The Republic of Sudan

Abdul Latif Al-Hamad University of Technology

College of Medicine and Health Sciences

Department of Medical Laboratory Sciences

HISTOPATHOLOGICAL CHARACTERISTICS OF THYROID LESIONS IN RELATION TO AGE AND GENDER AT MEROWE MEDICAL CITY HOSPITAL, NORTHERN STATE, SUDAN

"A Research Proposal Submitted in Partial Fulfillment of the Requirements for the Award of the Bachelor of Science (B.Sc.) Degree in Medical Laboratory Sciences (Histopathology)"

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1. INTRODUCTION & LITERATURE REVIEW :

1.1. Introduction (Research Problem Background) :

The thyroid gland is a vital endocrine organ located anteriorly in the lower neck. It synthesizes and secretes essential metabolic hormones—primarily triiodothyronine (T3) and thyroxine (T4)—which regulate basal metabolic rates, systemic energy expenditure, and the physiological functioning of cardiovascular, neuromuscular, and digestive systems [1]. Structural abnormalities or pathological alterations within the thyroid parenchyma can result in functional dysfunctions or distinct tissue enlargements (lesions), the epidemiology and histopathology of which vary significantly across age groups and biological sex [1].

Thyroid gland disorders represent a major endocrinological challenge worldwide, characterized by wide geographic variation in their presentation, incidence, and histological types [2]. Thyroid lesions can be broadly categorized into non-neoplastic conditions (such as multinodular goiter, thyroiditis, and hyperplasia) and neoplastic conditions (benign adenomas and malignant carcinomas) [1,3].

Malignant thyroid neoplasms, particularly papillary and follicular thyroid carcinomas, have shown a rising incidence globally over recent decades [2]. Understanding the clinicopathological spectrum of these lesions is critical for designing effective diagnostic algorithms, patient risk-stratification schemas, and optimized surgical management strategies [3,4].

In Sudan, endemic goiter and various thyroid malignancies remain prevalent health issues, often influenced by environmental factors such as dietary iodine deficiency in specific regions [5,6]. The Northern State, and specifically the Merowe locality, lacks detailed updated data regarding the specific demographic distribution of these thyroid lesions. This research aims to analyze the clinicopathological characteristics of thyroid specimens received at Merowe Medical City Hospital, classifying them by histological type, age, and gender, to provide essential baseline data for healthcare providers in the region.

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1.2. Literature Review :

Previous study :

The literature indicates a significant correlation between demographic variables (age and gender) and the pathological profile of thyroid lesions [7]. Globally, women are disproportionately affected by thyroid disorders, exhibiting a female-to-male ratio of up to 4:1 or 5:1 for both benign multinodular goiter and malignant epithelial thyroid cancers [7,8]. This marked gender disparity is hypothesized to be driven by estrogen receptors and fluctuating hormonal environments in females of reproductive age [8]. In contrast, while malignant thyroid tumors are less common in men, when they do present, they are often diagnosed at a later stage and exhibit more aggressive histological features [7,9].

Age is another vital clinicopathological parameter. Benign hyperplastic and nodular thyroid conditions tend to peak in the fourth and fifth decades of life [10], whereas the incidence of thyroid carcinoma peaks across distinct age groups depending on the histological variant [9,11]. For instance, papillary thyroid carcinoma (PTC) is commonly observed in young to middle-aged adults, whereas more aggressive subtypes, such as anaplastic thyroid carcinoma (ATC) and follicular thyroid carcinoma (FTC), are more frequently diagnosed in elderly patients [9,11]. Local studies conducted in Khartoum and central Sudan have echoed these trends, demonstrating that thyroid swelling is a common surgical presentation, with multinodular goiter dominating benign cases, and papillary thyroid carcinoma being the most frequent malignancy [5,6]. However, localized epidemiological and pathological mapping in Northern Sudan, where dietary habits and environmental conditions differ, remains scarce.

Research Hypothesis:

It is hypothesized that there is a statistically significant association between demographic characteristics (age and gender) and the histopathological types of thyroid lesions among patients at Merowe Medical City Hospital, Northern State, Sudan.

1.3. Justifications (Rationale):

Thyroid diseases constitute a major proportion of surgical admissions and histopathological workloads in Sudan.

Merowe Medical City Hospital is a vital tertiary care hub serving a vast catchment population in the Northern State. Despite this, there is an absence of published data on the histopathological trends of thyroid lesions specific to this institution.

Age and gender are simple, universally collectible demographic factors. Determining their exact relationship with thyroid pathology can help local physicians identify high-risk patient subgroups, leading to earlier intervention.

This research will provide crucial localized data to help medical and laboratory departments optimize their diagnostic resources, particularly fine-needle aspiration cytology (FNAC) and histopathology services.

1.4. Research Question and Objectives:

What are the histopathological characteristics of thyroid lesions, and how are they associated with age and gender among patients at the selected hospital?

General Objective:

To determine the histopathological characteristics of thyroid lesions in relation to age and gender among patients whose specimens are processed at the Histopathology Department of Merowe Medical City Hospital, Northern State, Sudan.

1.5. Specific Objectives:

1. To classify the diagnosed thyroid lesions into benign, inflammatory, and malignant categories based on histopathological findings.

2. To identify the distribution of benign and malignant thyroid lesions across different age groups.

3. To determine the prevalence and ratio of thyroid lesions between male and female patients.

4. To analyze the association between specific histopathological types of thyroid cancer (e.g., Papillary, Follicular, Medullary) and demographic variables (age and gender).

2. METHODOLOGY

2.1.1. Study Design:

This will be a hospital-based retrospective, descriptive cross-sectional study conducted among patients with thyroid lesions whose specimens were received and processed at the Histopathology Department of Merowe Medical City Hospital during the study period

2.1.2. Study Area:

The study will be conducted at the Histopathology Department of Merowe Medical City Hospital.

2.1.3. Study Duration:

The data collection phase will be conducted from June 2026 to August 2026. The study will retrospectively review and analyze all archived diagnostic records and histopathological thyroid specimens registered at the hospital over a designated prior period.

2.1.4. Study Variables:

Independent Variables: Age, Gender.

Dependent Variables:Histopathological Diagnosis: Broadly categorized into Benign, Inflammatory/Non-neoplastic, and Malignant lesions.

Histological Subtype: Specific histological classifications (e.g., Nodular/Multinodular Goiter, Follicular Adenoma, Hashimoto Thyroiditis, Papillary Thyroid Carcinoma, Follicular Carcinoma, Medullary Carcinoma, Anaplastic Carcinoma).

2.1.5. Study Population :

The study population comprises all archived records and tissue specimens of patients of any age and gender who underwent thyroid surgery and whose specimens were examined and archived at

the Histopathology Department of Merowe Medical City Hospital during the study period from July to September 2026.

2.1.6. Sampling and Sample Size:

Total coverage sampling will be used. All eligible thyroid cases and record received during the study period will be included in the study. Therefore, the final sample size will consist of all eligible cases available during the specified study period.

2.1.7. Study Criteria

2.1.7.1. Inclusion Criteria:

All archived histopathology records and reports of thyroidectomy specimens with complete demographic data (age and gender).

Cases with confirmed, clear histopathological diagnoses of thyroid lesions (classified into benign, inflammatory, or malignant).

Availability of archived tissue blocks and/or microscopic slides suitable for diagnostic verification when needed.

2.1.7.2. Exclusion Criteria :

. Incomplete diagnostic or laboratory records lacking primary demographic variables (age or gender).

Non-thyroid neck masses, lymph node biopsies, or secondary metastatic lesions to the thyroid gland from non-thyroid primary malignancies.

Autopsy thyroid specimens or severely damaged/poorly preserved tissue blocks that preclude definitive histological evaluation .

2.1.8. Data Collection:

Data will be collected retrospectively using a structured data collection sheet (proforma) from the archived pathology request forms, laboratory registers, and histopathological examination reports of eligible cases recorded at the Histopathology Department during the study period .p

2.1.9. Data Analysis:

Data will be entered, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS) software.

Descriptive statistics will be used to summarize the data, including frequencies and percentages for categorical variables (such as gender, age groups, and histopathological classifications) and appropriate measures of central tendency and dispersion (mean ± standard deviation or median) for continuous numerical variables (such as age).

The retrospective distribution of thyroid lesions will be assessed according to age groups and gender. The association between categorical demographic variables (gender and age groups) and histopathological diagnoses will be evaluated using appropriate inferential statistical tests, such as the Chi-square test (χ^2) or Fisher's exact test, where applicable. A p-value of < 0.05 will be considered statistically significant.

2.1.10. Ethical Consideration:

Ethical approval will be obtained from the Ethical Review Committee of Abdul Latif Al-Hamad University of Technology before commencement of the study. The required approval from the Ministry of Health will also be obtained before data collection. Written administrative permission will be obtained from the relevant authorities at Merowe Medical City Hospital, including the General Manager and Head of the Histopathology Department.

Confidentiality and privacy will be strictly maintained throughout the study. Patients' names and personal identification numbers will not be recorded on the data collection sheet. Each participant will be assigned a unique study code, and the collected data will be used solely for research purposes.

The study will not involve any additional invasive procedure or experimental intervention. Histopathological examination will be performed as part of the patients' routine diagnostic care. All collected data will be securely stored and accessed only by the research team.

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APPENDICES

Data Collection Sheet (Questionnaire):

Study Code	_____
Age (Years)	_____
Gender	☐ Male ☐ Female
Type of Surgery	☐ Lobectomy ☐ Subtotal Thyroidectomy ☐ Total Thyroidectomy
Histopathological Diagnosis	_____
Lesion Category	☐ Benign ☐ Inflammatory ☐ Malignant
Histological Type (if malignant)	_____

Appendix B: Estimated Budget

Item Description	**Estimated Cost (SDG)**	**Source of Funding**
Data Collection & Archiving Fees	To be determined (TBD)	Self-funded
Printing and Binding	To be determined (TBD)	Self-funded
Statistical Analysis	To be determined (TBD)	Self-funded

Appendix C: Gantt Chart (Project Timeline)

Research Activity	**Period**
Proposal preparation and revision	June 2026
Ethical and administrative approvals	Jun_July 2026
Data and sample Collection	June_Auguest 2026
Data entry and analysis	Auguest-Septemper2026
Research writing	Septemper 2026