

Prevalence and Histological Subtypes of Thyroid Cancer in the Aljuf Region, Saudi Arabia

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Abstract

Background: Thyroid cancer, the most common endocrine neoplasm, has a strong female predominance. There has been a steady increase in the incidence of thyroid cancer worldwide. This study aimed to investigate the prevalence of thyroid cancer and identify its predominant histological subtypes in the Aljuf region of Saudi Arabia. The study findings and new data obtained will contribute to advancing knowledge about thyroid cancer at the national level.

Methods and Results: This retrospective, cross-sectional descriptive study was conducted in Sakaka, Aljuf region, Saudi Arabia. Data from thyroid specimens collected at King Abdul-Aziz Specialist Hospital and Prince Mutaib Hospital between January and December 2022 was analyzed. Among 3102 histopathological samples and 298 cytology samples received in both hospitals, 181 were thyroid specimens: histopathology samples [63(34.8%)] and fine-needle aspiration (FNA) samples for cytological diagnosis [118(65.2%)]. The age of patients with thyroid disorders ranged from 17 to 69, with a mean age of 38.4±(SD)1.2 years. The highest percentage, 76(42%), were in the age group over 40. The majority of patients with thyroid disorders, 139(76.8%), were women compared to 42(23.2%) men, giving a female-to-male ratio of 3.3: 1. 165(91.2%) of the study population were Saudi patients, while the non-Saudis represented only 16(8.8%) cases.

Among 181 thyroid specimens, thyroid cancer was diagnosed in 33 patients (18.2%), benign tumors in 43 patients (23.8%) [follicular adenoma 39(90.7%) and Hürthle cell adenoma 4(9.3%)], goiter in 96(53.0%) cases, Hashimoto's thyroiditis in 6(3.3%) cases, and chronic lymphocytic thyroiditis in 3(1.7%) cases. The age of patients with thyroid cancer ranged from 20 to 57 years, with a mean age of 36.9 years. There were 25(75.8%) females versus 8(24.2%) males, with a ratio of 3.1:1. Papillary thyroid carcinoma was the most frequent histological subtype among patients with thyroid cancer, accounting for 75.8%, while follicular thyroid carcinoma represented only 24.2%. Among 155 cancer cases, thyroid cancer ranked third (21.3%) after breast cancer (26.4%) and colon adenocarcinoma (23.9%).

Conclusion: Thyroid pathology, including cancer, is notably prevalent among females and older age groups in the Al-Jouf region. Thyroid carcinoma is the third most diagnosed cancer type after breast carcinoma and colon adenocarcinoma in Al-Jouf in 2022. Papillary thyroid carcinoma is the most frequent histological subtype among Saudi patients with thyroid cancer. (International Journal of Biomedicine. 2024;14(3):448-453.)

Keywords: thyroid cancer • papillary thyroid carcinoma • histological subtype • women • Saudi Arabia

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Introduction

The thyroid gland is a butterfly-shaped gland located at the base of the neck. The thyroid hormone controls metabolism, growth, and many other organ systems in the body, including the heart, CNS, autonomic nervous system, bone, and gastrointestinal tract. Thyroid cancer (TC) is a malignancy arising from the thyroid parenchymal cells.¹ Differentiated thyroid cancer, arising from the thyroid follicular cells, is the most common category of thyroid cancer and includes papillary thyroid cancer, follicular thyroid cancer, and Hurthle cell cancer. Papillary thyroid cancer is the most common endocrine malignancy, accounting for 96.0% of total new endocrine cancers and 66.8% of deaths due to endocrine cancers.²

Thyroid cancer, the most common endocrine neoplasm, has a strong female predominance. Incidence rates in women are about three times higher than in men.³ Thyroid cancer accounts for 1% to 4% of all malignancies and is the fifth most common cancer in women in the United States.⁴

There has been a steady increase in the incidence of thyroid cancer worldwide. In particular, the detection of papillary thyroid cancer increased 2.9-fold from 1973 to 2002.⁵ From 1999 to 2015, the age-adjusted incidence rate of thyroid cancer in the U.S. increased from 6.8 per 100,000 people to 14.5 per 100,000 people. This increase in incidence is thought to be primarily due to the trend toward increased diagnostic imaging.⁶ In the United States, thyroid cancer is the 13th most commonly diagnosed cancer. Thyroid cancer accounted for approximately 44,000 new cancer cases in 2022 (2.3% of the total).⁷

Thyroid cancer is the fifth most common cancer in the Gulf Cooperation Council (GCC) countries. Between 1998 and 2007, 5,587 cases (5.9%) were diagnosed. The overall age-standardized rate (ASR) was 1.8 and 5.9 per 100,000 for men and women, respectively.⁸ The Saudi National Cancer Registry has reported a significant increase in the incidence of thyroid cancer in both males and females.^{9,10} In KSA, it is the second most common cancer among females after breast cancer.¹¹ In total, 23,846 cases (17,220 females and 6,626 males) were diagnosed with thyroid cancer in Saudi Arabia from 1990 to 2019.¹² In Saudi Arabia, between 1990 and 2016, the incidence of cancer increased around 26-fold in thyroid cancer compared to approximately 10-fold in breast, colon, bladder, and uterine cancers.¹³

Potential high-risk factors for thyroid cancer are radiation exposure (head and neck region) and chromosomal (genetic) alterations. Possible risk factors include Iodine deficiency, high thyroid stimulating hormone (TSH) level, thyroid nodule/s, environmental pollutants, lifestyle and diet, and older age at menopause.^{14,15} The prognosis and treatment of thyroid cancer depend on the tumor type and the stage at the time of diagnosis.¹⁶

This study aimed to investigate the prevalence of thyroid cancer and identify its predominant histological subtypes in the Aljuf region of Saudi Arabia. The study findings and new data obtained will contribute to advancing knowledge about thyroid cancer at the national level.

Materials and Methods

This retrospective, cross-sectional descriptive study was conducted in Sakaka, Aljuf region, Saudi Arabia. Data from thyroid specimens collected at King Abdul-Aziz Specialist Hospital and Prince Mutaib Hospital between January and December 2022 was analyzed. The study population comprised patients who underwent laboratory investigations for thyroid disorders, with inclusion criteria encompassing all genders and age groups within the specified timeframe. Exclusion criteria involved specimens from non-thyroid sites and data from years outside the study period.

Data for the study were collected by reviewing archive information. Laboratory diagnosis involved fixing samples in formalin, processing them, preparing thin sections, and staining them with hematoxylin and eosin for microscopic examination to confirm thyroid pathology. Fine-needle aspiration (FNA) samples were collected, fixed in 95% ethanol, and stained with hematoxylin and eosin for analysis.

Statistical analysis was performed using the statistical software package SPSS version 23.0 (SPSS Inc, Armonk, NY: IBM Corp). The one-way chi-square test was used to assess the statistical significance of differences in a one-way classification system. A probability value of $P < 0.05$ was considered statistically significant.

Results

The data from thyroid specimens received at the Department of Pathology, King Abdul-Aziz Specialized Hospital, and Prince Mutaib Hospital Aljuf, Saudi Arabia, from January to December 2022 was analyzed retrospectively. Three thousand one hundred two histopathological specimens and 298 cytological specimens were received from both hospitals.

A total of 181 samples were thyroid specimens: histopathology samples [63(34.8%)] and fine-needle aspiration (FNA) samples for cytological diagnosis [118 (65.2%)]. The age of patients with thyroid disorders ranged from 17 to 69, with a mean age of $38.4 \pm (SD) 1.2$ years. The highest percentage, 76(42.0%), were in the age group over 40, 52(28.7%) were in the age group of 31-40 years, followed by the age group of 21-30 years, 46(25.4%). The age group of ≤ 20 years was the most minor [7(3.9%)] (Table 1). The majority of patients with thyroid disorders, 139(76.8%), were women compared to 42(23.2%) men, giving a female-to-male ratio of 3.3:1. 165(91.2%) of the study population were Saudi patients, while the non-Saudis represented only 16(8.8%) cases.

Table 1.

The distribution of the study population by age group.

| Age group | Frequency | Percentage |
|-----------------|-----------|------------|
| ≤ 20 years | 7 | 3.9 |
| 21-30 years | 46 | 25.4 |
| 31-40 years | 52 | 28.7 |
| ≥ 40 years | 76 | 42.0 |
| Total | 181 | 100 |

Among 181 thyroid specimens, thyroid cancer was diagnosed in 33(18.2%) patients, benign tumors in 43(23.8%) patients [follicular adenoma - 39(90.7%) and Hürthle cell adenoma - 4(9.3%)] (Table 2). Papillary thyroid carcinoma, which represented 25(75.8%) cases, was the most common histological subtype of thyroid cancer, while follicular thyroid carcinoma was found in 8(24.2%) patients. Goiter was diagnosed in 96(53.0%) cases: colloid nodules were the most common type of goiter, 51(53.1%), followed by cystic nodules 32(33.3%) and the least common multinodular hyperplasia 13(13.5%). Hashimoto's thyroiditis was detected in 6(3.3%) cases, and chronic lymphocytic thyroiditis in 3(1.7%) cases (Table 3).

Table 2.

Clinical diagnoses in the study population.

| Diagnosis | Frequency | Percentage |
|-----------------------|-----------|------------|
| Thyroid cancer | 33 | 18.2 |
| Benign thyroid tumor | 43 | 23.8 |
| Other thyroid lesions | 105 | 58.0 |
| Total | 181 | 100 |

Table 3.

The histopathological diagnoses in the study population.

| Diagnosis | Frequency | Percentage |
|---------------------------------|-----------|-------------|
| <u>Malignant neoplasm</u> | <u>33</u> | <u>18.2</u> |
| Papillary thyroid carcinoma | 25 | 13.8 |
| Follicular thyroid carcinoma | 8 | 4.4 |
| <u>Benign neoplasm</u> | <u>43</u> | <u>23.8</u> |
| Follicular thyroid adenoma | 39 | 21.5 |
| Hurthle cell adenoma | 4 | 2.3 |
| <u>Goiter</u> | <u>96</u> | <u>53.0</u> |
| Colloid nodule | 51 | 28.2 |
| Cystic nodule | 32 | 17.6 |
| Multinodular hyperplasia | 13 | 7.2 |
| Hashimoto's thyroiditis | 6 | 3.3 |
| Chronic lymphocytic thyroiditis | 3 | 1.7 |
| Total | 181 | 100 |

The age of patients with benign tumors ranged from 17 to 64 years, with a mean age of 38.8 years. Total thyroidectomy was performed in one patient (2.3%), right hemithyroidectomy in 7(16.3%), left hemithyroidectomy in 2(4.7%), and 33(76.7%) patients underwent FNA. There were 30(69.8%) females versus 13(30.2%) males, with a ratio of 2.3:1.

The age of patients with thyroid cancer ranged from 20 to 57 years, with a mean age of 36.9 years. There were 25 (75.8%) females versus 8 (24.2%) males, with a ratio of 3.1:1. Total thyroidectomy was performed in 14 (42.4%) patients, right hemithyroidectomy in 10 (30.3%), left hemithyroidectomy in 3 (9.1%) and 6 (18.2%) patients underwent FNA.

A statistically significant incidence of thyroid cancer was noted among individuals over 30 years of age, with the highest incidence in the group over 40 years of age (39.4%) (P=0.0229). At the same time, no statistically significant difference was noted between age groups for benign tumors (P=0.0939). However, in general, the incidence of thyroid diseases increased significantly with age (P<0001) (Table 4). Thyroid cancer, benign tumors, and other thyroid diseases were significantly more often diagnosed in women than in men (P<0.01 in all cases) (Table 5).

Table 4.

The relationship between thyroid pathology and age group.

| Age group | Diagnosis | | | Total |
|-------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| | Thyroid cancer | Benign thyroid tumor | Other thyroid lesions | |
| ≤ 20 years | 1 (3%) | 4 (9.3%) | 2 (1.9%) | 7 (3.9%) |
| 21-30 years | 9 (27.3%) | 13 (30.2%) | 24 (22.8%) | 46 (25.4%) |
| 31-40 years | 10 (30.3%) | 11 (25.6%) | 31 (29.5%) | 52 (28.7%) |
| ≥ 40 years | 13 (39.4%) | 15 (34.9%) | 48 (45.8%) | 76 (42%) |
| Statistics | $\chi^2=9.5455$ DF=3 P=0.0229 | $\chi^2=3.3953$ DF=3 P=0.0939 | $\chi^2=41.4762$ DF=3 P<0.0001 | $\chi^2=54.2486$ DF=3 P<0.0001 |
| Total | 33 (18.2%) | 43 (23.8%) | 105 (58.0%) | 181 (100%) |

Table 5.

Thyroid pathology and gender.

| Gender | Diagnosis | | | Total |
|------------|-------------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| | Thyroid cancer | Benign thyroid tumor | Other thyroid lesions | |
| Male | 8 (24.2%) | 13 (30.2%) | 21 (20%) | 42 (23.2%) |
| Female | 25 (75.8%) | 30 (69.8%) | 84 (80%) | 139 (76.8%) |
| Statistics | $\chi^2=8.7576$ DF=2 P=0.0031 | $\chi^2=6.7209$ DF=2 P=0.0095 | $\chi^2=37.8000$ DF=2 P<0.0001 | $\chi^2=51.9834$ DF=2 P<0.0001 |
| Total | 33 (18.2%) | 43 (23.8%) | 105 (58.0%) | 181 (100%) |

Table 6 and Figure 1 show the incidence of thyroid cancer compared with other cancers diagnosed during the

study period. A total of 155 cancer cases were diagnosed, of which thyroid cancer ranked third (21.3%) after breast cancer (26.4%) and colon adenocarcinoma (23.9%).

Table 6.

The incidence of thyroid cancer and other types of cancer in 2022 (Aljouf region).

| Site of cancer | Frequency | Percentage |
|-------------------------|------------|------------|
| Breast carcinoma | 41 | 26.4 |
| Colon adenocarcinoma | 37 | 23.9 |
| Thyroid cancer | 33 | 21.3 |
| Urothelial carcinoma | 10 | 6.4 |
| Lymphoma | 8 | 5.2 |
| Skin squamous carcinoma | 8 | 5.2 |
| Gynaecological cancers | 7 | 4.5 |
| Oral carcinoma | 5 | 3.2 |
| Neuroendocrine tumours | 4 | 2.6 |
| Lung carcinoma | 2 | 1.3 |
| Total | 155 | 100 |

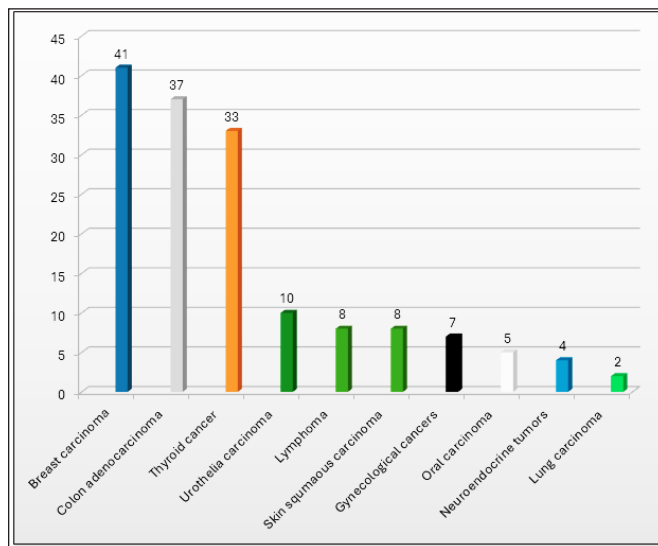


Fig.1. The incidence of thyroid cancer and other types of cancer in 2022 (Aljouf region).

Discussion

Thyroid cancer incidence is steadily increasing worldwide and regionally in the Middle East and Saudi Arabia. The clinical behavior of thyroid cancer is highly variable, from indolent, slowly progressing tumors to highly aggressive

tumors with high mortality rates. Assessing its frequency and understanding of the types of thyroid cancer is crucial in the patient's management. Hence, this study was conducted to establish reference data for the prevalence of thyroid cancer in the Aljouf region.

In our study, from 181 thyroid specimens, 63(34.8%) were diagnosed with histopathological examination, and 118(65.2%) were fine needle aspiration samples for cytological diagnosis, which is almost similar to another study conducted at a University Hospital in Western Saudi Arabia¹² with the FNA cytology samples comprised 76% of the study population.

The age of patients with thyroid disorders ranged from 17 to 69, with a mean age of 38.4±(SD)1.2 years. This agrees with a study conducted to find out the common pattern of thyroid disorders in northern Saudi Arabia,¹⁸ which found that the age ranged from 7 to 75, with a mean age of 35. Qari et al.¹⁷ reported that the mean age of patients with thyroid malignancy was 40.5±14.8 years. In some studies, the age of patients with thyroid cancer ranged from 11 to 77 years.^{19, 20} A study by Gajowiec et al.²¹ retrospectively analyzed 1547 patients with papillary thyroid carcinoma (1358 females and 189 males), treated from 1986 to 2018, and found the median age of 50 years for women and 51 years for men. In our study, the highest percentage of patients with thyroid disorders, 76(42%), were in the age group over 40. Albasri et al.²² retrospectively analyzed 292 thyroidectomy specimens from 230(78.8%) females and 62(21.2%) males; the patients' ages ranged from 14 to 95 years, with a mean age of 39.7. In a study by Hussain et al.⁸ that included 2292 patients with thyroid cancer, the median age at diagnosis was 40 for females and 44 years for males, with a male-to-female ratio of 0.3:1.

In the present study, the age of patients with thyroid cancer ranged from 20 to 57 years, with a mean age of 36.9 years. There were 25 (75.8%) females versus 8(24.2%) males, with a ratio of 3.1:1. For example, a study in the Makkah region reported a female-to-male ratio of 3:1.²³ Gajowiec et al.²¹ reviewed the database of 1547 thyroid cases and found 1358 females (87.8%) and 189 males (12.2%). Samargandy and colleagues¹⁹ found that among 285 TC patients enrolled, 231(81.05%) were female, and 54(18.95%) were male. A female-male ratio of 3.25:1 and 3.7:1 was found in a study by Alzahrani et al.⁹ and Albasri et al.,²² respectively.

In our study, most patients were Saudis [16 (91.2%)], while non-Saudi patients accounted for only 16(8.8%). Similarly, Alkaff et al.²³ reported that Saudi patients accounted for 77% of the study population with thyroid neoplasm. In the study by Refeidi et al.,²⁴ of the 516 patients with thyroid cancer, Saudis accounted for 83.7%.

In the current study, among 181 thyroid specimens, thyroid cancer was diagnosed in 33(18.2%) patients, benign tumors in 43(23.8%) patients [follicular adenoma - 39(90.7%) and Hürthle cell adenoma - 4(9.3%)], goiter in 96(53.0%) cases, Hashimoto's thyroiditis in 6(3.3%) cases, and chronic lymphocytic thyroiditis in 3(1.7%) cases.

In a study by Alkaff et al.,²³ among the 314 cases of thyroid neoplasms, 179(57%) were benign, and 135(43%)

were malignant. Samargandy et al.¹⁹ reported non-neoplastic lesions in 54(58.7%) cases, Hashimoto thyroiditis in 5(5.4%), and neoplastic lesions in 38(41.3%) cases.

Papillary thyroid carcinoma was the most frequent histological subtype among our patients with thyroid cancer, accounting for 75.8%, while follicular thyroid carcinoma represented only 24.2%. No other subtypes were encountered. This finding is in concordance with other studies. In a study by Samargandy et al.,¹⁹ papillary thyroid cancer accounted for 88.07% of all thyroid cancer cases. Similarly, papillary carcinoma was the common malignancy in a study by Aljarbou et al.²⁰ and was observed in 23(65.7%) cases of all malignant lesions. Albasri et al.²² observed papillary carcinoma in 87.8% of all thyroid malignancies, followed by lymphoma, follicular carcinoma, and medullary carcinoma.

The main limitations of this study were the retrospective design, small sample size, one-year duration, and focus solely on the local region. These factors may affect the general applicability of the data. The results should be interpreted cautiously, mainly when extrapolated to a large population or long-term trends in thyroid cancer epidemiology.

Conclusion

Further clinical research is needed to understand the causes and characteristics of thyroid cancer in the region to develop targeted prevention and treatment strategies at the national level. Awareness campaigns and early screening programs for thyroid cancer should be established to improve detection and treatment outcomes.

Ethical Considerations

The study protocol was approved by the Ministry of Health and the Ethics Committee at the College of Applied Sciences and ensures the privacy and confidentiality of patient data.

Competing Interests

The authors declare that they have no competing interests.

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