

Prevalence of Thyroid Cancer in Diyala Province, Iraq

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ABSTRACT

Background: Thyroid cancer is a significant global health concern, with variations in incidence based on demographic and environmental factors.

Objective: This study aims to investigate the incidence of thyroid cancer in Diyala province by analyzing demographic and epidemiological patterns among patients.

Methods: This retrospective observational study, conducted at Baqubah Teaching Hospital in Diyala Governorate from February to December 2024, analyzes demographic and epidemiological patterns of thyroid cancer among 100 patients. The study examines age, gender, and living conditions as potential risk factors using statistical analysis.

Results: The findings indicated a higher prevalence of thyroid cancer in females, who accounted for 72.2% of diagnosed cases. The most affected age group was 41-50 years, followed by 31-40 years, 51-60 years, and <30 years with no cases reported in individuals over 60. Living conditions also played a crucial role, as 88.9% of diagnosed cases were from rural areas, suggesting environmental factors may influence risk. Papillary carcinoma was the most common subtype, comprising 83% of cases, while follicular carcinoma accounted for 17%. Statistical analysis showed no significant difference in age distribution between male and female patients, but a significant difference in prevalence between rural and urban dwellers. The findings align with global trends, emphasizing the greater susceptibility of women to thyroid cancer, potentially linked to hormonal influences. The study also underscores the higher incidence in rural populations, possibly due to environmental exposures and healthcare access disparities. Limitations include the retrospective design and gender imbalance in the sample, which may affect generalizability.

Conclusion: This study reinforces the need for targeted screening programs, especially for high-risk groups, and further research into genetic and hormonal factors influencing thyroid cancer development.

Keywords: Thyroid cancer, papillary thyroid carcinoma, Follicular thyroid carcinoma, Diyala Province, Iraq.

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INTRODUCTION

The thyroid gland is a vital endocrine organ located in the lower anterior region of the neck and is anatomically shaped like a butterfly. It plays a central role in regulating metabolic activity, growth and development by secreting thyroid hormones, which are distributed via the bloodstream to various tissues throughout the body. These hormones are essential for maintaining energy balance, thermoregulation, and the optimal functioning of key organs such as the brain, heart, and muscles (1,2).

Thyroid cancer, although generally associated with favorable treatment outcomes, particularly when detected early, remains a significant clinical concern. Surgical intervention is often curative, especially in localized cases (1). Among the histological types, papillary thyroid carcinoma (PTC) is the most prevalent, distinguished by nuclear alterations such as enlargement, elongation, chromatin clearing, membrane irregularities, and pseudo-inclusions (3). Follicular thyroid carcinoma (FTC), while less common, is also significant and is now classified by the World Health Organization into three distinct subtypes: minimally invasive, encapsulated angioinvasive, and widely invasive forms (4). Notably, more than 95% of thyroid malignancies originate from follicular epithelial cells, with the remaining cases arising from parafollicular C cells, typically associated with medullary carcinoma. Epidemiologically, thyroid cancer predominantly affects females, especially those aged 40 to 60 years. However, the long-term prognosis can vary; mortality rates for FTC have been estimated at 18% within 10 years, rising to 40% over a 30-year span (5).

Disorders of the thyroid gland are globally prevalent and are associated with a range of clinical conditions. These include hypothyroidism, characterized by diminished hormone production; hyperthyroidism, marked by excessive hormone secretion; and the presence of thyroid nodules, which may or may not alter gland function (6). One of the most commonly encountered thyroid abnormalities is goiter, defined as an enlargement of the thyroid gland. It can occur in cases of hormone deficiency, excess, or even normal hormone levels, and is often a manifestation of underlying pathology (1). Goiter is particularly frequent among women and displays a wide

spectrum of clinical presentations in terms of size, texture, and functional impact (7).

A recent nationwide analysis investigating the incidence of thyroid cancer in Iraq over a 28-year period (1995–2023) revealed a consistent upward trend in diagnosis rates across all age groups and both sexes. The overall annual percent change (APC) in incidence was estimated at +7.51%, reflecting a steady rise in newly reported cases. Notably, gender-based analysis indicated a sharper increase among females, with an APC of +14.27% from 2007 to 2023, compared to +10.97% among males during the same period. Furthermore, the female-to-male incidence ratio rose substantially, shifting from 1.7:1 in 2000 to 4.14:1 by 2023. These findings underscore a growing burden of thyroid cancer within the Iraqi population, particularly among women, and point toward enhanced diagnostic practices, increased awareness, and potential environmental or hormonal factors contributing to this trend (8).

This study aims to investigate the incidence of thyroid cancer in Diyala province by analyzing demographic and epidemiological patterns among patients. It seeks to identify the distribution of cases across age groups, sexes, and residential settings. The research also explores potential associations between these variables and the risk of thyroid malignancy. Through statistical analysis, the study provides insights that may support early detection and targeted public health interventions.

METHODS

Study Design

This study is a retrospective observational cross-sectional analysis carried out in Diyala Governorate, Baqubah Teaching Hospital, Laboratory Division, Histological Examination Unit, from February 2024 to December 2024.

Data Collection

Data were gathered from the medical records of one hundred patients, covering their demographic info like gender, age, and living situation, as well as the results of their postoperative histopathological examinations. Data completeness and accuracy were ensured through systematic record review. Any patient records that lacked essential information such as age, gender, or place of residence, were excluded from the analysis to maintain data integrity.



Additionally, cases with ambiguous histopathological findings or incomplete diagnostic documentation were not considered. To address missing values, a case-wise deletion method was applied, whereby only complete records were included in the final statistical analysis.

Ethical Consideration

Ethical approval was received from Baqubah Teaching Hospital (E-234, in 2024-1-2).

Statistical Analysis

The data were analyzed with IBM SPSS Statistics version 28.0. T-test was used to determine the mean and standard deviation of age, with the significance level set at $p < 0.05$.

RESULTS

One hundred patients aged from 16 to 75 years old, 15 were male and 85 were female suspected of having thyroid cancer were referred to the Histological Examination Unit of the Laboratory Division at Baqubah Teaching Hospital in Diyala Governorate. The distribution of thyroid conditions across demographic variables reveals notable patterns.

Among male participants, 66.7% were diagnosed with no malignancy, while 33.3% had papillary carcinoma, and no cases of follicular carcinoma were recorded. In contrast, females accounted for a larger proportion of the sample, with 84.7% showing no malignancy, 11.8% diagnosed with papillary carcinoma, and 3.5% with follicular carcinoma.

Age group analysis indicates that the highest proportion of thyroid cancer cases was observed in individuals aged 41–50 years, where papillary carcinoma constituted 22.6%. In the 31–40 and 51–60 age groups, papillary carcinoma was found in 12% and 23.5% of participants, respectively. Notably, no malignancies were reported among individuals over 60, while only one case of papillary carcinoma occurred in the ≤ 30 age group.

Regarding place of residence, 93.8% of urban dwellers had no malignancy, and only 6.2% presented with papillary carcinoma. Conversely, the rural group showed a higher proportion of thyroid malignancies, with 19.1% diagnosed with papillary carcinoma and 4.4% with follicular carcinoma, suggesting a possible environmental or access-related influence in disease occurrence (Table 1).

Table 1: Demographic characteristics of patients

Demographic characteristic		Groups			Total (%)
		No malignancy	Follicular carcinoma	Papillary carcinoma	
Sex	Male	n 10	0	5	15%
		% 66.7%	0%	33.3%	
	Female	n 72	3	10	85%
		% 84.7%	3.5%	11.8%	
Age groups	≤ 30	n 18	0	1	19%
		% 94.7%	0%	5.3%	
	31-40	n 20	2	3	25%
		% 80%	8%	12%	
	41-50	n 23	1	7	31%
		% 74.2%	3.2%	22.6%	
	51-60	n 13	0	4	17%
		n 76.5%	0%	23.5%	
	>60	% 8	0	0	8%
		% 100%	0%	0%	
Residential status	Urban	n 30	0	2	32%
		% 93.8%	0%	6.2%	
	Rural	n 52	3	13	68%
		% 76.5%	4.4%	19.1%	



The mean age of individuals having thyroid cancer was 43.06 ± 7.84 years, compared to 42.18 ± 13.64 years in patients without thyroid cancer. Male individuals had a mean age of 44.87 ± 13.26 years,

whereas female individuals had a mean age of 41.89 ± 12.70 years. The P-value was above 0.05, suggesting that there's no statistically significant difference in the age distribution (Table 2).

Table 2: Comparison of Age Distribution by Thyroid Cancer Status and Sex

Groups		N	Mean	SD	P value
Age	No malignancy	18	43.06	7.84	> 0.05
	Thyroid cancer	82	42.18	13.64	
Sex	Male	15	44.87	13.26	> 0.05
	Female	85	41.89	12.70	

According to positive results for thyroid cancer, the analysis revealed a higher prevalence of thyroid cancer in females. Among the 18 patients diagnosed with thyroid cancer, 13 (72.2%) were female, while only 5 (27.8%) were male, based on their residential status, 16 (88.9%) were living in rural zones, while 2

(11.1%) resided in urban zones. Among the diagnosed cases, papillary carcinoma was the most prevalent subtype, accounting for 15 (83%) cases, while follicular carcinoma accounted for 3 (17%) cases (Table 3).

Table 3: Characteristic of positive cases of thyroid cancer

Characteristic		P value
No. of positive cases for thyroid cancer (%) based on sex		
Males	5 (27.8%)	> 0.05
Females	13 (72.2%)	
No. of positive cases for thyroid cancer (%) based on residential status		
Urban	2 (11.1%)	< 0.05
Rural	16 (88.9%)	
No. of positive cases for thyroid cancer (%) based on thyroid cancer subtype		
Papillary carcinoma	15 (83%)	< 0.01*
Follicular carcinoma	3 (17%)	

DISCUSSION

There is great variability in thyroid cancer prevalence rates between and within countries (9). A study conducted by Obadiel and co-worker who found that 84.8% of patients with thyroid cancer were females, and 15.2% were males, indicating that females are more likely to develop thyroid cancer and this is consistent with the findings of the current study (10). Substantial evidence suggests that female sex hormones contribute to the development of thyroid cancer. Specifically, studies using mouse models have pointed out that estrogen acts as a promoter in the formation of thyroid tumors (11). In the intervening time, investigate outcomes established that increased serum estrogen might be a risk factor for Papillary

thyroid cancer in human (12). The prevalence rate of thyroid cancer was found to be highest in women than in men (13). Goiter is a recognized disorder in females all over the world (14).

The findings of the present study align with broader national and regional patterns reported in recent literature. According to the 2022 Iraqi National Cancer Registry, thyroid cancer ranked among the top five most prevalent malignancies in females nationwide, with notable increases in incidence across all age groups, particularly in women aged 30 to 50 years. This corresponds with the current study's observation that most diagnosed cases occurred within the 31–50 age range, highlighting a consistent epidemiological profile across different populations.



Furthermore, the national retrospective analysis covering the period from 1995 to 2023 documented a steady rise in thyroid cancer cases, with an overall annual percent change (APC) of +7.51%. Notably, the APC among females was markedly higher (+14.27%) compared to males (+10.97%), which supports the current study's finding of a female predominance (72.2%). This gender disparity may be attributed to hormonal influences, as suggested by previous molecular and epidemiological studies (15).

The higher rates of thyroid cancer in rural areas can be partly attributed to how surgeons in these regions tend to refer patients who they suspect might have cancer or those with large goiters that could lead to compression issues or cosmetic problems. Moreover, because our hospital offers free services, we tend to see more cases, which might mean our sample is leaning toward more severe instances of the disease. However, the findings of the current study did not agree with the findings of McDow and co-worker who found a higher rate for thyroid cancer in urban areas compared to rural areas (16).

Older age is associated with increased incidence and worse survival (1). The outcomes of the current study are slightly agreed with Obadiel and co-worker who concluded that the largest number of cancers was seen in the (41–50) year age group, which were 48.5% of the cases and followed by the (31–40) year group (33.3%), the (18–30) year group (15.2%), and the (51–60) year group (3.0%). The outcomes of the current study are also agreed with Obadiel and co-worker who concluded that the majority of patient (72.2%) suffering from papillary thyroid carcinoma, this makes it the utmost prevalent form of thyroid cancer. and follicular thyroid carcinoma was diagnosed in (12.1%) of the cases (10).

This finding is consistent with worldwide trends and earlier research from the area, which also identified papillary carcinoma as the most frequently occurring type of thyroid cancer. The reason for the high occurrence of papillary carcinoma may be due to its well-differentiated characteristics, which make it more detectable during histopathological examinations (17,18).

Papillary thyroid cancer is the utmost prevalent form, accounting for roughly 70% to 80% of all thyroid cancer cases. It can develop at any stage of life and usually grows at a slow pace, often spreading to the lymph nodes in the neck. Thankfully, the prognosis

for papillary cancer is quite positive, even when it has spread to those lymph nodes. On the other hand, follicular thyroid cancer represents about 10% to 15% of thyroid cancers in the U.S. This type of cancer has the potential to spread through the bloodstream to distant organs, especially the lungs and bones (1). A localized clinical study conducted in Mosul reported that papillary thyroid carcinoma was the most frequently diagnosed subtype, comprising over 80% of cases. This closely mirrors the present study, where papillary carcinoma accounted for 83% of diagnosed malignancies. The consistent dominance of this subtype in various Iraqi regions reinforces the notion of shared etiological or diagnostic patterns, potentially related to iodine status, genetic predisposition, or improved histopathological surveillance in recent years (19).

Another study indicated that the utmost predominant form of thyroid cancer is papillary thyroid cancer, which arises from follicular epithelial cells. It has a brilliant prognosis, with a 10-year survival rate of 42%. This kind of malignancy naturally affects females more frequently than males and tends to spread nearby, occasionally leading to metastasis in cervical lymph nodes (5).

A study conducted at Al-Shafa Hospital in Diyala province examined thyroid abnormalities in a sample of 67 patients aged between 20 and 80 years. Females accounted for 86.6% of the cases, with the highest prevalence observed in the 31–50 age group, and a mean patient age of approximately 49 years. Multinodular goiter was the most frequently identified condition, reported in 64.2% of patients, and was particularly common among women (86% of MNG cases). Histopathological analysis indicated that 79.1% of the lesions were benign, while malignant cases primarily involved papillary thyroid carcinoma. These results are in agreement with the present study, especially regarding female predominance, age distribution, and the dominance of papillary histology. The similarity in clinical patterns reinforces the potential role of multinodular goiter as a precursor lesion and highlights the importance of early detection strategies, particularly for women in middle age (13).

Limitations

The retrospective design might bring in some biases when it comes to how complete and accurate the



medical records are. Also, the fact that the sample has a gender imbalance, with mostly female participants, could influence how generalizable the findings are. These limitations were taken into account when analyzing and interpreting the results.

CONCLUSION

This study highlights the significant gender disparity in thyroid cancer incidence, with females being more frequently affected. Age and residential setting were significant risk factors of thyroid cancer risk. Papillary carcinoma remains the most common subtype. Future research should focus on hereditary and hormonal aspects contributing to the higher prevalence in women and develop effective early screening programs.

Conflict of Interest

The author declare that no conflict of interest.

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