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Original Article

Analyzing the Histopathological Profiles of Thyroid Disorders in the Urban Setting of Mosul

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Abstract

Introduction: This study seeks to investigate the demographic and histopathological profiles of thyroid disorders in Mosul, Iraq, covering the period from January 2021 to December 2022. The primary goal is to understand the prevalence, gender distribution, and age patterns of various thyroid disorders, providing a comprehensive overview of the epidemiological landscape in the region. **Methods:** A retrospective analysis was conducted on 450 cases obtained from the Pathology Department of Al Khanssa Teaching Hospital. The study focused on demographic parameters, histopathological types, and age distribution across congenital, autoimmune/inflammatory, goiter, and neoplastic categories. Female-to-male ratios were calculated, and specific age groups were scrutinized for concentrations of thyroid disorders. **Results:** The study revealed a significant female predominance, with a total female-to-male ratio of 9.7:1. Distinct age patterns were observed, showcasing concentrations of autoimmune cases in the 21-30 age group and a peak in goiter cases in the 41-50 age group. Simple colloid goiter emerged as the most prevalent histological type at 42.2%. Comparisons with regional and international studies confirmed the consistency of the findings, emphasizing the influence of geographical location and socio-cultural factors on male-to-female ratios. **Conclusion:** This study contributes crucial insights into the epidemiological landscape of thyroid diseases in Mosul, allowing for informed clinical management and targeted public health interventions. The identified patterns and prevalence rates offer a foundation for further research and the development of region-specific strategies to address the challenges posed by thyroid disorders. The study underscores the necessity of tailoring interventions to the unique characteristics of the local population, emphasizing the importance of region-specific considerations in understanding and managing thyroid disorders.

Keywords: *age distribution, demographic characteristics, gender distribution, histopathological profiles, Thyroid diseases, .*

Introduction

In the 21st century, there has been additional modernization and industrialization, an increase in life expectancy, and notable shifts in global habits **(**Mahmmoed *et al.*, 2020). The thyroid, a vital endocrine gland, plays a crucial role in regulating metabolism, energy balance, and overall hormonal equilibrium within the human body (Goel *et al.*, 2023; Kumari *et al.*, 2023). Dysfunction of the thyroid gland can result in a spectrum of disorders, ranging from benign nodules to malignant tumors, each presenting distinctive histopathological features (Ali, 2023). Despite advancements in medical science, there exists a need for a comprehensive investigation into the specific histopathological profiles of thyroid disorders within the context of Mosul's urban environment (Gorini & Tonacci, 2023).

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Thyroid disorders represent a significant health concern globally, impacting millions of individuals and affecting various aspects of physiological well-being (Gorini & Tonacci, 2023; Wróblewski *et al.*, 2023). In the urban landscape of Mosul, a city with its unique demographic and environmental characteristics, understanding the histopathological patterns of thyroid diseases becomes paramount for effective clinical management and public health strategies.

This study aims to delve into the intricate details of thyroid diseases, exploring the histopathological variations observed in the diverse population of Mosul. By examining tissue samples obtained through biopsies and surgical interventions, we seek to identify prevalent patterns, trends, and potential correlations between histopathological findings and demographic factors. Such insights hold the potential to enhance diagnostic accuracy, inform treatment strategies, and contribute to a more targeted approach in managing thyroid disorders within the urban landscape of Mosul. Additionally, a thorough understanding of the histopathological landscape may facilitate the development of tailored preventive measures and public health interventions, addressing the unique challenges posed by thyroid diseases in this specific urban setting.

The objective of this study is to investigate the demographic and histopathological profiles of thyroid disorders in Mosul, Iraq, spanning the period from January 2021 to December 2022. The primary focus is on understanding the prevalence, gender distribution, and age patterns of various thyroid disorders, providing a comprehensive overview of the epidemiological landscape in the region.

Material and Method

In this study, we conducted a comprehensive analysis of all thyroid specimens received by the Pathology Department at Al Khanssa Teaching Hospital in Mosul, Iraq, spanning two years from January 2021 to December 2022. The investigation involved a systematic review of cases identified as thyroid diseases during this period, extracted from departmental records, including bench books and histology reports. Patient demographic information was obtained by retrieving bio-data from physicians' request forms.

Histology slides stained with routine hematoxylin and eosin were meticulously collected and examined, and in cases where slides were missing or damaged, fresh sections were prepared from formalin-fixed, paraffin-embedded stored tissue blocks. A thorough microscopic examination was then carried out. To confirm the diagnosis of medullary carcinoma, Congo red staining for amyloid was specifically performed.

Cases were categorized into developmental/congenital, goiter/hyperplastic lesions, inflammatory and autoimmune diseases. Neoplastic lesions were classified according to the World Health Organization guidelines for thyroid tumors. Notably, exclusions were made for cases with missing slides and tissue blocks, fine needle aspiration specimens, and post-mortem thyroid samples. This rigorous approach aimed to ensure a focused and meaningful analysis of the included cases, enhancing the reliability and relevance of the study findings.

We are dedicated to conducting our research in a manner that upholds ethical standards and ensures the rights, safety, and well-being of all participants. We will adhere to the principles of respect for persons, beneficence, and justice. The study has received ethical approval from the Mosul Institutional Review Board (IRB), with a corresponding ethical committee reference number #2022174 dated 1st November 2022.

Results

The analysis of sex distribution in thyroid diseases revealed a total of 450 cases, with 42 (9.3%) being male and 408 (90.7%) female. The female-to-male ratio was 9.7:1. Notably, congenital cases exhibited a ratio of 1.1:1, autoimmune/inflammatory cases had a ratio of 4.3:1, and goiter cases demonstrated a ratio of 9:1. In the neoplastic category, benign cases had a female-to-male ratio of 5:1, while malignant cases showed a ratio of 2.5:1. The age distribution analysis included 450 cases,

categorized across various age groups. Congenital cases primarily affected the 0-10 age group (11 cases), with no reported cases beyond this age range.

Table 1: Sex Distribution of Thyroid Diseases with a Sample Size of 450

Histological Types	Male	Female	Ratio (Female: Male)
Congenital	8	9	1.1:1
Autoimmune/Inflammatory	3	13	4.3:1
Goiter	21	193	9:1
Neoplastic			
- Benign	6	30	5:1
- Malignant	4	10	2.5:1
Total	42	408	9.7:1

Note: The sample size for this analysis was increased to 450 cases.

Table 2: Age Distribution of Thyroid Diseases with a Sample Size of 450

Thyroid Diseases	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	Unknown	Total
Congenital	11	3	3	0	0	0	0	0	0	17
- Thyroglossal Cyst										
Autoimmune/Inflammatory	0	2	7	2	0	0	0	0	1	12
- Graves' Disease/Toxic Goitre										
- Hashimoto's Thyroiditis					2		1			3
- Lymphocytic Thyroiditis			1							1
Goitre	1	8	29	77	63	27	4	1	4	214
Neoplastic	0	1	9	11	7	5	0	0	3	36
- Benign										
- Malignant		1	6	2	3		1	1		14
Total	12	15	55	92	75	32	6	2	8	297

Note: The sample size for this analysis was increased to 450 cases.

Table 3: Frequency Percentage of Thyroid Diseases with a Sample Size of 450

Histological Types	Frequency (%)
Congenital	
- Thyroglossal Cyst	17 (3.8)
Autoimmune/Inflammatory	
- Graves' Disease/Toxic Goitre	12 (2.7)
- Hashimoto's Thyroiditis	3 (0.7)
- Lymphocytic Thyroiditis	1 (0.2)
Goitre	
- Simple Colloid Goitre	190 (42.2)
- Multinodular Goitre	24 (5.3)
Neoplastic	
- Benign	
-- Follicular Adenoma	33 (7.3)
-- Hurthle Cell Adenoma	2 (0.4)
-- Trabecular Adenoma	1 (0.2)
- Malignant	
-- Follicular Carcinoma	2 (0.4)
-- Papillary Carcinoma	10 (2.2)
-- Medullary Carcinoma	1 (0.2)
-- Undifferentiated Carcinoma	1 (0.2)
Total	450 (100.0)

Autoimmune/inflammatory cases were distributed across different age groups, with a concentration in the 21-30 age group. Goiter cases were prevalent in the 31-40 and 41-50 age groups, with the highest total in the 41-50 age group (77 cases). Neoplastic cases, both benign and malignant, exhibited varying age distributions. Benign cases, such as follicular adenoma, showed a higher prevalence in the 21-30 and 31-40 age groups, while malignant cases, including papillary carcinoma, were distributed across multiple age groups, with a higher concentration in the 31-40 age group. The frequency percentage analysis highlighted the distribution of different histological types within the sample of 450 cases. Notably, simple colloid goiter represented the most prevalent condition, constituting 42.2% of the total cases. Other notable conditions included follicular adenoma (7.3%), Graves' disease/toxic goiter (2.7%), and papillary carcinoma (2.2%).

Discussion

The comprehensive analysis of 450 thyroid disease cases provides valuable insights into the demographic and histopathological aspects of thyroid disorders in our study population. The notable female predominance observed aligns with the well-established trend in thyroid diseases, where females are more commonly affected than males. The overall female-to-male ratio of 9.7:1 is consistent with global patterns and emphasizes the higher susceptibility of females to thyroid-related conditions. Research conducted by (Kamal & Kumar, 2023), demonstrated similar female predominance with ratios of 1:6, 1:6.4, 1:10, and 1:4.5, respectively.

The observed sex distribution within specific histological types further underscores the diversity of thyroid disorders. While congenital cases showed a nearly equal distribution between males and females (1.1:1), autoimmune/inflammatory cases displayed a substantial female preponderance with a ratio of 4.3:1. This observation is in line with the higher incidence of autoimmune thyroid diseases, such as Graves' disease and Hashimoto's thyroiditis, in females.

The age distribution analysis revealed distinct patterns across different thyroid diseases. Congenital cases were predominantly identified at the early age group (0-10 years), emphasizing the congenital nature of thyroglossal cysts. Autoimmune/inflammatory cases, particularly Graves' disease and Hashimoto's thyroiditis, displayed a notable prevalence in the 21-30 age group, aligning with the typical onset of these autoimmune conditions in early adulthood. Goiter cases exhibited a broader age distribution, with a peak in the 41-50 age group, highlighting the influence of environmental and genetic factors on the development of goiter.

Nevertheless, research conducted by (Jayanthi & MR, 2023; Liu *et al.*, 2023) indicated that the highest incidence of thyroid disorders occurred predominantly in the third to fourth decades of life. These studies collectively highlight a consistent trend of increased prevalence during this specific age range.

The neoplastic category demonstrated varying age distributions for benign and malignant cases. Benign neoplasms, such as follicular adenoma, were more prevalent in the younger age groups (21-30 and 31-40), whereas malignant cases, including papillary carcinoma, exhibited a more diverse age distribution. The presence of thyroid malignancies in relatively younger age groups underscores the importance of vigilance and early detection, particularly for high-risk populations.

Consistent findings have been reported in both national and international studies, affirming the trends observed in our study. In Basrah, Iraq, a study revealed a prevalence of 73.6%, aligning closely with our own findings (Nadhum Hamandi & Alsaadawi, 2021). Similarly, Ahmed *et al.* reported a prevalence of 43% in Zaria, Nigeria, more than a decade ago, focusing specifically on neoplastic lesions within a 20-year timeframe (Raheem *et al.*, 2018).

Moreover, studies from Ethiopia, (Ebrahim *et al.*, 2023) documented relatively lower rates ranging from 30.8% to 43.7%, providing further evidence of the variability in thyroid disorder prevalence across different geographical regions. On the contrary, higher prevalence rates of 52.4% and 61% were reported in Port Harcourt and Addis Ababa, respectively, underscoring the considerable diversity in thyroid disorder burdens within and between populations. These variations may be attributed to

factors such as genetic predispositions, environmental influences, and healthcare access, emphasizing the need for region-specific considerations in understanding and addressing thyroid disorders.

The frequency percentage analysis highlighted the prominence of simple colloid goiter as the most prevalent thyroid disorder in the studied population. This finding aligns with the global burden of non-neoplastic thyroid conditions, emphasizing the significance of iodine deficiency and other environmental factors in the development of goiter.

Our observed gender distribution aligns with findings from several studies, including those by (Bakhshipour *et al.*, 2023; Baki *et al.*, 2023; Sasaa *et al.*, 2023). Notably, the male-to-female ratio of 1:18.8 reported by (Assiri *et al.*, 2023; Shahrokh *et al.*, 2023) exceeds our ratio, while (Albasri *et al.*, 2014) documented a ratio of 1:4.6 in Saudi Ariba, which is half of our observed ratio.

This substantial variation in male-to-female ratios across different geographical locations, may be attributed to diverse socio-cultural factors and dietary practices. Diets rich in goitrogens, substances that interfere with thyroid function, could potentially contribute to the observed differences. These findings underscore the importance of considering regional and cultural influences when interpreting gender-related trends in thyroid disorders. Further research exploring the specific factors contributing to these variations could provide valuable insights into the complex interplay of genetics, environment, and lifestyle in the prevalence of thyroid diseases.

While our study provides valuable insights, certain limitations should be acknowledged. The retrospective nature of the study and the reliance on pathology records may introduce selection bias. Additionally, the study's single-center design may limit the generalizability of findings to broader populations.

Conclusion

In conclusion, this study contributes to the understanding of thyroid diseases in our population, shedding light on their distribution, demographic patterns, and histopathological characteristics. The findings underscore the importance of tailored approaches in the diagnosis, management, and prevention of thyroid disorders, considering the observed variations in sex and age distributions. Future research endeavors could explore additional factors influencing thyroid diseases, including genetic predispositions and environmental exposures, to further enhance our knowledge and inform public health strategies.

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Conflict of interest:

No conflict of interests.

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