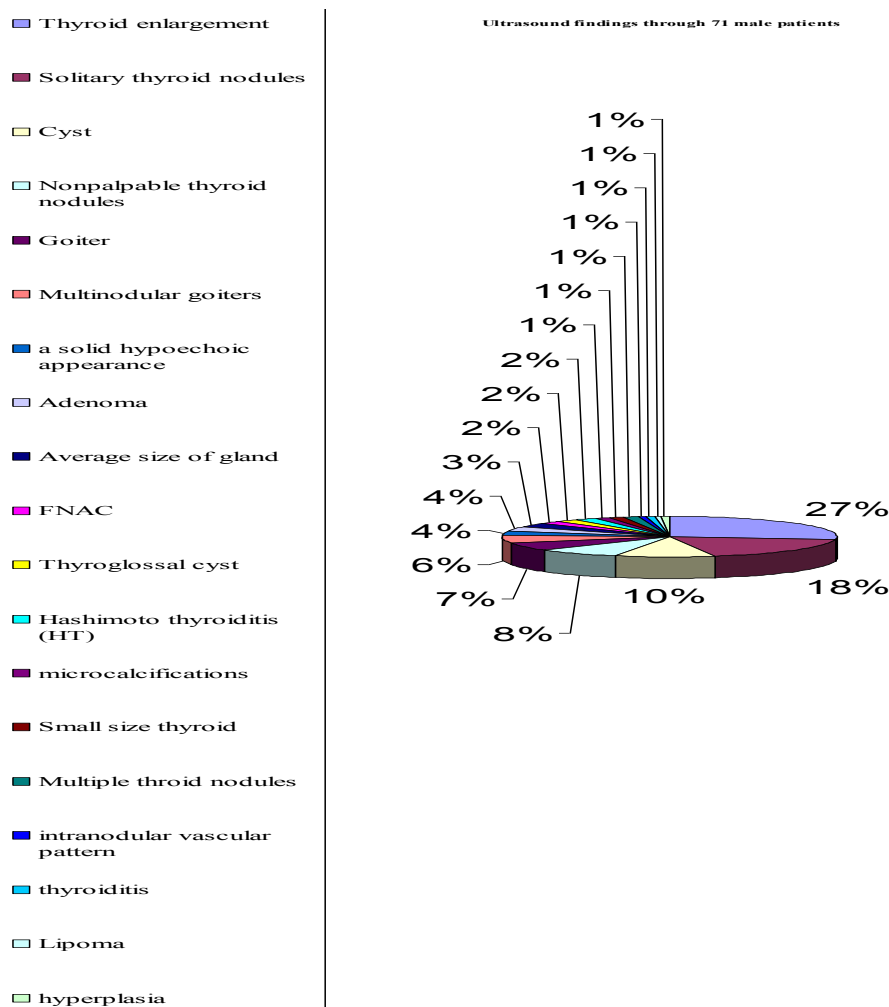
V. Discussion

Thyroid ultrasound is an imaging modality to evaluate the size, shape, and abnormalities of the thyroid gland.

This study which was carried out on 303 patients in which different cases of thyroid pathologies were identified sonographically, 77 % were female patients and 23 % were male patients (Table 4-1). So females were more affected than the males.

Previous study confirmed that, all thyroid disorders are much more common in women than in men[1]. Along this series 25 % of ultrasound findings were thyroid enlargement(Figure1) which represent the most common ultrasound findings of thyroid pathologies (Table 4-5) followed by, 23 % solitary thyroid nodules(Figure2), 10 % multinodular goiters, 8 % simple cyst(Figure3), 7 % nonpalpable thyroid nodules, 4 % goiter, 4 % FNAC, 3% Hashimoto thyroiditis(Figure4), 2 % a solid hypoechoic appearance, 2 % nodal enlargement, 2 % adenoma, 2 % increase vascularity, 2 % average size of gland, 2 % thyroiditis, 1 % microcalcifications, 1 % small size thyroid, 1 % intranodular vascular pattern, 1 % multiple thyroid nodules, 1 % thyroglossal cyst and 1 % Graves disease. There was no percentage presented with irregular or blured

margins of ultrasound findings, swelling, mediastinum extension, intranodular vascular spots, isoechoic area, hypovascularity, complex mass, lipoma, hyperplasia nor hyperthyrodism. Previous study confirmed that, the majority of nonpalpable thyroid tumors can be identified by cytological evaluation of lesions presenting hypoechoic appearance in conjunction with one independent risk factor. Due to the nonnegligible prevalence of extracapsular growth and nodal metastasis, US-FNA should be performed on all 8–15 mm hypoechoic nodules with irregular margins, intranodular vascular spots or microcalcifications. Nonpalpable lesions of the thyroid without risk factors should be followed by means of clinical and US evaluation[2].

The youngest patient in this study was 55 days old boy with clinical findings of hypothyroidism, ultrasound found that nonpalpable thyroid nodule. The eldest patient was 88 years old female with thyroid enlargement. The highest incidence of thyroid pathologies between 3rd and 5th decades of life. While the lowest incidence in 1st and 2nd decades, 8 and 9th (Table 4-2).

Previous study confirmed that, the detection of thyroid calcifications by sonography was diagnostically valuable, especially in cases involving a solitary nodule or a young person. The presence of calcifications should raise the suspicion of malignancy. The low incidence of cancer in patients with multiple noncalcified thyroid nodules suggests that a more conservative approach may be appropriate in such cases[3].

The most clinical presentation in this study (Table 4-4) associated with thyroid pathologies in this study was pain (32 %), and hyperthyroidism (19 %) they were more frequently associated with thyroid pathologies, there were 79 patients asymptomatic (Table 4-3) commonly associated with thyroid pathology.

Sonographic evaluation of thyroid pathologies revealed that thyroid enlargement and thyroid nodules were most commonly seen in thyroid pathologies and limited mass, lipoma, hyperplasia and hyperthyroidism.

According to the different signs and symptoms through 172 symptomatic female patients (Table 4-6) there were (57 of 75) were complain of pain, (36 of 45) were hyperthyroidism, (22 of 35) were neck swelling, (22 of 28) were goiter, (10 of 11) were problems with swallowing or inappropriate fixation of the neck, (9 of 11) were tenderness, (7 of 7) were compression of the respiratory tract,(8 of 10) were hypothyroidism, (6 of 9) were thyroid nodule, (2 of 2) were vocal fold paralysis, (2 of 2) were thyrotoxic, (1 of 1) was enlarge thyroid, (1 of 1) was sweating, (1 of 1) was nervous and anxiety, (1 of 1) was fullness of neck, (1 of 1) was thyroiditis, (1 of 1) was adenomyopathy elevated T3, T4 and TSH, (1 of 1) was Graves disease . Previous study confirmed that, Ultra- sound can obviate the need for scintigraphy in more than half (54%) of patients with possible congenital hypothyroidism. Ultrasound had a potential to predict prognosis of patients with possible congenital hypothyroidism[4].

Usually the nodule are solitary but may be multiple. As was seen in this study, (23 %) cases presented solitary thyroid nodules, (1 %) cases as multiple thyroid nodules (Table 4-5).

Thyroid enlargement and solitary thyroid nodules were the most common concomitant with thyroid pathology during this study (147 and 131patients) (Table 4-5).23 cases were aspirated under ultrasound guidance without any mentioned of complications or side effect, (15 of 23) were sent to the laboratory for cystological examination, (1 of 23) was chronic lymphocytic thyroiditis (Hashimoto thyroiditis (HT)), (1of 23) was thyroid nodule (Benign lesion), (1 of 23) was nodular goiter observed in autoimmune thyroid disease (AITD), (4 of 23) were thyroid cyst. Previous study confirmed that, two drawbacks were noted when conventional FNAB was used: (1) cancer lesions difficult to palpate (e.g., small cancers with or without benign lesions or cancers associated with Hashimoto's thyroiditis or Graves' disease); and (2) palpable cancers with insufficient cell material for analysis (e.g., cystic carcinoma and cancers with calcified lesions)[5]. UG-FNAB is a powerful technique for detecting microcancers, cystic carcinomas, cancers associated with benign nodules, Hashimoto's thyroiditis, or coarse calcifications[5]. High-resolution ultrasonography is sensitive and capable of detecting many small, nonpalpable thyroid nodules. Most of these lesions are benign. For most patients with nonpalpable nodules that are incidentally detected by thyroid imaging, simple follow-up neck palpation is sufficient[6].

Abnormal imaging studies suggesting thyroid pathology are almost invariably followed by ultrasonography of the thyroid. Endocrinologists themselves are using ultrasonography more frequently. A recent study suggested that ultrasonography would alter the clinical management of nodular thyroid disease in 63% of patients[7].
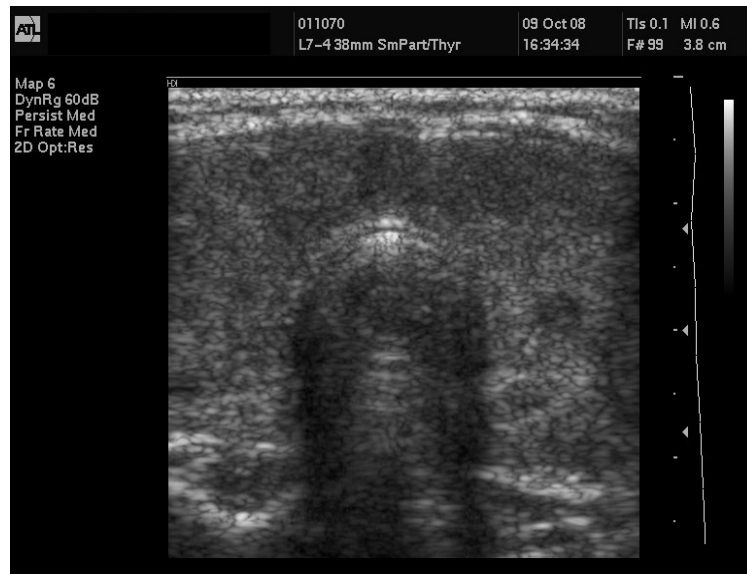
Figure 1: Female 31 years old; thyroid enlargement and multinodular goiters.

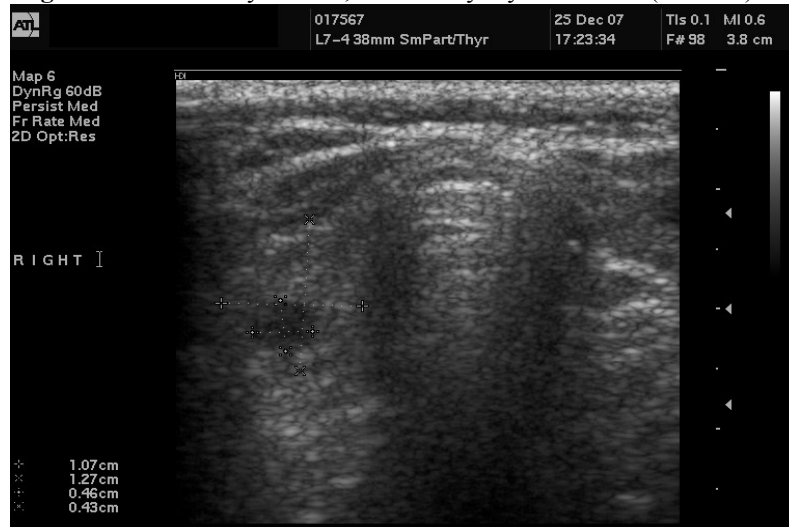**Figure 2:** Female 55 years old; left solitary thyroid nodule (0.6x 0.6) cm

Figure3:Female 77 years old; right thyroid lobe small cyst.

Figure4: Female 25 years old; bilateral diffuse thyroiditis (Hashimoto's disease).

VI.   conclusion

Sonography is the single cost effective mean in detection of thyroid pathologies.

Ultrasound –guided aspiration is an expeditious mean to helps to identify a bacterial cause of the nodule.

This study has shown one case of complex mass, lipoma, hyperplasia and hyperthyroidism.

The highest incidence of thyroid diseases in between 3rd and 5th decades of life. While the lowest incidence in 1st and 2nd decades/ 8 and 9th decades of life. All thyroid disorders are much more common in women than in men.

In conclusion, the thyroid gland pathologies obtained in this study was agreement with a previous study.

Recommendations

Believe more that diagnostic Ultra sonography should be the first-line test owing to its safety and availability. The recommendations in this consensus statement, which are based on analysis of the current literature and common practice strategies, are thought to represent a reasonable approach to thyroid pathologies. Thyroid US is the imaging method of choice for the evaluation of thyroid gland structure, and FNAC, as the most accurate test for nodule diagnosis, has reduced the need for scanning and for thyroidectomy, thereby reducing the health-care costs significantly.

The clinical management of thyroid diseases and to propose a work-up which is very likely to diagnose benign or malignant thyroid neoplasia, preoperatively. The standard diagnostic protocol of thyroid diseases consists of: (i) patient's history including the prior existence and treatment of a benign thyroid disease, (ii) clinical examination, (iii) laboratory tests, (iv) thyroid ultrasound (US), (v) scintigraphy (SC), (vi) fine-needle aspiration biopsy (FNAB) and (vii) molecular studies employed for the detection of malignancy as a part of clinical research.

References

[1] http://www.thyroid.ca/Guides/HG01.html.
[2]http://www.springerlink.com/content/3732n0ewhqb6amd7/
[3] http://jcem.endojournals.org/cgi/content/full/87/5/1938
[4]http://www3.interscience.wiley.com/cgi-bin/abstract/72514684/ABSTRACT
[5] http://www.ajnr.org/cgi/content/abstract/16/5/1117
American Journal of Neuroradiology, Vol 16, Issue 5 1117-1123, Copyright © 1995 by American Society of Neuroradiology.
[6] http://www.springerlink.com/content/4h43yxr7ay7xwna8/
[7] Jarlov AE, Hegedus L, Gjorup T, Hansen JEM. Accuracy of the clinical assessment of the thyroid size. Dan Med Bull 1991; 38:87-89.

DATA COLLECTION SHEET (QUESTIONNAIRE)

Sex……Age……….. Hospital…………… I.D…… Refer Dr/Dept…

Clinical Findings	√ / X	Ultrasound Findings	√ / X	Aspirate (FNAC)	√ / X
Asymptomatic		Thyroid enlargement		1-Nodular goiter observed in autoimmune thyroid disease (AITD), i.e.	

Pain		Nonpalpable thyroid nodules		-chronic lymphocytic thyroiditis (Hashimoto thyroiditis (HT))	
Tenderness		Solitary thyroid nodules		-Graves' disease (GD)	
Compression of the respiratory tract		Multinodular goiters		-nonpalpable thyroid nodules	
Problems with swallowing or inappropriate fixation of the neck		Mediastinum extension		2-Folicular adenoma	
Vocal fold paralysis		Nodal enlargement		3-Cyst	
Heat and redness of the skin over the nodule		Neoplastic lesions		4-Papillary carcinoma	
Others…………		a solid hypoechoic appearance		Others :	
		irregular or blurred margins			
		intranodular vascular pattern			
		Microcalcifications			
		intranodular vascular spots			
		Others…………			