

## A National Overview of Thyroid Cancer Trends in Iraq: A Descriptive Epidemiological Analysis

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(Received : 15 July 2025; Accepted : 4 January 2026; First published online: 1 April 2026)

### ABSTRACT

**Background:** Thyroid cancer has emerged as one of the fastest-rising malignancies globally. Its incidence, aggressiveness, and prognosis vary between gender.

**Objectives:** To assess thyroid cancer incidence trends in Iraq from 2009 to 2023 and examine patterns related to gender, age, cancer ranking, and histopathology.

**Materials and methods:** A retrospective descriptive epidemiological analysis was conducted using data from the Iraqi Cancer Registry (2009-2023), focusing on annual incidence, gender distribution, age-specific rates, and histological subtypes. Crude incidence rates (CIRs) were calculated as the number of new thyroid cancer cases per 100,000 population per year for each gender and year.

**Results:** Over the 15 years, thyroid cancer in Iraq increased significantly, approximately tenfold (288 in 2009 and 2823 in 2023), with female incidence rising 11-fold (1.3 per 100,000 in 2009-9 per 100,000 in 2023) and male incidence 6.7-fold (0.5 per 100,000 in 2009-3 per 100,000 in 2023). The female-to-male ratio increased from 2.5:1 in 2009 to 4:1 in 2023. Thyroid cancer ranked rose from 17<sup>th</sup> to 4<sup>th</sup>. The age category of 30 and 34 was the highest, while the highest rates of new cases were among individuals 70 years and older. The papillary subtype forms 82% of the cases.

**Conclusion:** Thyroid cancer is increasing in Iraq, especially among women. This is consistent with the global pattern and may be because of overdiagnosis or environmental factors. The results show that we need to improve screening, better diagnostics, and cancer registry systems so that we can find cancer earlier to provide patients with better care.

**Keywords:** Thyroid cancer; Incidence; Iraq; Epidemiology; Gender disparity.

DOI: [10.33091/amj.2026.162830.2335](https://doi.org/10.33091/amj.2026.162830.2335)

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### INTRODUCTION

Thyroid cancer is among the most rapidly progressing malignancies, with its incidence increasing across diverse global populations. Apart from Africa, its prevalence has risen consistently globally over the last thirty years [1, 2].

The primary etiology of the global increase in thyroid cancer is currently unidentified. The cause is likely multifactorial, with the increased detection rate attributed to a higher prevalence of small tumors [3]. Numerous factors contribute to increased thyroid cancer detection worldwide; Yihao Liu et al.

emphasize that routine screening in healthy people, increased use of imaging examinations, increased frequency and extent of thyroid surgery, and altered pathological examination practices contribute to this increase [4]. Additionally, factors such as cigarette smoking, alcohol consumption, overweight and obesity, and insufficient physical activity may influence the age-standardized incidence rate of thyroid cancer [5].

Worldwide, and according to the Global Cancer Observatory (GLOBOCAN) 2018 report, thyroid cancer was the ninth most frequent type of cancer in men and women, with an estimated incidence of 567,233 new cases and 41,071 deaths. The global age-standardized incidence rate for thyroid cancer is 6.7 per 100,000 for both sexes. In contrast, the age-standardized incidence rate was 10.2 per 100,000 for females and 3.2 per 100,000 for males [6]. In GLOBOCAN 2022, it

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was the 7<sup>th</sup>-ranked cancer in both males and females, with an estimated 821,214 registered new cases and 47,507 deaths, with a rank of 24, with an age-standardized ratio in both sexes of 9.1/100000. In females, the incidence was 13.6, ranking 5<sup>th</sup> after breast, lung, colorectal, and cervical cancers, and in males, it was 4.6, ranking 13<sup>th</sup> [7].

At the regional level, in the Middle East and North Africa (MENA) region, from 1990 to 2019, the thyroid cancer incidence increased by 396% increase, primarily attributed to a 256.8% rise in the disease-specific incidence rate. The highest age-standardized rates of incidence, mortality, and disability-adjusted life years (DALY) were observed in Lebanon, Afghanistan, and the United Arab Emirates (UAE), respectively [8].

Within the Gulf Cooperation Council (GCC) member states, thyroid cancer is the 5<sup>th</sup> most frequently diagnosed type of cancer. Between 1998 and 2012, 10,417 thyroid cancer cases (6.3 percent of all malignancies) were recorded from all GCC states. Males and females had an overall age-standardized rate (ASR) of 2.1 and 7.1 per 100,000 population, respectively [9]. In 2020, the number of registered cases of thyroid cancer in the same region (GCC) was 3800 in both males and females, which forms 9% of all cancer cases, and it ranked third after breast and colorectal cancer. In females, it was the second rank, while in males, it was the ninth rank [10].

In Iraq, cancer has been an increasing problem over the past decades [11]. Because there is no national study detailing the epidemiological profile of thyroid cancer in Iraq, the researchers sought to clarify the scope of the problem and the pattern of its incidence in this study.

## MATERIALS AND METHODS

This retrospective descriptive study used official data from the annual Iraqi Cancer Registry reports (2009–2023), which were published on the Iraqi Ministry of Health website. This study obtained ethical approval from the Ethical Committee of the College of Medicine, Al-Ameed University, with reference Number (41/2025) in accordance with national research regulations.

The Iraqi Cancer Registry (ICR) collects data on all newly diagnosed cancer patients across Iraq's governorates. The cancer registration method is based on the CanReg software and standardized CanReg forms given by the International Agency for Research on Cancer (IARC), which primarily focuses on malignant neoplasms. ICR was established in 1974 and began its official work in 1975. ICR produced multiple reports from 1976 to 1999, encompassing the periods of 1976–1985, 1986–1988, 1989–1991, 1992–1994, 1995–1997, and 1998–1999. Furthermore, from 2000 to 2023, the annual ICR reports were published. The registry collects data from inpatient, outpatient, and pathology departments across Iraqi hospitals and private labs. Data were extracted on thyroid cancer incidence, gender distribution, age groups, and histological types. During the study period (2009–2023), the ICR used reporting standards and coding based on the International Classification of Diseases for Oncology, Third Edition (ICD-O-3) [12]. Five-year age intervals (0–4, 5–9, 10–14 ... 70+ years) were used to calculate age-specific incidence rates, in accordance with the ICR's standard grouping. Crude incidence rates (CIRs) were computed annually by dividing the total number of newly registered thyroid cancer cases by the corresponding mid-year population, multiplied by 100,000.

The population data were obtained from the annual reports of the Iraqi Ministry of Health and the Central Statistical Organization.

All statistical analyses were conducted using Microsoft Excel 2019 (Microsoft Corp., Redmond, WA, USA). Linear regression analysis was used to investigate trends, and independent-samples t-tests were used to analyse gender differences. A P-value of less than 0.05 was considered statistically significant. This study used anonymous secondary data maintained by the Ministry of Health.

## RESULTS

### Population Trends

Thyroid cancer cases in Iraq increased significantly from 288 in 2009 to 2,823 in 2023 (Table 1). Linear regression analysis showed a significant positive trend over time (P-value < 0.001). The increase was more noticeable in females, who observed a 11-fold rise compared to a 6.7-fold rise in males. The ratio of females to males increased by 1.5 during the study period.

Figure 1 shows that the highest incidence rate per 100,000 population (both men and women) occurred in 2023. This is about 5.4 times higher than the 2009 figure. A P-value of less than 0.05 indicates that the positive linear trend in the number of thyroid cancer cases over the years is highly statistically significant.

Figure 2 demonstrates the incidence rate by gender, revealing that the highest rates were observed in 2023, with males at 3.09 and females at 9.05 instances per 100,000 of the population. Furthermore, over fifteen years, the rate for males increased by 6.2 times and for females by 7 times. A t-test revealed a highly statistically significant difference in the mean incidence rates of thyroid cancer between males and females, with a P-value of < 0.001.

### Cancer Ranking Over Time

Table 2 illustrates that the national rank of thyroid cancer has advanced from 17<sup>th</sup> in 2009 to 4<sup>th</sup> in 2023 for both males and females. In particular, the ranking for females increased from 10<sup>th</sup> to 2<sup>nd</sup>, while for males it progressed from 21<sup>st</sup> to 10<sup>th</sup>.

### Age Distribution

From 2009 to 2023, the highest incidence rate of thyroid cancer was observed in individuals over 70 years old, followed by those aged 50 to 54. The average number of registered cases increased steadily with age, peaking in the 30–34 age group. Conversely, diagnoses of thyroid cancer in individuals under 20 were rare (Figure 3).

### Histological Types

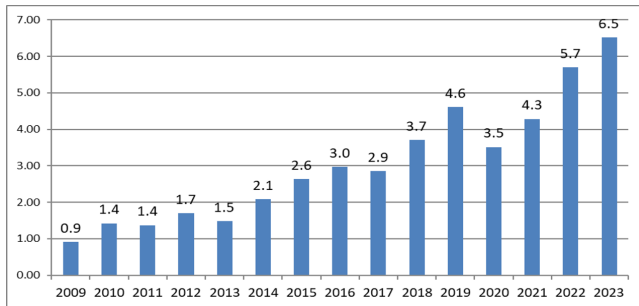
Thyroid cancer has been diagnosed in both males and females over the past fifteen years (2009–2023) based on histological analysis. Figure 4 demonstrates that papillary thyroid carcinoma represents the predominant cancer type in Iraq, comprising approximately 82 percent of all cancer cases.

## DISCUSSION

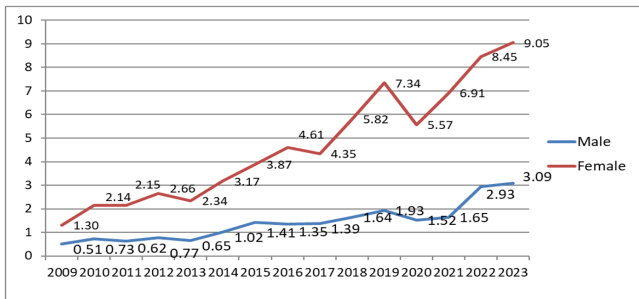
Thyroid gland cancer is the most common endocrine cancer in the world. Our study from 2009 to 2023 showed that the number and rate of thyroid cancer cases in Iraq increased dramatically. This led the cancer to ascend in the rankings of

**Table 1.** Number of thyroid cancer cases registered by gender and male-to-female ratio over fifteen years (2009-2023).

Year	Male	% of Total Males	Female	% of Total Females	Total	% of Total	Male/Female Ratio
2009	82	1.14	206	2.56	288	1.88	2.5:1
2010	121	1.42	341	3.34	462	2.40	2.8:1
2011	105	1.12	352	3.22	457	2.25	3.3:1
2012	134	1.44	446	3.76	580	2.74	3.3:1
2013	117	1.10	404	3.17	521	2.23	3.4:1
2014	187	1.63	561	3.95	748	2.92	3:1
2015	264	2.35	708	5.03	972	3.84	2.6:1
2016	259	2.31	864	6.01	1123	4.39	3.3:1
2017	260	2.08	799	4.84	1059	3.65	3:1
2018	316	2.32	1097	6.13	1413	4.49	3.4:1
2019	381	2.47	1421	6.96	1802	5.02	3.7:1
2020	309	2.23	1101	6.17	1410	4.45	3.5:1
2021	354	2.28	1409	6.94	1763	4.92	3.9:1
2022	478	2.93	1924	8.45	2402	6.15	4:1
2023	558	3.09	2265	9.05	2823	6.56	4:1



**Figure 1.** Incidence of thyroid cancer in both genders in Iraq (2009-2023).



**Figure 2.** Thyroid cancer incidence rates in Iraq from 2009 to 2023 based on gender.

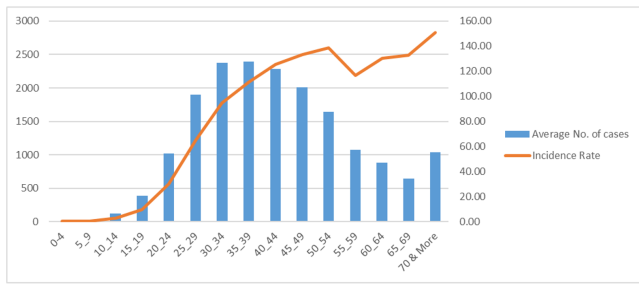
all cancers, from a lower to a higher position. This number matches global statistics, which show that there were about 212,000 cases in 2008, or 1.7% of all cancer cases. Thyroid cancer was the 14th most common type of cancer. The percentage increased to 4.1% by 2022, with 821,173 cases reported, making it the fifth most common [7, 13].

The incidence of thyroid cancer is significantly high in all Gulf Cooperation Council (GCC) states, with a female-to-male ratio of 3.3 to 1. Breast cancer is the most common cancer in women, followed by thyroid cancer, which is the

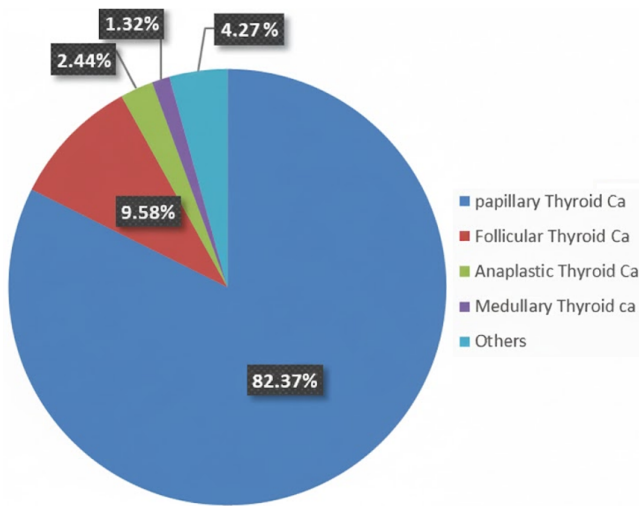
**Table 2.** The national rank of thyroid carcinoma in both males and females (2009-2023).

Year	Both Male and Female Rank	Female Rank	Male Rank
2009	17	10	21
2010	10	8	21
2011	12	8	21
2012	12	7	18
2013	12	7	18
2014	10	6	18
2015	8	3	16
2016	8	2	16
2017	8	3	17
2018	8	2	15
2019	7	2	14
2020	8	2	16
2021	6	2	14
2022	4	2	13
2023	4	2	10

second most common. Qatari women had the highest incidence rate of thyroid cancer, with an ASR of 10.9. Kuwait, Bahrain, United Arab Emirates (UAE), Saudi Arabia, and Oman followed, with an ASR of 5.6 [14]. Thyroid cancer was the third most common type of cancer in 2020, making up 9% of all cases. Breast cancer was the most common type, making up 16% of all cases, and colorectal cancer was the second most common type, making up 13% of all cases. These three types of cancer made up almost 40% of all cancer cases in the GCC countries. Thyroid cancer was the second most common cancer in women in all countries, except for Qatar, where it was third, and Bahrain, where it was sixth [10]. This pattern is like the Jordanian model, which shows a gradual increase in the incidence rate (2.6, 2.6, 2.9, 3.76, and 4.66 per 100 000 individuals) for the years 1996, 2008, 2011, 2016, and 2022, respectively [15–17]. The global rise in thyroid cancer incidence is likely multifactorial, driven by overdiagnosis related to advanced imaging, socioeconomic de-



**Figure 3.** Incidence rates and the average number of cases by age category in both males and females (2009-2023).No. = Number.



**Figure 4.** Pathology of thyroid carcinoma in Iraq (2009-2023).

velopment, improved healthcare access, and expanded cancer registry coverage, particularly in countries with high or very high human development indices. Demographic and lifestyle factors associated with aging, obesity, exposure to ionizing radiation, and other factors contribute to the disruption of the endocrine system [18, 19].

In Iraq, during the last 15 years of registration, the analysis demonstrated that thyroid cancer incidence was markedly higher among females than males, consistent with global patterns. Women are 2.9 times more susceptible than men, with the gender disparity in incidence depending upon age [1]. According to GLOBOCAN reports the global female-to-male ratio was 3.3:1 in 2008, decreased slightly to 3:1 in 2018, and further decreased to 2.98:1 in 2022 [6, 7, 13]. Furthermore, the percentage of cases of thyroid cancer in Saudi Arabia that were female and male in 1990 was 76.5% and 23.5%, respectively, of the total number of thyroid cancer cases registered. In 2019, the figures for females were 68.7%, while those for males were 31.3% [20]. Moreover, the studies in the UAE indicate that thyroid carcinomas are more common in females, exhibiting a significantly higher female-to-male ratio in the UAE. Citizens, suggesting that the female gender may be a risk factor for their development [21]. Various interrelated mechanisms may reveal this gender disparity. Estrogens can biologically stimulate thyroid-cell proliferation via estrogen-

receptor-mediated pathways, increasing the risk of neoplastic transformation in women of reproductive age [1, 22]. Epidemiologically, women are more susceptible to medical assessment and cervical imaging for endocrine or reproductive purposes, resulting in elevated rates of incidental findings [23]. Moreover, the increased incidence of autoimmune thyroid disorders and possible exposure to endocrine-disrupting substances may further enhance female vulnerability [5].

Our research shows that the 30-34-year-old age group had the most registered cases, while the over-70 age group had the highest incidence rate, followed by the 50-54-year-old age group. The rates of thyroid cancer throughout the world are different for men and women of different ages. In females, prevalence rises among younger to middle-aged individuals, then declines. The incidence of thyroid cancer in males rises progressively with age, reaching its peak typically after 70-years-old. Women usually demonstrate elevated incidence rates in comparison to men, especially those within the 30-34 age group [24].

Between 2009 and 2018 in Saudi Arabia, the age groups of 20-39 and 40-59 years had the highest incidence rate ratios, with risks that were 11.63 (95% CI 10.47-12.97) and 10.43 (95% CI 9.41-11.67) times higher than the 20-year-old or younger group, respectively [25].

In Abu Dhabi from January 2012 to December 2015, the average age at diagnosis was 40.2 years. Over a third of the patients were aged 30-39. A greater proportion of women (54.3%) received a diagnosis prior to the age of 40 years compared to men (45.9%) [26].

Our study findings align with data from the Jordanian cancer registry of 2015, which indicated that the age group 30-34 exhibited the highest registration rate [27]. The early female peak may be related to hormonal influences, as oestrogen appears to stimulate thyroid cell activity through its receptors, promoting cell growth and limiting programmed cell death during the reproductive period [22, 28], while the elderly age group may have been attributed to cumulative lifetime exposure to risk factors, such as ionizing radiation, environmental pollutants, and metabolic stress, as well as the biological accumulation of somatic mutations over time [2].

According to our research, papillary thyroid cancer was the most common type of histopathology that was diagnosed in Iraq between the years 2009 and 2023. Our findings were consistent with the global picture in which papillary thyroid cancer was the primary contributor to overall thyroid cancer in all the countries that were studied, and it was the only histological subtype that increased systematically in all the countries, even though there was a large amount of variation between countries [2]. The circumstances in Abu Dhabi and Saudi Arabia were comparable to those in Iraq, with papillary thyroid carcinoma identified in 67.7% and 88% of cases, respectively [26, 27]. The higher prevalence of papillary thyroid cancer may be attributed to its sensitivity to modern diagnostic methods, particularly fine-needle aspiration cytology and high-resolution ultrasound, which effectively identify small papillary lesions that were formerly undiscovered [28].

### Strengths of the Study

This study is the first national work to explore the epidemiology of thyroid cancer in Iraq over the last 15 years of registration. It provides helpful details on how disease patterns have changed over time. The ICR is the official, Ministry of Health-approved source of cancer information. This

strengthens and makes the study's findings more reliable.

### Limitations of the Study

The study lacks information about the molecular features of thyroid cancer, which makes it hard to do a detailed subtype analysis. It also doesn't include information on important risk factors like radiation exposure, iodine intake, or family history, which makes it harder to determine cause and effect.

### CONCLUSION

This study demonstrates a sustained increase in thyroid cancer incidence in Iraq from 2009 to 2023, particularly among females and older adults. This trend likely reflects improved detection, possible overdiagnosis, and broader environmental and healthcare-related factors. The findings highlight the need for national thyroid cancer screening guidelines tailored to Iraq's context, along with improved diagnostic protocols, targeted public and professional education, and investment in diagnostic infrastructure across Iraqi provinces to ensure early detection while minimizing unnecessary treatment.

### ETHICAL DECLARATIONS

#### Acknowledgments

The authors would like to thank the Iraqi Cancer Registry and the Ministry of Health for making the cancer incidence data publicly available.

### Ethics Approval and Consent to Participate

The current study obtained ethical approval from the Ethical Committee of the College of Medicine, Al-Ameed University, with reference Number (41/2025) in accordance with national research regulations. Informed consent was waived for such a study.

### Consent for Publication

Not applicable.

### Availability of Data and Material

Data generated during this study are available from the corresponding author upon reasonable request.

### Competing Interests

The authors declare that there is no conflict of interest.

### Funding

No funding.

### Use of Artificial Intelligence

Artificial intelligence has been used in limited ways to correct spelling, grammar, and punctuation, as well as in specific texts with editing.

### Authors' Contributions

Al Ibraheemi A developed the concept, methodology, and conducted the analysis. Al-Atiyyat N and Mousa AAH drafted the final version of the manuscript and critically revised it for intellectual content. The authors have read and approved the final version of the manuscript.

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