

## Thyroid Surgeries in a Single Centre, 2010-2014

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**Background:** Thyroid surgery is the preferred modality of treatment in malignant and benign thyroid disease including papillary thyroid cancer and multinodular goiter.

**Objective:** To describe the epidemiology of surgically treated thyroid disease in a single center, the cytological and histological patterns and assess the sensitivity and specificity of fine-needle aspiration cytology (FNAC) in diagnosing thyroid nodules with malignant potentials.

**Design:** A Retrospective Study.

**Setting:** Department of Surgery, Salmaniya Medical Complex, Kingdom of Bahrain.

**Method:** Data was collected for all thyroid surgeries performed from 1 January 2010 to 30 December 2014, including preoperative FNAC and postoperative histopathology reports.

**Result:** Two hundred surgeries were performed during the study period. One hundred thirty-two (66%) were benign, and 68 (34%) were malignant. Nodular goiter was the most common benign pathology, 98 (74.2%), and papillary thyroid cancer constituted 63 (92.6%) of all thyroid malignancies. The mean age of patients was 42 years (17-88), with a female predominance 166 (82.9%) observed in both benign and malignant pathologies.

**Conclusion:** Thyroid surgeries were most commonly performed for benign pathologies, and papillary thyroid cancer was the most frequent histopathological type of thyroid carcinoma. The pattern is similar to that of other GCC populations. In our unit, FNAC was a reliable tool in preoperative diagnosis.

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Through decades, thyroid cancer has remained the most common endocrine cancer worldwide and the most rapidly increasing cancer<sup>1,2</sup>. That could be due to a better diagnosis<sup>3</sup>.

Thyroid and cervical lymph nodes ultrasound (US) is performed in all patients with known or suspected thyroid nodules<sup>2</sup>. The diagnostic US confirms the presence of a nodule, and fine needle aspiration cytology (FNAC) may be performed to evaluate the nodule further, as it is the most accurate and cost-effective method<sup>4</sup>.

The aim of this study is to describe the cytological and histological patterns as well as the epidemiology of surgically treated thyroid disease in a single center, and assess the sensitivity and specificity of (FNAC) in diagnosing thyroid nodules with malignant potentials.

### METHOD

A retrospective study of all patients above 14 years who had thyroid surgery (hemithyroidectomy, subtotal thyroidectomy or total thyroidectomy) from 1 January 2010 to 31 December 2014 were reviewed.

Patients aged  $\geq 14$  years old who underwent thyroid surgery (hemithyroidectomy, subtotal thyroidectomy or total thyroidectomy) were included. Patients who had negative histopathology or if the type of surgery was not specified were excluded. The preoperative FNAC and postoperative histopathology reports were reviewed.

Data collected included patient gender, age, surgical procedure, pathologic findings of FNAC and histopathology specimens. Operations were as follows: hemithyroidectomy, total

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thyroidectomy, subtotal thyroidectomy and total completion thyroidectomy. The histopathological findings were classified into four groups: (1) multinodular goiter, (2) thyroiditis, (3) adenoma (follicular adenomas and Hurthle cell type adenoma), (4) malignant tumors (follicular, papillary and medullary carcinoma).

The data were analyzed using the Statistical Package for the Social Sciences version 24.

**RESULTS**

Two hundred twenty-nine surgeries were performed over a five-year period (2010-2014). Twenty-nine cases were excluded due to missing histological reports; therefore, 200 cases were included in the study. Patients' age ranged from 17 to 88 years with a mean age of 42 years. Females constituted 83% and female to male ratio was 5:1. Patients' characteristics are summarized in table 1.

**Table 1: Personal and Clinical Characteristics**

Variable	Gender		Total
	Males	Females	
Frequency	34 (17%)	166 (83%)	200 (100%)
Mean age (years)	49	40	42
Postoperative histological diagnosis			
Benign thyroid disease	22 (11%)	110 (55%)	132 (66%)
Malignant thyroid disease	12 (6%)	56 (28%)	68 (34%)
Total	34 (17%)	166 (83%)	200 (100%)
Type of operation			
Hemithyroidectomy	18 (9%)	82 (41%)	100 (50%)
Total thyroidectomy	9 (4.5%)	58 (29%)	67 (33.5%)
Subtotal thyroidectomy	3 (1.5%)	17 (8.5%)	20 (10%)
Completion	4 (2%)	9 (4.5%)	13 (6.5%)
Total	34 (17%)	166 (83%)	200 (100%)

One hundred thirty-two (66%) were benign, and 68 (34%) were malignant. Sixty-three (31.5%) patients were papillary. Two (1%) were follicular, two (1%) were medullary, and one (0.5%) was anaplastic thyroid cancer, see table 2. Ninety-eight (49%) of benign thyroid diseases were nodular, 18 (9%) were thyroiditis, and 16 (8%) were adenoma, see table 3.

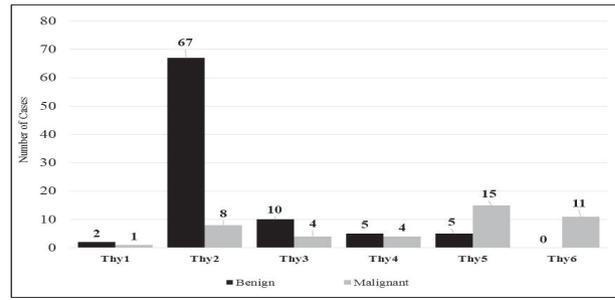
**Table 2: Histopathological Distribution of Thyroid Cancer (68)**

Primary Thyroid Cancer	Males		Females		Total	
	Frequency	Mean age	Frequency	Mean age	Frequency n (%)	Mean age
Papillary TC	10 (15%)	50	53 (78%)	40	63 (92.6%)	42
Follicular TC	1 (1%)	34	1 (1.4%)	53	2 (2.9%)	44
Medullary TC	1 (1%)	72	1 (1.4%)	54	2 (2.9%)	63
Anaplastic	0	-	1 (1.4%)	71	1 (1.5%)	71
Total	12 (17%)	50	56 (82%)	41	68 (100%)	43

**Table 3: Histopathological Distribution of Benign Thyroid Diseases (132)**

	Males		Females		Total	
	Frequency	Mean age	Frequency	Mean age	Frequency n (%)	Mean age
Nodular goitre	15 (11%)	52	83 (62.8%)	41	98 (74.2%)	43
Thyroiditis	4 (3%)	41	14 (10.6%)	35	18 (13.6%)	36
Adenoma	3 (2%)	45	13 (9.8%)	37	16 (12.1%)	38
Total	22 (16.6%)	49	110 (83%)	40	132 (100%)	41

Preoperative FNAC reports were found in 132 cases. Figure 1 and tables 4 and 5 illustrate the correlation of postoperative histological diagnosis with each category FNAC results.



**Figure 1: Cyto-Histologic Diagnostic Correlation of Thyroid Tissues (132)**

**Table 4: Association between FNAC and Histopathology**

Histopathology/FNAC	Malignant/Suspicious	Benign	Total
<b>Malignant</b>	TP= 30	FP=13	43
<b>Benign</b>	FN= 10	TN= 79	89
<b>Total</b>	<b>40</b>	<b>92</b>	<b>132</b>

FNAC: Fine needle aspiration cytology

**Sensitivity** (true positive ÷ true positive + false negative)

**Specificity** (true negative ÷ true negative + false positive)

**Accuracy** (true positive + true negative ÷ total evaluations)

**Positive Predictive Value** (true positive ÷ true positive + false positive)

**Negative Predictive Value** (true negative ÷ true negative + false negative)

**Table 5: Pre-Operative FNAC Results and Postoperative Histopathology Reports**

FNAC	Thy1	Thy2	Thy3	Thy4	Thy5	Thy6
<b>Malignant</b>	33.33%	10.67%	28.57%	44.44%	75%	100%
<b>Benign</b>	66.67%	89.33%	71.43%	55.56%	25%	-

**DISCUSSION**

Thyroid cancer comprises approximately 1% of all malignancies<sup>2</sup>. It is postulated that it might become the fourth most common cancer by 2030 in the United States<sup>5</sup>. In 2012, approximately 230,000 new cases of thyroid cancer were diagnosed; 70,000 were in males<sup>5</sup>. According to the American Cancer Society statistics published in 2016, the most rapidly increasing type of cancer was thyroid cancer<sup>1</sup>. However, the increase in incidence is not accompanied by an increase in the mortality rates which have remained stable for 35 years<sup>3</sup>.

The result of this study is broadly consistent with the major patterns described in studies from the region and other parts of the world. The mean age of patients with thyroid malignancy was 42 years (40 for females, 49 for males). The findings of this study are consistent with those of Darwish et al who studied thyroidectomy specimens in a different tertiary care center in Bahrain during 2000-2004, in which the mean age for females was 44 and 47 for males<sup>6</sup>. These results match those observed in other GCC countries, such as KSA, where the mean age reported was 41.7<sup>7</sup>. In contrast, the mean age of 51 years was

reported in the United States, 52 and 50 in Brazil, 52 in Poland and 49 in Turkey<sup>2,3,8-10</sup>.

Our study confirms the gender disparity in thyroid cancer described in the literature. In this study, not only did thyroid cancer predominate in females, but also presented nine years earlier, which is consistent with an earlier study from Bahrain<sup>6</sup>. We found a female to male ratio of 4.7:1, and thyroid cancer in females constituting 82.4% of all cases. This finding is higher than that reported ten years earlier (69.2%)<sup>6</sup>. In Bahrain, thyroid cancer ranked third most common cancer in females in 1998-2001, according to the report of cancer statistics in the GCC countries<sup>11</sup>. Similarly, it is ranked the third most common among Kuwaiti women and second most common among Saudi women<sup>12</sup>. The female predominance observed in this study is similar to those of the previous studies from KSA, UAE, Yemen, Kuwait, Poland, Togo, Turkey, and Brazil<sup>7,9,10,13-17</sup>. In contrast, thyroid cancer is the 16th most common among females in Ireland<sup>18</sup>.

The most common histopathological type of thyroid carcinoma was papillary carcinoma which accounted for 92.6% of the malignant cases, compared to 96.8% in the previous data from Bahrain<sup>6</sup>. These results are similar to what is reported in the international literature. Papillary and follicular cancer make up the majority (>90%) of all thyroid cancers worldwide<sup>1</sup>. Papillary thyroid cancer constituted the majority of diagnosed thyroid cancer with variations in relative frequencies in reported studies from KSA, Poland, India, Brazil, Turkey, Germany, Italy, China and Philippines<sup>2,7,9,10,13,14,19-24</sup>. Even in Africa where follicular thyroid cancer was predominant over papillary in the 1980s, a more frequent occurrence of papillary thyroid cancer was reported by Ogbera and Kuku<sup>25</sup>.

This study supports the view that FNAC is a reliable and accurate tool for preoperative diagnosis of thyroid nodules. In our unit, the calculated specificity and sensitivity were corresponding to international standards. The calculated specificity was as high as 85.9%, negative predictive value (NPV) was 88.8%, positive predictive value (PPV) was 69.8%; the calculated sensitivity was 75% and accuracy was 82.6%. The very low rate of false negatives and high sensitivity was comforting. While a multitude of diagnostic tests is available to investigate thyroid nodule, including ultrasound and thyroid nuclear scan, nowadays FNAC is considered the standard gold test for preoperative evaluation of solitary thyroid nodules. FNAC is non-invasive, safe, reliable and cost-effective<sup>4</sup>.

This study was limited by the loss of long-term follow-up of patients and was unable to look for recurrences. In addition, some of the histology and cytology reports were missing. A future prospective study could provide more systematic data.

## CONCLUSION

**This study revealed that thyroid surgery was the most commonly performed procedure for benign pathologies, whereas papillary thyroid cancer was the most frequent histopathological type of thyroid carcinoma. Moreover, the pattern is similar to that of other GCC populations and to what was reported in Bahrain ten years ago. In our**

**unit, FNAC was a reliable tool in preoperative diagnosis. Nevertheless, further prospective study to reveal the long-term prognosis is advised.**

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**Competing Interest:** None.

**Sponsorship:** None.

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