

## The Patterns of Surgically Treated Thyroid Disease in Central Rural Region of Saudi Arabia

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### ABSTRACT

**Objective:** It is well recognized that incidence of thyroid disease is increasing in Saudi Arabia and varies in geographical areas of Saudi Arabia. This study was aiming to evaluate the patterns of thyroid pathology in Al Kharj region, which is a rural agricultural area in central Saudi Arabia with relatively large (3.1%) population.

**Methods:** The retrospective study was designed covering period from 2012 to 2016, which include only patients, who received surgical treatment for the various thyroid pathologies. All data was collected from Department of Surgery at King Khaled Hospital (KKH), which is the university hospital, serving over 600,000 population of Al Kharj region. 92 thyroidectomies performed for various thyroid disorders where analyzed.

**Result:** The incidence of thyroid disease for females in Al Kharj region was estimated as 2.7/100.000 of population per year comparing to males of 0.4/100.000 respectively. Female to male ratio of 6.7:1 was observed in relation to the overall thyroid pathologies. The mean age of all studied cases was 41.3 years ranging from 19 to 77 years. The majority of the thyroid diseases was in the age group 20-50 years (79.3%). Cancerous lesions were found in 35 cases (38%) and presented mainly as papillary or follicular carcinomas with the female to male ratio of 10.5:1. The prevalence of thyroid cancer in Al Kharj region in current study was 1.1/100.000 of population per year for females and 0.1/ 100.000 of population per year for males respectively.

**Conclusion:** This study showed that in central rural province of Saudi Arabia females are dominantly affected by thyroid pathologies. The female to male ratio requiring surgical intervention was higher in Al Kharj region compared to the other Saudi Arabian areas. Incidence of thyroid pathology and prevalence for thyroid cancer was significantly higher in females compare to male population.

**Keywords:** Thyroid disease, Thyroid cancer, Saudi Arabia research, Incidence and prevalence

### INTRODUCTION

The incidence and prevalence of thyroid disease globally continue to increase substantially and recently became a common clinical issue that associated with aging, where two-thirds of the people who are diagnosed with thyroid cancer were between 20 to 55 years old. In the United States alone, incidence of thyroid diseases rose 12 times for women and 1.5 times for men over the last 60 years<sup>[1,2]</sup>. Risk factors, such as low iodine diet, exposure to ionizing radiation, hereditary factor and obesity increase the incidence of developing thyroid disease and thyroid cancer. However, the majority of people, who are diagnosed with thyroid cancer, have no apparent risk factors and the remaining patients may have one or two risk factors<sup>[3]</sup>. It is well recognized that nodular thyroid disease is frequently present in mountain areas of Saudi Arabia, which is explained by the iodine deficiency in these regions. However, the risk factors in other areas are poorly identified in literature<sup>[4]</sup>. It is well established that thyroid cancer

currently is the most frequent malignancy in endocrine disorders, which accounts for more than 90% of malignant endocrine tumors. In 2010 thyroid cancer ranked as the third most prevalent cancer, which affect Saudi Arabian adult population after breast cancer and colorectal cancer. According to the resent data from the National Cancer Institute, approximately 1.2 % of population will be diagnosed with thyroid cancer at some point of a lifetime. Recent reports demonstrated that in Saudi Arabia, thyroid carcinomas was accounted for 5% to 6.1% of all newly clinically diagnosed cancers cases and are ranked second in females and fourth in males with female to male ratio of 3.46:1.

In the Cancer Incidence Report, Ministry of Health of Saudi Arabia and Saudi Cancer Registry 2010, the thyroid cancer ranked the third most prevalent cancer among Saudi adults, after breast and colorectal cancer<sup>[5]</sup>. As the first line of thyroid pathology diagnosis, thyroid ultrasound is commonly used as a sensitive and noninvasive diagnostic imaging for

identifying thyroid tissue with nodules, but still no proven criteria to differentiate benign from malignant nodule [6]. It is widely accepted that ultrasound guided Fine Needle Aspiration Cytology (FNAC) is a simple, cost-effective, safe and accurate method to assess thyroid nodule. FNAC is proven to be essential in evaluation of euthyroid patients with thyroid nodule to reduce the rate of unneeded thyroid surgery for benign nodule [7]. 70 to 80% of FNAC classified thyroid lesion as cancerous or non-cancerous with 92 negative predictive values for non-cancerous lesion and 100% positive predictive value for cancerous lesions [8]. However, up to 20% of first FNAC could be non-diagnostic and require repeating procedure or proceed for punch biopsy or surgery for definitive pathological diagnosis, as out of these non-diagnostic cases 2 to 51 percent will be malignant [9]. This study was aiming to evaluate the patterns of thyroid pathology in Al Kharj region, which is a rural agricultural area in central Saudi Arabia with relatively large (3.25%) population according to most recent census [10]. Clinical presentation, demographic characteristics, incidence of thyroid cancer, as well as surgical complications were studied in surgically treated thyroid disease.

#### MATERIALS AND METHODS

The design of this retrospective surgical audit type study was based on data obtained from the Department of Surgery at King Khaled Hospital (KKH), which is a major teaching government hospital affiliated with the Prince Sattam bin Abdulaziz University for public admissions in Al Kharj governorate of Saudi Arabia providing health care to near 600,000 multinational population of mixed socioeconomic status [10]. All patients older than 18 years with proven thyroid disease, including thyroid nodule or multinodular goiter with histopathological benign or malignant diagnosis, who underwent thyroid surgery (thyroid lobectomy, subtotal thyroidectomy or total thyroidectomy) between January 2012 and December 2016 at the Department of Surgery of the KKH were included in the research data for analysis. The medical files from the Medical Records department were reviewed for demographic data such as age, sex, nationality, as well as clinical presentation, risk factors including family history of thyroid diseases, stress, malnutrition, and radiation exposure. The data included thyroid function test and ultrasound

investigations with review of their treatment from surgical notes, histopathological reports, parathyroid and calcium levels. Two pathologists, according to the World Health Organization (WHO) classification (2004) of a thyroid tumor, interpreted the results of the fine needle aspiration cytology (FNAC). The approval from the Prince Sattam bin Abdulaziz University Ethics committee was obtained to conduct this research.

#### Statistical analysis

Data from 92 patients were obtained and analyzed using the Statistical Package for Social Sciences v22 (SPSS Inc., IBM, USA). Both analysis of descriptive statistics in the form of frequency and percentage and the Chi-Square test were performed. Mean and standard deviation (SD) values were calculated for comparisons of data for categorical variables. A p-values equal or less than 0.05 throughout the study, were considered statistically significant.

**The study was done after approval of ethical board of prince Sattam Bin Abdulaziz university.**

#### RESULTS

A total of 92 thyroidectomies for various thyroid disorders performed in the surgical department of KKH during the research period were included in this study.

The incidence of thyroid disease for Al Kharj region in this study was estimated as 2.7/100.000 of regional population per year for females and 0.4/100.000 of regional population per year for males respectively [10].

Data for all patients were analyzed, which included 80 females and 12 males (87% and 13% respectively) with female to male ratio of 6.7:1. For females mean age was 48.2 + 27.8 years, while for males mean age was 44.3 + 21.2 years respectively.

**Table 1.** Patients age distribution.

Age	M	F
<20	0	1
20-30	2	15
31-40	5	25
41-50	2	24
51-60	2	12
>60	1	3

The mean age of all studied cases was 41.3 years ranging from 19 to 77 years. The majority of the

thyroid diseases were in the age group 20-50 years (79.3%) in this study. Patient's risk factors, including hypertension (HTN), diabetes mellitus (DM), stress and malnutrition, which may be associated with thyroid disease development, are shown in table 2.

**Table 2.** Patients risk factors

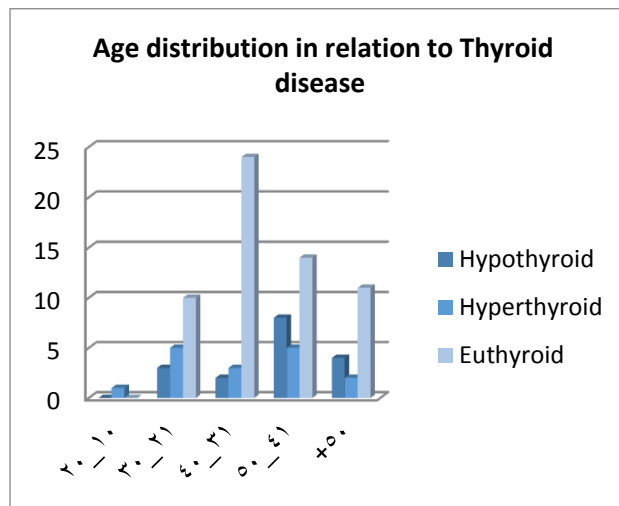
COMPLICATIONS	MALE	FEMALE	TOTAL
HTN Only	1	6	7
DM ONLY	0	14	14
DM + HTN	2	3	5
STRESS	2	3	5
MALNUTRITION	1	2	3

DM as risk factor was predominantly higher compared to HTN, stress, malnutrition or combination of these factors ( $p < 0.05$ ). Family history as risk factor was not present in patients included in this study. There was no significant difference between female and male groups in risk factors, such as stress and malnutrition ( $p > 0.5$ ). Also, among all patients iodine deficiency was not identified in this study, according to patient's history and laboratory findings. From all 92 patients, social history of cigarette smoking as possible risk factor was accounted in 4 patients (4.3%). However, we could not identify from the medical files the severity or duration of smoking characteristics and considered this as statistically negligible. Multinodular goiter was found in 46 patients (50%), where the majority, 29 patients (63%) had euthyroid status. There was a female prevalence of hyperthyroidism among the rest of the patients in this group ( $p < 0.05$ ), as shown in table 3. In total, 33 out of 92 patients (35.9%) in this study had thyroid dysfunction.

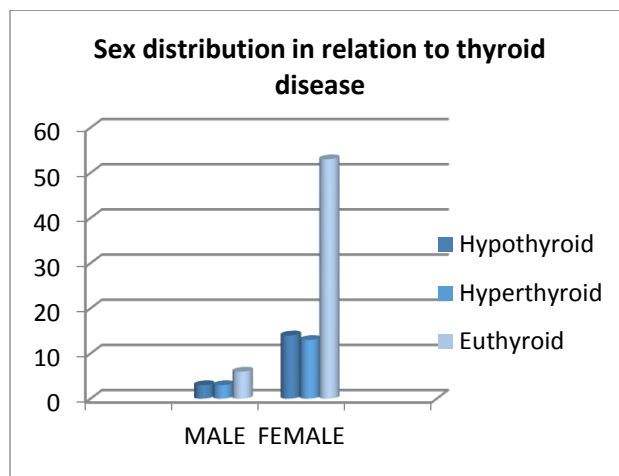
**Table 3.** Distribution of thyroid status

THYROID STATUS	MALE	FEMALE	TOTAL
EUTHYROID	3	26	29
HYPOTHYROID	2	6	8
HYPERTHYROID	1	8	9

The age and sex distribution of patients according to thyroid dysfunction are presented in Fig. 1 and Fig. 1.



**Fig. (1):** Age distribution and thyroid status.



**Fig. (2):** Sex distribution and thyroid status

The distribution of thyroid pathology diagnosed in our study, which mandated surgical intervention reflected in table 4.

**Table 4.** Patterns of thyroid pathology required surgical intervention

PATHOLOGY	MALE	FEMALE	TOTAL
Papillary Ca	2	21	23
Follicular Ca	1	10	11
Hurthle Cell Ca	0	1	1
COLLOID	2	1	3
Follicular Adenoma	0	3	3
MNG	6	40	46
Hashimoto's	1	4	5

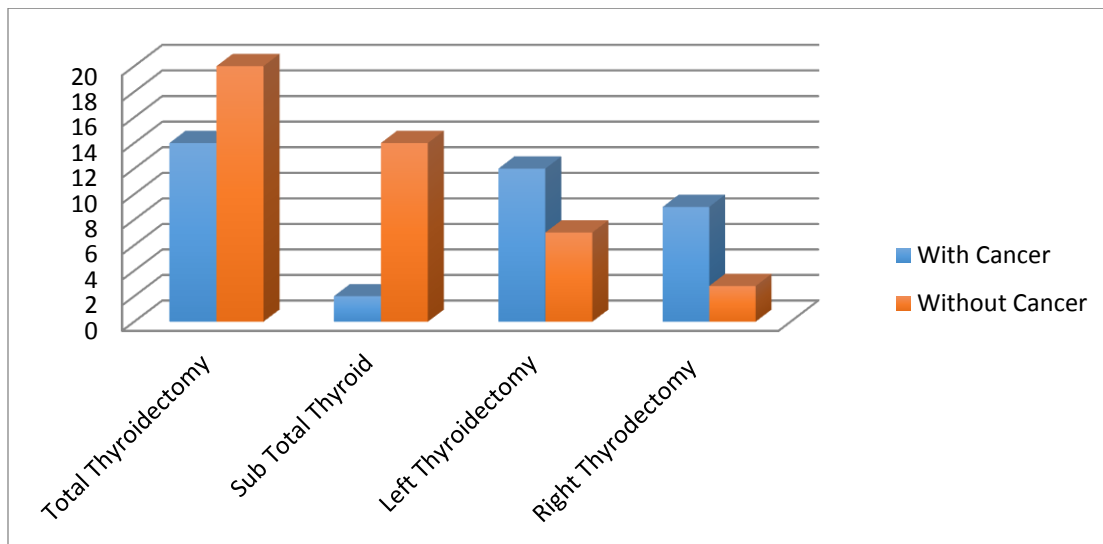
Non-neoplastic lesions were found in 54 (58.7%) cases. Hashimoto thyroiditis was diagnosed in 5 patients (5.4%). Neoplastic lesions were found in 38 cases (41.3%) and presented mainly as papillary or follicular carcinomas in 35 cases (38%) with the female to male ratio a 10.5:1. Only 3 cases of follicular adenomas (3.2%) were diagnosed. The prevalence of thyroid cancer in Al Kharj region in current study was 1.1/100.000 of regional population per year for females and 0.1/ 100.000 of regional population per year for males respectively <sup>[10]</sup>. The papillary carcinoma was commonest malignancy in this study and observed in 23 cases (65.7%) of all

malignant lesions. The rest of the thyroid carcinoma cases were presented by follicular type with female: male ratio 10:1 for both types and one case of Hurtle cell carcinoma. The FNAC studies revealed either positive or negative for cancer cells and the biopsy was done for patients with solitary or multinodular goiter to confirm the diagnosis for justification of surgical invasion. We found the accuracy for FNAC in our study was 82% after pre- and post-surgery pathologies were compared. There was no mortality in this study and 1 case of morbidity, which was vocal cord paralysis due to the recurrent laryngeal nerve injury.

**Table 5.** Clinical manifestations of thyroid pathology

Clinical manifestation	Male		Female	
	Number	Percentage	Number	Percentage
Fatigue	3	3.26	20	21.74
Heat intolerance	2	2.17	6	6.52
Cold intolerance	2	2.17	5	5.43
Sweating	1	1.09	3	3.26
Dry skin	2	2.17	5	5.43
Weight gain	3	3.26	9	9.78
Weight loss	2	2.17	5	5.43
Palpitation	3	3.26	10	10.87
Hoarseness of voice	4	4.35	7	7.61
Nervousness	2	2.17	5	5.43
Goiter	6	6.52	40	43.48

Types of surgeries performed for malignant and non-malignant thyroid pathology presented in Fig. 3.



Fig(3): Types of thyroid surgery in relation to thyroid malignancy.

## DISCUSSION

The thyroid gland diseases remain important in medicine and surgical specialties because the majority of cases are managed by medical or surgical treatments. Patients with thyroid diseases usually presented with body changes associated with an excessive release of thyroid hormones (hyperthyroidism), deficiency of the thyroid hormone (hypothyroidism) or lesions of the thyroid tissue. Multiple risk factors of thyroid disease include: gender, diet rich or deficient iodine, pregnancy, ionizing radiation exposure, genetic aberrations in family history and smoking. Both the benign and malignant diseases of thyroid pathologies are common all around the world, where frequency and incidences varying upon specific and non-specific risk factors<sup>[11]</sup>. In both sexes thyroid cancer was recognized as one of the fastest growing tumor, a number of recent epidemiological and hospital based studies on thyroid disease in Gulf countries similarly support the growth of thyroid tumors in the region<sup>[12]</sup> and particularly in KSA<sup>[13]</sup>. Although few studies, which compared incidence and prevalence of thyroid cancer in different regions of Saudi Arabia (KSA), became available in the last decade, there was no previous attempt to study thyroid disease in fast growing agricultural region of KSA. Globally, 80% of total thyroid cancer cases were papillary thyroid cancer. The fine needle aspiration cytology was widely used as the initial diagnostic technique for establishing this pathology in thyroid nodules<sup>[14]</sup>. In our present study we attempted to establish current frequency and patterns of thyroid disease. We have also attempted to find correlations of risk factors and findings of thyroid function with thyroid cancer diagnosed histologically. Overall the incidence of thyroid disease for the Al Kharj region estimated in this study was 3.1/100,000 of population per year (with female 2.7/100,000 and male 0.4/100,000 respectively), which represent above 3 % of the country population<sup>[10]</sup>. In contrast with the other recent study from a major university hospital in Saudi Arabian capital city, which is a big referral center, overlooking for 10 years of thyroid research; the incidence of thyroid diseases in female Saudi adults visiting tertiary care hospital in Riyadh, was 7:1<sup>[15]</sup>. Our study showed less incidence of thyroid disease for both female and male population. It has been historically known, that thyroid diseases primarily affecting females in the majority of cases

around the world with female (as high as 88.7%) to male ratio of 4.5:1 and have also been supported in recent international the studies<sup>[16-18]</sup>. In the Gulf region this figures were also supported by the studies from Bahrain and the western regions of KSA<sup>[19,20]</sup>. Regarding the mean age for thyroidectomies, there are significant variations from 51 years in Ireland<sup>[21]</sup> and 42.6 years in Turkey and Greece<sup>[18,22]</sup>. A study from Bahrain quoted the age range of thyroid malignancy as 21-82 years<sup>[23]</sup>. In the regions of KSA some of the studies also shown predominance of benign pathologies in the thyroidectomy specimens. Our study is also in agreement with the multiple recent studies that thyroidectomies are performed more frequently for benign diseases compared to malignant lesions<sup>[17]</sup>. Among non-neoplastic lesions, colloid solitary nodule or multi-nodular goiter, found in the thyroidectomy specimen, are the commonest pathologies, which was supported by multiple studies from Greece, Zambia, Bangladesh, Pakistan and western Saudi Arabia, Iraq, Bahrain, which were done both in endemic and non-endemic areas and ranging from 36.8% to 71.96% of studied cases<sup>[24]</sup>. The FNAC biopsy is commonly accepted as a simple, safe and reliable investigation of choice for identifying thyroid pathology, especially in discrimination of malignant changes, the results of which is one of the indications for surgical intervention. Prevalence of thyroid cancer in our study was significantly higher for females than males in proportion of 10:1. These findings are in agreement to other recent studies from Saudi Arabian large medical centers, which reported about thyroid research over 10 years period<sup>[15]</sup>. In our study, papillary carcinoma accounted for 65.7% from all diagnosed malignancies, followed by follicular variant 31.4% and one case (2.9%) of Hurthle cell carcinoma. The frequency of papillary thyroid cancer is comparable to previously reported Saudi Arabian studies<sup>[25]</sup>. From our results with zero mortality; morbidity was less (2.9%) than the central region (6.8%) and the western region (18%)<sup>[13,19]</sup>. Medullary thyroid carcinoma and anaplastic carcinoma were not observed in our study. They are relatively rare malignant variations with predominantly genetic risk factors<sup>[2]</sup>. Treatment of thyroid malignancies included total or subtotal thyroidectomies, which are universally accepted as the treatment of choice for the types of thyroid cancers identified in our study. During the post-surgery period of papillary and

follicular tumors, L-thyroxine was prescribed for all patients in order to suppress TSH. The complications of surgical intervention were similar to the other studies, which included injury to recurrent laryngeal nerve, transient hypothyroidism and hypoparathyroidism. Some limitations of this study include the relatively small sample size of the included patients. All cases were taken from a single hospital and managed by the general surgeons with no subspecialty training. In conclusion, our study demonstrated, that thyroid cancer in central province of Saudi Arabia was predominantly affecting females with a mean age of 48.2 years. The female to male ratio of thyroid disease, which required surgical intervention, was higher for the Al Kharj region compared to the other Saudi Arabian studies. Experienced thyroid surgeons with endocrinologists and pathologists may improve diagnostic accuracy by forming multidisciplinary approach based on the detailed patient's history, physical examination and ultrasound guided FNAC thyroid studies in order to avoid unnecessary surgical procedures.

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