

Histopathological Patterns of Thyroid Cancer in Karbala Province, Iraq

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Abstract

Background: Histopathological patterns of thyroid cancer vary globally due to variation in genetic, environmental, and demographic factors. **Objective:** The aim of this study was to provide basic data for the different subtypes of thyroid cancer in the Iraqi province of Karbala and to comparing them with regional and global data. **Methods:** A retrospective descriptive study was conducted at Al-Hussein Cancer Center in Karbala, Iraq. The study included 133 patients diagnosed with thyroid cancer between December 2012 and February 2025. Data were collected and analyzed regarding patients' age, sex, tumor location, and histopathological subtype. **Results:** The median age of patients was 41.5 years. Females constituted the majority of cases (81.95%), with a male-to-female ratio of 0.22:1. Papillary thyroid carcinoma was the most common subtype (65.41%), followed by follicular thyroid carcinoma (18.05%), medullary thyroid carcinoma (8.27%), and anaplastic thyroid carcinoma (2.26%). The most common subtype in both sexes was papillary thyroid carcinoma. The most commonly affected location was the right thyroid lobe (39.85%). **Conclusion:** The histopathological subtypes of thyroid cancer in Karbala province were statistically analyzed for the first time in this study. The results offer baseline epidemiological information that could help future studies, regional comparisons, and healthcare planning.

Keywords: Thyroid cancer- Histopathological patterns- Karbala- Iraq

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Introduction

Thyroid cancer is the most common cancer of the endocrine system; it arises from either the thyroid gland's parafollicular C cells or follicular epithelial cells [1]. Despite making up a small percentage of total cancer cases, thyroid carcinoma has become more common worldwide in recent years, especially in developed nations. It is the tenth most frequent cancer worldwide, with over 586,000 new cases diagnosed in 2020 while fatality rates have stayed very low and consistent [2].

In Iraq, thyroid cancer is the sixth most prevalent cancer and the sixteenth most common cancer in Karbala province, making it a significant public health problem [3]. Although the exact causes of the rising prevalence are still unknown, they could include environmental risk

factors such as iodine imbalance, radiation exposure, dietary variables, and advanced imaging modalities [4].

Thyroid cancer is also influenced by genetic factors. Germline activating mutations of the RET proto-oncogene may cause medullary thyroid cancer, which is frequently linked to multiple endocrine neoplasia type 2 (MEN2) syndrome, especially in juvenile populations. Moreover, there have also been reports of familial non-medullary thyroid carcinoma, which is characterized by three or more first-degree relatives having the illness [5].

There are numerous unique histopathological subtypes of thyroid cancer, each with its own biological behavior, prognosis, and course of treatment. The main primary subtypes of thyroid carcinoma are papillary, follicular,

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medullary and anaplastic [6,7]. While there are uncommon variations such thyroid lymphoma, squamous cell carcinoma, poorly differentiated carcinoma, and Hürthle cell carcinoma [8].

Due to variations in genetic vulnerability and environmental exposures, these histopathological subtypes are distributed differently throughout different regions [9, 10].

The aim of this study was to describe the histopathological subtypes of thyroid cancer in the Iraqi province of Karbala and to evaluate related demographic factors including age and sex. The findings may contribute to establish baseline data to support future research, screening strategies, and health policy planning related to thyroid cancer in Iraq.

Materials and Methods

Study Design

This retrospective descriptive study was conducted at Al-Hussein Cancer Center in Karbala, Iraq, a tertiary oncology center serving patients from Karbala province and the Middle Euphrates Region [11, 12].

Study Population

A total of 133 patients diagnosed with thyroid cancer between December 2012 and February 2025 were included.

Inclusion and Exclusion Criteria

Patients with a confirmed histopathological diagnosis of thyroid cancer were eligible. Cases with incomplete records or missing essential diagnostic data were excluded.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Al-Hussein Cancer Center, Karbala, Iraq according to the document number 58 on November 9, 2024. Patient confidentiality was strictly maintained, and data were used solely for research purposes.

Statistical Analysis

Data were analyzed using SPSS version 25 (IBM, Armonk, NY, USA). Descriptive statistics were presented as frequencies, percentages, medians, and ratios.

Results

A total of 133 patients were diagnosed with thyroid cancer. Females accounted for 109 cases (81.95%), while males accounted for 24 cases (18.05%), resulting in a M:F ratio of 0.22:1. The median age was 41.5 years, with patient ages ranging from 17 to 82 years. The most affected age group was 31–40 years (28.57%), followed by 41–50 years (24.06%) (Table 1).

Papillary thyroid carcinoma was the most common histopathological subtype, diagnosed in 87 patients (65.41%). This was followed by follicular thyroid carcinoma in 24 patients (18.05%), medullary thyroid carcinoma in 11 patients (8.27%), and anaplastic thyroid

Table 1. Age Distribution of 133 Patients

Age (year)	Number (%)
≤20	4 (3.01)
21-30	23 (17.29)
31-40	38 (28.57)
41-50	32 (24.06)
51-60	19 (14.29)
61-70	14 (10.53)
71-80	1 (0.75)
>80	2 (1.50)
Total	133 (100)

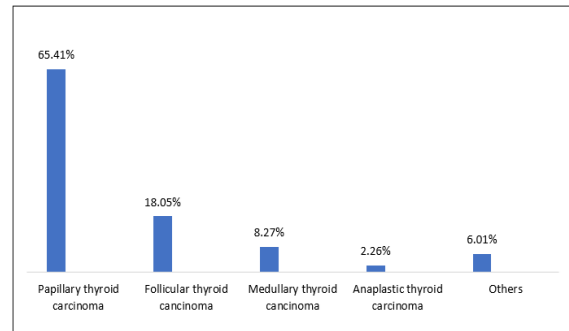


Figure 1. Histopathological Subtypes Prevalence of Thyroid Carcinoma in Karbala Province

carcinoma in 3 patients (2.26%). Other rare subtypes were identified in 8 patients (6.01%) (Figure 1).

Among males, papillary thyroid carcinoma was the predominant subtype in 12 patients (50%), followed by medullary thyroid carcinoma in 5 patients (20.83%), follicular thyroid carcinoma in 2 patients (8.33%), and anaplastic thyroid carcinoma in one patient (4.17%). Among females, papillary thyroid carcinoma was also the most frequent subtype in 75 patients (68.81%), followed by follicular thyroid carcinoma in 22 patients (20.18%), medullary thyroid cancer in 6 patients (5.50%), and anaplastic thyroid carcinoma in two patients (1.83%) (Table 2).

Regarding tumor location, the right thyroid lobe was most commonly affected in 53 patients (39.85%), followed by the left lobe in 47 patients (35.34%). Multifocal or bilateral involvement was observed in 27 patients (20.30%), while isolated isthmus involvement was noted in 6 patients (4.51%) (Figure 2).

For patients with papillary thyroid carcinoma there

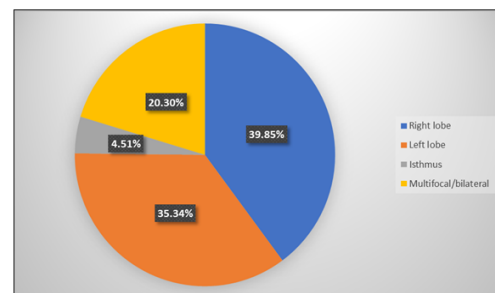


Figure 2. Anatomical Distribution of Thyroid Cancer in Karbala Province

Table 2. Distribution of Histopathological Subtypes by Gender

N	Males n (%)	Females n (%)
1	Papillary thyroid carcinoma 12 (50)	Papillary thyroid carcinoma 75 (68.81)
2	Medullary thyroid carcinoma 5 (20.83)	Follicular thyroid carcinoma 22 (20.18)
3	Follicular thyroid carcinoma 2 (8.33)	Medullary thyroid carcinoma 6 (5.50)
4	Anaplastic thyroid carcinoma 1 (4.17)	Anaplastic thyroid carcinoma 2 (1.83)
5	Others 4 (16.67)	Others 4 (3.67)
Total	24 (100)	109 (100)

Table 3. Distribution of Histopathological Patterns by Median Age and Gender.

Histopathology	Number of cases (%)	Median age (Years)	Gender		
			Males n (%)	Females n (%)	M:F ratio
Papillary thyroid carcinoma	87 (65.41)	40	12 (13.8)	75 (86.2)	0.16:1
Follicular thyroid carcinoma	24 (18.05)	32.5	2 (8.3)	22 (91.7)	0.09:1
Medullary thyroid carcinoma	11 (8.27)	51	5 (45.5)	6 (54.5)	0.83:1
Anaplastic thyroid carcinoma	3 (2.26)	60	1 (33.3)	2 (66.7)	0.5:1
Others	8 (6.01)	47	4 (50.0)	4 (50.0)	1:1
Total	133 (100)	41.5	24 (18.0)	109 (82.0)	0.22:1

was an obvious female predominance as the M:F ratio was (0.16:1), and the median age was 40 years. Just over half of papillary thyroid carcinoma patients (51.72%) were \leq 40 years while 48.28% were $>$ 40 years (Tables 3 and 4).

Follicular thyroid carcinoma patients were presented with a median age of 32.5 years, and a M:F ratio of a (0.09:1). About 62.50% of patients were \leq 40 years and 37.50% of them were $>$ 40 years old (Tables 3 and 4).

Medullary thyroid carcinoma patients' median age was 51 years old. Their M:F ratio was (0.83:1). About 27.27% of patients were \leq 40 years, and 72.73% were $>$ 40 years (Tables 3 and 4).

Anaplastic thyroid carcinoma patients were presented with median age 60 years, all patients were $>$ 40 years and M:F ratio was (0.5:1) (Tables 3 and 4).

Discussion

Thyroid cancer represents the most prevalent malignancy of the endocrine system and exhibits substantial variation in its histopathological subtypes and

demographic distribution across different populations. Worldwide variation in the histopathological subtypes of thyroid cancer is driven by a combination of regional environmental exposures, dietary differences, and ethnic backgrounds [13]. The current study fills a significant gap in regional epidemiological data by offering a thorough description of thyroid cancer patterns in the Iraqi province of Karbala.

Nearly 82% of the patients in our study were female, resulting in a M:F ratio of 0.22:1. This strong female preponderance is in line with regional and global findings that thyroid cancer affects women three to four times more frequently than men [14-16]. One important biological explanation for this discrepancy is hormonal impacts, particularly the role of estrogen in promoting the proliferation of thyroid follicular cells [7]. Women are also more likely to have thyroid imaging and evaluation, which could lead to increased detection rates [17, 18]. Regional healthcare utilization patterns and increased diagnostic surveillance among women may account for the slightly higher female preponderance found in this study when

Table 4. Distribution of Histopathological Patterns by Age Groups

Age years	Papillary thyroid carcinoma n (%)	Follicular thyroid carcinoma n (%)	Medullary thyroid carcinoma n (%)	Anaplastic thyroid carcinoma n (%)	Others n (%)
\leq 20	4 (4.60)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
21-30	11 (12.64)	11 (45.83)	1 (9.09)	0 (0.00)	0 (0.00)
31-40	30 (34.48)	4 (16.67)	2 (18.18)	0 (0.00)	2 (25)
41-50	24 (27.59)	4 (16.67)	2 (18.18)	0 (0.00)	2 (25)
51-60	10 (11.49)	2 (8.33)	3 (27.27)	2 (66.67)	2 (25)
61-70	7 (8.05)	3 (12.50)	2 (18.18)	1 (33.33)	1 (12.5)
71-80	0 (0.00)	0 (0.00)	1 (9.09)	0 (0.00)	0 (0.00)
$>$ 80	1 (1.15)	0 (0.00)	0 (0.00)	0 (0.00)	1 (12.5)
Total	87 (100)	24 (100)	11(100)	3 (100)	8 (100)

compared to worldwide averages.

The median age at diagnosis in this study was 41.5 years, which is younger than that reported in many Western populations, where peak incidence typically occurs between the fifth and sixth decades of life [19,20]. However, similar age distributions have been reported in several Middle Eastern and Asian countries [21]. This younger age at presentation may reflect population demographics, earlier clinical evaluation of thyroid nodules, or unique environmental exposures. Notably, differentiated thyroid cancers, particularly papillary and follicular carcinomas, predominated in younger age groups, consistent with their known biological behavior [22].

With 65.41% of cases, papillary thyroid carcinoma was the most common histological subtype. This result is consistent with regional and global data showing that papillary thyroid carcinoma is the most common subtype globally, accounting for 70–85% of thyroid cancer cases [23,24]. The study's findings are consistent with existing epidemiological patterns, as evidenced by the significant female preponderance and lower median age of papillary thyroid carcinoma patients, which are well-documented characteristics of this subtype [25].

Compared to many iodine-sufficient communities, where follicular thyroid carcinoma usually accounts for 10–15% of thyroid malignancies, it accounted for 18.05% of our cases [26]. Iodine deficiency has been linked in numerous studies to a higher relative frequency of follicular thyroid carcinoma [27]. The increased follicular thyroid carcinoma percentage may indicate persistent iodine imbalance in some areas of Iraq, even though iodine consumption was not directly evaluated in this study. This result emphasizes the potential significance of iodine nutrition monitoring for public health and supports the necessity for population-based research examining this relationship [28].

About 8.27% of cases were medullary thyroid carcinoma, which is higher than the 1–5% global average [29]. Studies from tertiary referral centers, where complex and aggressive patients are more likely to be concentrated, have revealed similar rises [30]. This study's nearly equal sex distribution and higher median age among medullary thyroid carcinoma patients are in line with earlier findings [31]. The number of suspected medullary thyroid carcinoma cases at tertiary centers may be inflated due to delayed referrals caused by limited availability to genetic testing and specialist endocrine services in peripheral regions.

Despite being uncommon, anaplastic thyroid carcinoma was found in 2.26% of cases, which is similar to findings from throughout the world that range from 1% to 3% [32, 33]. Because anaplastic thyroid carcinoma is aggressive and frequently develops from pre-existing differentiated thyroid carcinoma, it predominantly affects older individuals and to be related with a higher median age [28]. The existence of anaplastic thyroid carcinoma emphasizes how crucial it is to identify differentiated thyroid tumors early and treat them appropriately in order to prevent the disease from progressing [34].

Tumor location analysis showed that the right thyroid lobe was most frequently affected. This finding is consistent with global and regional studies that have also reported right-lobe dominance, which may be linked to minor anatomical or embryological variations between thyroid lobes [35]. When comparing the results with worldwide datasets, a higher rate of multifocal disease was found which could be due to regional risk factors, delayed diagnosis, or referral bias [36]. This result shows the need of thorough preoperative imaging and careful surgical planning.

There are various strengths and limitations of this study. One strength of this study is that it contributes valuable insight into the pathological characteristics of thyroid cancer in Karbala province of Iraq. It also enables significant comparison with data from nearby and worldwide nations. Additionally, to best of our knowledge, this study fills a significant data gap in the area being the first comprehensive profiling of thyroid cancer characteristics in the province of Karbala. However, this study's limitations include its retrospective design, single-center location, possible referral bias, and absence of survival or genetic data, which may have led to incomplete clinical information and limited assessment of prognostic factors. These elements prevent causal inference and restrict generalizability, as the findings may not fully represent the broader population or reflect long-term outcomes.

In conclusion, in Karbala province, papillary thyroid carcinoma was the most prevalent histopathological subtype of thyroid cancer, with a clear female predominance. The observed clinical and demographic patterns were largely consistent with regional and global trends. These findings highlight the need for multicenter studies across Iraq to develop a more comprehensive national epidemiological profile of thyroid cancer.

Conflict of interest

There are no conflicts of interest.

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