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Ministry of Higher Education and Scientific
Research El-Sheikh Abdallah Elbadri University
Faculty of Medicine



Frequency of thyroid disorders among patients in ATBARA and ELDAMER teaching hospitals in Jan 2024_ Jan 2025

Prepared By:

Amna Abdelraheem Omer Mohammed Ahmed

Drocella Alshaib Fanous Hizgial

Rahma Mohamed Elmubarak AbdElgadir

Saeed Abdullah Abdulrahman Abdullah Babgi

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Supervisor by:

Dr. Murtada Osman Eltahir

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الآية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ
﴿أَقْرَأْ بِاسْمِ رَبِّكَ الَّذِي خَلَقَ ﴿١﴾ خَلَقَ الْإِنْسَانَ مِنْ عَلَقٍ ﴿٢﴾
أَقْرَأْ وَرَبُّكَ الْأَكْرَمُ ﴿٣﴾ الَّذِي عَلَّمَ بِالْقَلَمِ ﴿٤﴾
عَلَّمَ الْإِنْسَانَ مَا لَمْ يَعْلَمْ ﴿٥﴾﴾

صدق الله العظيم

سورة العلق 1-5



بِاسْمِ الثَّالُوثِ الْقُدُّوسِ

- "إِنَّ إِلَهَ السَّمَاءِ يُعْطِينَا النَّجَاحَ، وَنَحْنُ عَبِيدُهُ نَقُومُ وَنَبْنِي"

20:2 سفر نحيا

Dedication

This work is dedicated to:

The sake of Allah, our creator and our master, our greater teacher and messenger Mohammed (May Allah bless and grant him), Who taught us the purpose of life?

And to our parents who have never failed to give us financial and moral support, for giving all our needs during the time we developed our self and for teaching us that even the largest task can be accomplished if it is done one step at a time.

We dedicate

This research to all the people who have worked hard to help us complete this research.

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Abstract:

Background: Thyroid diseases represent a significant worldwide public health problem, primarily occurring in women and often being linked to iodine deficiency. In Sudan, while prevalence has been reported, few up-to-date localized epidemiological data exist, particularly from Northern regions like Atbara. This paucity of data hinders effective health planning and improved patient outcomes.

Objective: The aim of this study was to assess the prevalence and types of thyroid diseases among patients attending the Medicine and Surgery Departments of Atbara Teaching Hospital and Aldamar Teaching Hospital between January 2024 and January 2025.

Methodology: A descriptive cross-sectional hospital-based study was conducted at Atbara Teaching Hospital and Aldamar Teaching Hospital. Convenience sample of 103 adult patients (male and female and across age) with a laboratory and/or clinical diagnosis established thyroid disease was drawn from surgical and internal medicine wards. Patient records and questionnaire were utilized to capture data on type of thyroid disorder, medications at the time of present, demographics, clinical presentation, history of surgery, and thyroid function tests (TSH, T3, T4). Statistical procedures were conducted using SPSS.

Results: The cohort consisted of 103 participants, of whom the majority were female (61%) with a median age of 35 years (interquartile range: 27-48 years) and residing predominantly in urban locations (53%). The most common thyroid illnesses diagnosed were Goiter (25%), Hypothyroidism (24%), and Hyperthyroidism (17%). A majority of patients (59%) had a history of thyroid surgery, and 30% were on thyroid medications. The most frequently found symptom was neck swelling (46.6%), followed by tachycardia (28.2%) and general fatigue (21.4%). Thyroid function tests in patients with known test results showed diverse abnormalities: 15.5% with elevated TSH, 8.7% with extremely low TSH, 10.7% with elevated T3, and 10.7% with elevated T4, collectively indicating a high prevalence of thyroid dysfunction.

Conclusion: Thyroid disorders are a significant health problem among patients within Atbara Teaching Hospital and Aldamar Teaching Hospital, predominantly in young to middle-aged women. The findings of high incidence of goiter, hypothyroidism, and

hyperthyroidism, coupled with the high rates of surgical history and present medication, indicate an emergent need for better awareness, early screening, improved diagnostic facilities, and simplified management strategies in order to improve thyroid outcome in this region.

Keywords: Goiter, Hypothyroidism, Hyperthyroidism, Thyroid diseases, Atbara Teaching Hospital and Aldamar Teaching Hospital, Sudan, Epidemiology, Women's health, Public health

المستخلص :

الخلفية تمثل اضطرابات الغدة الدرقية مصدر قلق صحي عام كبير على مستوى العالم، وتصيب النساء بشكل غير متناسب، وغالبًا ما تكون مرتبطة بنقص اليود. في السودان، وعلى الرغم من الانتشار المعترف به، إلا أن هناك ندرة في البيانات الوبائية المحلية الحديثة، لا سيما من المناطق الشمالية مثل عطبرة. تعيق هذه الفجوة في البيانات التخطيط الفعال للرعاية الصحية وتحسين نتائج المرضى.

الهدف :هدفت هذه الدراسة إلى تقييم انتشار وأنواع أمراض الغدة الدرقية بين المرضى المراجعين لأقسام الباطنة والجراحة في مستشفى عطبرة التعليمي ومستشفى الدامر التعليمي خلال الفترة من يناير 2024 إلى يناير 2025.

المنهجية :أجريت دراسة وصفية مقطعية قائمة على المستشفى في مستشفى عطبرة التعليمي ومستشفى الدامر التعليمي تم تسجيل عينة مريحة من 103مرضى (بالغين) من جميع الفئات العمرية والجنس (تم تشخيصهم سريريًا و/أو مخبريًا) باضطرابات الغدة الدرقية من أقسام الباطنة والجراحة. تم جمع البيانات المتعلقة بالخصائص الديموغرافية، والسمات السريرية، ونوع اضطراب الغدة الدرقية، والأدوية الحالية، والتاريخ الجراحي، ونتائج اختبارات وظائف الغدة الدرقية (TSH, T3, T4) باستخدام استبيان منظم ومراجعة سجلات المرضى. تم تحليل البيانات باستخدام برنامج SPSS.

النتائج :تألفت المجموعة من 103أفراد، وكانت غالبيتهم من الإناث (61%) بمتوسط عمر 35 عامًا (المدى الربيعي-27 : 48 سنة) (ويقيمون بشكل أساسي في المناطق الحضرية). (53%) كانت حالات الغدة الدرقية الأكثر شيوعًا هي تضخم الغدة الدرقية (25%)، قصور الغدة الدرقية (24%)، وفرط نشاط الغدة الدرقية (17%) كان لدى نسبة كبيرة من المرضى (59%) تاريخ من جراحة الغدة الدرقية، و 30% كانوا يتناولون أدوية الغدة الدرقية حاليًا. كان تورم الرقبة (46.6%) هو العرض الأكثر شيوعًا، يليه تسرع القلب (28.2%) والتعب العام. (21.4%) أظهرت اختبارات وظائف الغدة الدرقية بين من توفرت نتائجهم اضطرابات متنوعة :أظهر 15.5% ارتفاعًا في TSH، و 8.7% انخفاضًا شديدًا في TSH، و 10.7% ارتفاعًا في T3، و 10.7% ارتفاعًا في T4، مما يشير مجتمعة إلى ارتفاع معدل انتشار الخلل الوظيفي للغدة الدرقية.

الخلاصة :تشكل اضطرابات الغدة الدرقية عبئاً صحياً كبيراً بين المرضى في مستشفى عطبرة التعليمي ومستشفى الدامر التعليمي، وتؤثر بشكل أساسي على الإناث في سن الشباب والمتوسطة. إن الانتشار المرتفع لتضخم الغدة الدرقية، وقصور الغدة الدرقية، وفرط نشاط الغدة الدرقية، إلى جانب المعدلات الكبيرة لتاريخ الجراحة والأدوية المستمرة، يسلط الضوء على الحاجة الماسة لتعزيز الوعي، والفحص المبكر، وتحسين القدرات التشخيصية، وبروتوكولات الإدارة لتحسين نتائج صحة الغدة الدرقية في هذه المنطقة.

الكلمات المفتاحية :اضطرابات الغدة الدرقية، تضخم الغدة الدرقية، قصور الغدة الدرقية، فرط نشاط الغدة الدرقية، مستشفى عطبرة التعليمي ومستشفى الدامر التعليمي، السودان، صحة المرأة، علم الأوبئة، الصحة العامة.

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List of abbreviations:

Abbreviation	Full Form
DSF	Diabetic septic foot
DM	Diabetes Mellitus
WHO	World Health Organization
T4	Thyroxine
T3	Triiodothyronine
TSH	Thyroid-Stimulating Hormone
UGI	Upper Gastrointestinal
BMR	Basal Metabolic Rate
LDL	Low-Density Lipoprotein
TRH	Thyrotropin-Releasing Hormone
TBG	Thyroxine-Binding Globulin
TFTs	Thyroid Function Tests
IgG	Immunoglobulin G
TSHR-Ab	TSH Receptor Antibodies
AIT	Amiodarone-Induced Thyrotoxicosis
HCG	Human Chorionic Gonadotropin
ESR	Erythrocyte Sedimentation Rate
FNA	Fine Needle Aspiration
MNG	Multinodular Goitre

PUD	Peptic Ulcer Disease
NSAIDs	Nonsteroidal Anti-inflammatory Drugs
LDA	Low-Dose Aspirin
GAVE	Gastric Antral Vascular Ectasia
GIB	Gastrointestinal Bleeding
IDDs	Iodine-Deficiency Disorders
IQR	Interquartile Range
TPO	Thyroid Peroxidase
HIV	Human Immunodeficiency Virus
MBBS	Bachelor of Medicine, Bachelor of Surgery
MPH	Master of Public Health
MD	Medical Doctor
SPSS	Statistical Package for the Social Sciences

Chapter One

Introduction

1. Introduction:

The thyroid gland, which is a vital endocrine gland located in the neck, regulates the metabolism of the body by secreting thyroxine (T4) and triiodothyronine (T3) hormones. These are required for a variety of body functions from stimulating carbohydrate and fat metabolism to cardiovascular function regulation, central nervous system activity, and reproductive function regulation. The delicate regulation of thyroid hormone production and release is predominantly regulated by the hypothalamic-pituitary-thyroid axis, where TSH from the pituitary gland stimulates the thyroid and systemic thyroid hormones, especially T3, feed back in a negative manner. Abnormalities of this delicate system can lead to a variety of thyroid diseases, which range from hyperthyroidism with excess production to hypothyroidism with deficiency. Thyroid disease is a significant global public health problem, present in around 5–10% of the global population. The diseases are disproportionately prevalent among women, particularly in the post-menopausal and reproductive stages of life. The leading underlying cause of thyroid disease globally, as well as in developing nations, is iodine deficiency. The World Health Organization (WHO) identifies low iodine intake, all too often due to the lack of universal salt iodization, as responsible for an overwhelming proportion of goiter, thyroid nodules, and hypothyroidism. Such global morbidity warrants effective public health interventions for ensuring adequate iodine nutrition and improved early detection.

In much of Africa, including Sudan, the problem of thyroid disease is exacerbated by nutritional factors like iodine deficiency and poor access to healthcare. Goiter, an extremely common expression of iodine deficiency, remains extremely prevalent in rural and economically disadvantaged communities across the continent. Sudanese research, and in Khartoum, the capital, has revealed high incidence of thyroid disorder, and even some indication that over 20% of endocrine clinic patients present with evidence of thyroid disorder. Despite this, a deadly lacuna pervades the local and recent data, and particularly from the northern states of Atbara and Aldamer.

The current study aims to fill this data gap by investigating thyroid disease prevalence among patients attending Atbara Teaching Hospital during 2024–2025. This study is

valuable to provide up-to-date epidemiological information pertinent to this region, which can inform local healthcare planning and improve patient outcomes. Through identifying patterns and distribution of thyroid illness in this initial healthcare center, the study hopes to contribute to insight into the local burden of thyroid disease, including demographic variation and most common ones faced.

Ultimately, findings of this research will be of high value to both medical practitioners and policy makers. The data gathered can help bridge the gap between local needs and national health policy, which can potentially guide the establishment of targeted awareness campaigns, aid iodine supplementation initiatives, and help improve diagnostic and treatment protocols. By offering a finer picture of thyroid disorder prevalence in Atbara and Aldamer, this research will serve as an early guide to follow-up efforts and contribute to supporting better overall thyroid well-being management in the area.

1.2. Literature review:

-:Background about thyroid gland

The thyroid gland is the first endocrine gland to develop in humans (1), forming one of the largest endocrine glands, typically weighs 15–20 grams in adults. It is located in the front of the neck, just below the larynx, and wraps around the upper trachea with two lobes connected by an isthmus.(2) Each lobe extends from the oblique line of the thyroid cartilage to the fourth or fifth tracheal ring, while the isthmus lies over the second and third rings. The gland moves with swallowing due to its anatomical attachments.(3)

Embryologically, the thyroid originates near the base of the tongue and migrates downward to its final position in the neck. In some individuals, remnants of this migration pathway may remain, occasionally forming ectopic thyroid tissue such as a lingual thyroid.(4) At the microscopic level, the thyroid consists of numerous follicles lined by cuboidal epithelial cells and surrounded by a basement membrane. Each follicle contains colloid, a gel-like substance rich in thyroglobulin, the storage form of thyroid hormones. These hormones are reabsorbed, processed by follicular cells, and released into the bloodstream to regulate metabolism. Between follicles, parafollicular (C) cells secrete calcitonin, which helps regulate blood calcium levels.(2)

Functionally, the thyroid is one of the most metabolically active organs, which is

reflected in its rich blood supply. It receives blood from the superior and inferior thyroid arteries, with a perfusion rate about five times its weight per minute, supporting constant hormone output. The gland may also enlarge naturally during puberty, menstruation, and pregnancy.(3)

The thyroid gland produces thyroxine (T4) and the more active triiodothyronine (T3) which together regulate metabolism. T4 makes up about 93% of secretion but is mostly converted to T3 in tissues. T3, though only 7% of output, is about four times more potent and shorter-acting. (2) Synthesis of thyroid hormone involves multiple steps including iodide trapping, organification, coupling, storage, and secretion. Iodine is essential for the production of thyroid hormones and is considered the rate-limiting step. (5) Recommended daily allowances of iodine depends on growth, body weight, sex, age, nutrition, climate, and disease. For a normal adult, 150 µg of iodine is required daily, about 50 mg each year and one teaspoon of iodine for the whole life, to manufacture adequate quantities of thyroid hormones.(6)

Thyroid hormones are made within thyroglobulin, a protein containing many iodine-binding tyrosine sites. Once formed, they are stored in the colloid of thyroid follicles providing a hormone reserve that can last 2–3 months. This storage explains why signs of deficiency may not appear immediately if hormone production stops.(2)

When the hormones are needed, they are released into the bloodstream, where they bind to plasma proteins for transport. T4 binds more tightly to these proteins than T3 causing a slower release into tissues. Consequently, T3 becomes available to cells more rapidly, within approximately one day, whereas T4 is released more gradually over about six days. After entering target cells, both hormones bind to intracellular proteins and are stored for further use, leading to a delayed but sustained physiological response. Due to these dynamics, the effects of thyroid hormones do not occur instantly. T3.(2) being more active and faster-acting, begins to exert its effects within 6 to 12 hours with peak activity occurring in 2 to 3 days. In contrast, T4 has a slower onset, with noticeable effects appearing only after 2 to 3 days and peaking in 10 to 12 days. The activity of T4 may persist for several weeks, sometimes lasting up to two months. This slow onset and prolonged action ensure stable and long-term regulation of metabolic processes in the body. (2)

Thyroid hormones play a vital role in regulating overall metabolism and multiple body systems. They stimulate carbohydrate and fat metabolism by enhancing glucose uptake, glycolysis, gluconeogenesis, lipid mobilization, and oxidation, while lowering plasma cholesterol and triglycerides through increased LDL clearance (2) This heightened metabolic activity raises the body's vitamin requirements, basal metabolic rate (BMR), and often leads to weight loss, though appetite may increase. Cardiovascular effects include increased heart rate, cardiac output, and blood flow with a widened pulse pressure but generally normal mean arterial pressure. Respiratory rate and depth also rise due to elevated oxygen demand. In the gastrointestinal system thyroid hormones enhance motility and secretions, often causing diarrhea in excess or constipation in deficiency. (2) They stimulate the central nervous system, boosting alertness but potentially causing anxiety or insomnia in hyperthyroidism, and sluggishness in hypothyroidism. Muscle strength is initially enhanced, but excessive hormone levels lead to weakness and tremors, while deficiency causes slow movements and fatigue. Thyroid hormones also influence other endocrine glands by increasing the demand for insulin, parathyroid hormone, and adrenal hormones. Finally, they are essential for reproductive health, with imbalances causing menstrual irregularities, libido changes, and sexual dysfunction in both men and women. (2)

The synthesis and secretion of thyroid hormones are primarily regulated by the hypothalamic-pituitary axis. The hypothalamus releases thyrotropin-releasing hormone (TRH), a tripeptide that stimulates the thyrotrophs in the anterior pituitary to produce and secrete thyroid-stimulating hormone (TSH), a glycoprotein. TSH promotes both the growth of the thyroid gland and the secretion of thyroid hormones. TSH secretion itself is controlled by two opposing mechanisms: it is stimulated by TRH from the hypothalamus and inhibited by circulating thyroid hormones through negative feedback. This feedback is mainly mediated by free T₃, which reduces the sensitivity of thyrotrophs to TRH by down-regulating TRH receptors. (7)

In addition to hypothalamic-pituitary regulation, several extrathyroidal factors influence thyroid hormone homeostasis. Since thyroid hormone metabolism occurs largely in the liver and kidneys, conditions such as chronic liver disease or kidney dysfunction can disrupt the T₃ to T₄ ratio. Alcohol dependence further alters this

balance by impairing the hypothalamic-pituitary-thyroid axis, resulting in reduced levels of TSH, T3, and T4. Cigarette smoking has a dose-dependent suppressive effect on TSH secretion, with heavier smoking causing more significant reductions. Moreover, environmental exposure to heavy metals such as lead, mercury, and cadmium can interfere with thyroid hormone activity and its peripheral conversion further impacting overall hormonal balance.(8)

Thyroid function tests (TFTs) assess hormone levels to evaluate thyroid status. The thyroid mainly secretes T4, which is less potent than T3, with most T3 produced by—peripheral conversion of T4. In circulation, hormones are largely protein-bound primarily to thyroxine-binding globulin (TBG)—but only free T3 and T4 are biologically active, making their measurement more accurate than total hormone levels. TBG levels can rise with pregnancy, estrogen therapy, and hepatitis, or fall with nephrotic syndrome, malnutrition, certain medications, chronic liver disease, and acromegaly. In hyperthyroidism, TSH is typically low, with elevated T4 or, in rare cases, isolated T3 elevation. In hypothyroidism or during treatment follow-up, TSH is high and free T4 is low, while T3 is usually not useful. Test results vary depending on whether the thyroid disorder is primary or secondary in origin.(9)

Hyperthyroidism (Thyrotoxicosis)

Hyperthyroidism, or thyrotoxicosis, is a clinical condition characterized by excessive production of thyroid hormones (T3 and T4), leading to an increased basal metabolic rate and multisystemic manifestations. It is a common disorder, affecting approximately 2–5% of women at some point in their lives, with a female-to-male ratio of 5:1. It typically presents between the ages of 20 and 40 years. More than 99% of cases are due to intrinsic thyroid disease, while pituitary causes are extremely rare.

Causes of Hyperthyroidism

Hyperthyroidism may result from several etiologies, which can be classified into common, uncommon, and rare causes

Common Causes

Graves' disease: The most frequent cause of hyperthyroidism. It is an autoimmune condition in which IgG antibodies bind to TSH receptors on thyroid follicular cells, mimicking TSH and stimulating thyroid hormone production. These TSH receptor

antibodies (TSHR-Ab) are specific to Graves' disease.

Toxic multinodular goitre: Common in older women. While antithyroid medications can control hormone levels, remission is rarely achieved.

Solitary toxic nodule (toxic adenoma): Accounts for approximately 5% of cases. It does not typically respond to antithyroid drugs in terms of long-term remission.

Uncommon Causes:

Subacute (de Quervain's) thyroiditis: Often post-viral in origin. It causes transient hyperthyroidism accompanied by neck pain, malaise, fever, and elevated ESR. Thyroid uptake scans show suppressed uptake during the acute phase. Hypothyroidism may follow weeks later.

Postpartum thyroiditis: A self-limited autoimmune thyroiditis occurring after delivery.

Gestational thyrotoxicosis: Caused by HCG-induced thyroid stimulation during pregnancy.

Neonatal thyrotoxicosis: Caused by transplacental passage of maternal TSHR antibodies.

Exogenous iodine exposure: May trigger thyrotoxicosis, especially in susceptible individuals.

Amiodarone-induced thyrotoxicosis (AIT):

Type I AIT occurs in individuals with pre-existing thyroid disease (e.g., Graves' or multinodular goitre) and is triggered by the high iodine content of amiodarone.

Type II AIT occurs without prior thyroid disease and is due to a destructive thyroiditis caused by direct toxic effects of the drug on thyroid follicular cells. It may be followed by a hypothyroid phase.

Amiodarone also inhibits peripheral conversion of T4 to T3, leading to unusually high T4:T3 ratios.

Thyrotoxicosis factitia: Results from intentional or accidental ingestion of exogenous thyroid hormones (e.g., levothyroxine abuse).

Euthyroid goitre

Many goitres are small, cause no symptoms and can be observed (including self-monitoring by the patient in the longterm). In particular, during puberty and pregnancy a goitre

associated with euthyroidism rarely requires intervention and the patient can be reassured that spontaneous resolution is likely. Indications for surgical intervention are-
□ The possibility of malignancy. A positive or suspicious FNA makes surgery mandatory and surgery may be necessary if doubt persists even in the presence of a negative FNA (especially if the patient is concerned by the false-negative rate).

□ Pressure symptoms on the trachea or, more rarely, oesophagus. The possibility of retrosternal extensions should be excluded.
□ Cosmetic reasons. A large goitre is often a considerable anxiety to the patient even though functionally and anatomically benign. Radioactive iodine has also been advocated for the treatment of euthyroid goitre, particularly when surgery is an unattractive option. Toxic nodule This is initially with antithyroid drugs but surgery or radioiodine is often required.

Hypothyroidism A clinical disorder characterized by a deficiency in thyroid hormone production, leading to a generalized slowing of metabolic processes.(4)

Hypothyroidism is divided into primary, secondary, tertiary, and peripheral types. Primary hypothyroidism is caused by a deficiency of T4, secondary hypothyroidism is caused by a deficiency of TSH, and peripheral

hypothyroidism is caused by a deficiency of thyrotropin-releasing hormone. Secondary as well as tertiary hypothyroidism together constitute central hypothyroidism. Central and peripheral hypothyroidism (extrathyroidal) are very rarely seen (<1%) [10,11].

Primary Hypothyroidism In iodine-sufficient areas, the leading cause of thyroid peroxidase (TPO) and anti-thyroglobulin antibodies. TPO antibodies are found in most Hashimoto's patients and in about 12% of healthy individuals. In subclinical hypothyroidism, the presence of TPO antibodies indicates a higher risk of progression to overt hypothyroidism.(12,13)

The exact cause of Hashimoto's remains unclear, but both genetic and environmental factors play a role. A genetic risk score based on specific gene variants has shown a link between higher TSH levels and clinical hypothyroidism (14,15). Interestingly, TPO antibody levels are lower in smokers, though the risk of autoimmune thyroiditis increases after quitting smoking(16,17). Other contributing factors include vitamin D and selenium deficiencies and moderate alcohol intake(18,19).

Iodine is essential for thyroid hormone production. Its deficiency can lead to goiter,

thyroid nodules, hypothyroidism, and the most severe condition—cretinism, which causes impaired physical and mental development in infants. Iodine fortification is a low-cost, effective public health measure to prevent these disorders(20,21).

Certain medications can affect thyroid function. Iodine-containing drugs like amiodarone may reduce thyroid hormone production through the Wolff-Chaikoff effect, leading to hypothyroidism in about 15% of patients. Conversely, excess iodine can cause hyperthyroidism (Jod-Basedow syndrome). Lithium also disrupts thyroid hormone synthesis and release, with around 6% of users needing levothyroxine within 18 months. Tyrosine kinase inhibitors, especially sunitinib, are linked to a higher risk of hypothyroidism compared to sorafenib. Other drugs such as thalidomide, interferon-alpha, anti-epileptics, and some TB treatments can also induce primary hypothyroidism(22,23).

Hypothyroidism commonly occurs after treatments like radioiodine therapy, hemithyroidectomy, neck radiation, or cancer surgery. Around 75% of Graves' disease patients develop hypothyroidism even with low radioiodine doses. It also affects 50% of those treated for toxic nodular goiter and 7% with toxic nodules. A meta-analysis found a 20% rate after hemithyroidectomy. Other causes include infiltrative diseases and transient thyroiditis (24,25).

–Thyroid disorders represent a major global public health concern, with an estimated 5 .of the population affected by some form of thyroid dysfunction [1] %10 Hypothyroidism, hyperthyroidism, and autoimmune thyroiditis are among the most ,frequently encountered endocrine disorders. Women are disproportionately affected especially during reproductive and post-menopausal years [2]. The World Health Organization (WHO) has identified iodine deficiency as the leading cause of preventable thyroid disease globally, particularly in regions lacking universal salt . iodization (26)

In many African countries, including Sub-Saharan Africa, the burden of thyroid .disease is significantly influenced by nutritional factors, particularly iodine deficiency Iodine-deficiency disorders (IDDs) such as goiter remain highly prevalent, especially in rural and economically disadvantaged communities [4]. Limited access to healthcare services, inadequate nutritional programs, and poor awareness have contributed to the

underdiagnosis and underreporting of thyroid conditions in Africa. A 2020 review indicated that hypothyroidism in African populations may often go unrecognized due to overlapping symptoms with other endemic diseases (27,28)

in Sudan, thyroid disorders are increasingly recognized as a common clinical problem. Several local studies have identified a notable prevalence of goiter and hypothyroidism, particularly among females and individuals from iodine-deficient regions [6]. A study conducted in Khartoum reported that more than 20% of patients presenting to endocrine clinics had evidence of thyroid dysfunction [29]. However, there is a lack of updated data from Northern regions like Atbara, highlighting the need for localized research and reporting to better understand the regional patterns and risk factors.

Importance of the Study :

This study holds significant value as it aims to provide current epidemiological data on the frequency of thyroid disease among patients at Atbara Teaching Hospital and Aldamar Teaching Hospital during the period of 2024–2025. Despite the known global and national burden of thyroid disorders, there is limited data specific to Northern Sudan, particularly in Atbara. Understanding local prevalence is essential for improving early diagnosis, guiding appropriate treatment, and reducing disease complication(28,30)

Furthermore, this study may help bridge the gap between national healthcare policies and local healthcare needs. It could inform public health planning, support iodine supplementation initiatives, and aid in designing awareness programs targeting at-risk populations [29]. The data generated may also be a valuable reference for future research and provide a foundation for introducing thyroid screening programs in regional hospitals.

1.3.__:Problem Statement

Thyroid diseases are among the most common endocrine disorders worldwide, with a significant impact on individual health and public healthcare systems. Despite their prevalence and potential complications, they are often underdiagnosed or diagnosed late, especially in low-resource settings. In Sudan, there is a paucity of recent epidemiological data regarding the frequency and distribution of thyroid disorders. Atbara Teaching Hospital and Aldamar Teaching Hospital serves a large population in River Nile State, but no recent study has documented the burden of thyroid disease among its patients. This gap in data may hinder efforts to improve early diagnosis management, and resource allocation. Therefore, this study aims to determine the frequency of thyroid disease among patients attending Atbara Teaching Hospital and Aldamar Teaching Hospital during the period 2024–2025.

1.4.Justification :

This study aims to investigate the frequency of thyroid diseases among patients admitted to the Medicine and Surgery Departments at Atbara Teaching Hospital and Aldamar Teaching Hospital during the period 2024–2025

Thyroid disorders are among the most common endocrine diseases worldwide affecting millions of individuals and leading to a wide range of clinical symptoms that can significantly impair quality of life. Despite their prevalence, these conditions are often underdiagnosed or mismanaged, particularly in low-resource settings. By identifying the patterns and distribution of thyroid diseases within a key healthcare facility in Atbara and Aldamar this research seeks to contribute to a better understanding of the burden of thyroid disorders in the region. The study will also help highlight demographic variations such as differences in prevalence by age and gender which are important for early detection and effective clinical management. The findings may also support healthcare providers and policymakers in planning awareness programs and improving diagnostic and treatment protocols for thyroid-related conditions

1.5.Objectives of the Study

1.5.1.:General Objective

To assess the frequency of thyroid diseases among patients attending the Medicine and Surgery Departments at Atbara Teaching Hospital and Aldamar Teaching Hospital.during the period 2024–2025

1.5.2.:Specific Objectives

To determine the distribution of thyroid diseases among inpatients and outpatients in .the Medicine and Surgery Departments

To identify the most common types of thyroid disorders diagnosed during the study .period

To assess the demographic characteristics (age, gender) of patients with thyroid .diseases

Chapter Two

Methodology

2. Methodology

2.1.:Study Design

This is a descriptive cross-sectional hospital-based study conducted to determine the frequency of thyroid disease among patients attending Atbara and Eldamer Teaching Hospitals.

2.2.:Study Area

The study was conducted at Atbara and Eldamer Teaching Hospitals, the main referral centers in River Nile State, Northern Sudan, serving over 500,000 people.

Atbara Teaching Hospital, located in Atbara city, is a tertiary facility with about 300 beds, including 80 in the medical and 70 in the surgical departments, and has full diagnostic and laboratory services.

Eldamer Teaching Hospital, 20 km north of Atbara, has around 150 beds and provides general medical and surgical care.

Both hospitals are affiliated with El-Sheikh Abdallah Elbadri University and serve as major teaching and research centers, making them appropriate settings for this hospital-based cross-sectional study on thyroid disorders.

2.3.:Study Period

The study was carried out over a two-year period, from January 2024 to August 2025.

2.4.:Study Population

The study included all patients diagnosed with thyroid disease who attended the internal medicine and surgical departments of Atbara and Eldamer Teaching Hospitals during the study period.

2.4.1.:Inclusion Criteria

Patients of all age groups and both genders -

Confirmed clinical and/or laboratory diagnosis of thyroid disease (e.g. - hypothyroidism, hyperthyroidism, goiter, thyroid nodules, or thyroid cancer)

2.4.2.:Exclusion Criteria

Patients with incomplete medical records -

Patients refusing to participate or withdraw consent -

2.5 Sample Size

A convenience sampling method was used. All eligible patients during the study period who fulfilled the inclusion criteria were enrolled.

$$n = \frac{Z^2 \times P \times (1 - P)}{d^2}$$

Where :

N = required sample size

z = standard normal value corresponding to the 95% confidence level (1.96)

p = estimated studies (20%=0.20)

d = desired margin of error (0.05)

Substituting the values

$$n = \frac{(1.96)^2 \times 0.20 \times (1 - 0.20)}{(0.05)^2}$$
$$n = \frac{3.8416 \times 0.16}{0.0025} = \frac{0.614656}{0.0025} = \mathbf{245.8}$$

Thus , the calculated minimum sample size was 246 participants

2.6.sample tequnice

The study will use a systematic random sampling technique to select participants from patients attending the medical and surgical outpatient departments and wards of Atbara and Eldamer Teaching Hospitals. Every nth patient who meets the inclusion criteria will be selected based on the daily attendance log, ensuring proportional representation throughout the study period. This method allows for reducing sampling bias and ensuring that the sample reflects the general patient population of the hospital

2.7.:Data Collection Tools

.Data were collected using a structured questionnaire and by reviewing patient records
The questionnaire included demographic data (age, gender, residence), clinical features, type of thyroid disease, laboratory findings (TSH, T3, T4), imaging results and history of surgical intervention or medical treatment

2.8.:Data Analysis

Data were entered and analyzed using SPSS (Statistical Package for the Social Sciences) version [mention version used]. Results were presented in tables and figures using frequencies and percentages

2.9. Study Variables

1. Dependent Variable:

- Presence of thyroid disease (Yes/No)

2. Independent Variables:

- Age

- Gender
- Residence (urban/rural)
- Type of thyroid disorder (e.g., hypothyroidism, hyperthyroidism, goiter, thyroid nodules, cancer)
- Duration of disease
- Family history of thyroid disease
- Presence of other comorbidities (e.g., diabetes, hypertension)
- Medications used for thyroid disease
- Whether thyroid surgery has been done

2.10: Ethical Considerations

Ethical approval was obtained from the Research and Ethics Committee of the Faculty of Medicine, El Sheikh Abdullah Albadri. Informed consent was obtained from all participants. Patient confidentiality and data privacy were ensured throughout the study.

Chapter Three

Results

3.Results:

Table 1: Demographic Characteristics of University Students (N=117)

Characteristic	N = 103 ¹
1. Department	
Medicine	41 (40%)
Surgery	62 (60%)
2. Age	35 (27, 48)
3. Gender	
Female	63 (61%)
Male	39 (38%)
None	1 (1.0%)
4. Marital status	
Divorced	9 (8.7%)
Married	51 (50%)
None	16 (16%)
Single	26 (25%)
Widowed	1 (1.0%)
5. Residence	
None	8 (7.8%)
Rural	39 (38%)
Urban	55 (53%)
¹ n (%); Median (Q1, Q3)	

Table 2: Interpretation of Thyroid-Related Characteristics in the Cohort (N=103)

Characteristic	Category	n (%)
7. What the specify the type:	Cancer	2 (1.9%)
	Goiter	26 (25%)
	Goiter, MNG	2 (1.9%)
	Goiter, Multidiffuse goiter	1 (1.0%)
	Goiter, Multinodular goiter	1 (1.0%)
	Goiter, simple solitary	1 (1.0%)
	Goiter, Thyroglossed cyst	1 (1.0%)
	Goiter, Thyrotoxicosis	1 (1.0%)
	Hyperthyroidism	18 (17%)
	Hyperthyroidism, Graves disease	1 (1.0%)
	Hypothyroidism	25 (24%)
	Recurrent Multigoiter	1 (1.0%)
	Thyroglossal cyst	1 (1.0%)
	Thyroiditis	12 (11.6%)
	Toxic MNG	1 (1.0%)
8. Are you currently taking thyroid medications?	No	48 (47%)
	Yes	31 (30%)
If yes, type of medication	Alternative - Carbimazole, Between them - Thyroxin according to symptoms	1 (1.0%)
	Carbamazole	1 (1.0%)
	Carbamazole for 3 months, Thyroxin for 8 years	1 (1.0%)
	Carbamazole	14 (14%)

	Carbimazole, Propranolol	2 (2.0%)
	Carbimazole, Vitamin D3	1 (1.0%)
	Levethyroxine	9 (8.8%)
	None	52 (51%)
	Radioactive Iodine	1 (1.0%)
	Thyroxin	14 (2.0%)
9. Is there a family history of thyroid disease?	No	71 (69%)
	Yes	27 (26%)
If yes, specify the type if known:	goiter	1 (1.0%)
	Goiter	3 (2.9%)
	Goiter, hypothyroidism	1 (1.0%)
	Hyper	2 (1.9%)
	Hyperthyroidism	3 (2.9%)
	Hyperthyroidism (Brother)	1 (1.0%)
	Hypothyroidism	9 (8.7%)
10. Have you undergone thyroid surgery?	No	37 (36%)
	None	5 (4.9%)
	Yes	61 (59%)
If yes:	Cancer	7 (6.8%)
	Hyperthyroidism	4 (3.9%)
	Hypothyroidism	1 (1.0%)
Are you planned for surgery?	No	54 (52%)
	Yes	11 (11%)

Table 3:Prevalence of Symptoms in the Cohort (N=103)

Characteristic	No N = 103 ¹	Yes N = 103 ¹
Statement		
Cold intolerance	55 (9.2%)	7 (3.3%)
Excessive sweating	42 (7.1%)	20 (9.5%)
General fatigue	40 (6.7%)	22 (10%)
Heat intolerance	47 (7.9%)	15 (7.1%)
hyperactivity	58 (9.7%)	4 (1.9%)
Irregular heartbeat	56 (9.4%)	6 (2.8%)
Irregular menstrual cycle (Females)	52 (8.7%)	10 (4.7%)
Lethargy or anxiety	49 (8.2%)	13 (6.2%)
Neck swelling	14 (2.4%)	48 (23%)
Sleep disturbances	56 (9.4%)	6 (2.8%)
tachycardia	33 (5.5%)	29 (14%)
Weight gain	54 (9.1%)	8 (3.8%)
Weight loss	39 (6.6%)	23 (11%)
¹ n (%)		

TABLE 4 : Thyroid Function Tests and Surgical Planning (N=103)

Characteristic	Category	n (%)
Are you planned for surgery?	No	54 (52%)
	None	38 (37%)
	Yes	11 (11%)
11. Have you undergone thyroid function tests (TSH, T3, T4)?	No	27 (26%)
	None	11 (11%)
	Yes	65 (63%)
12. Last Results (if available): TSH	Ranges	
	Very Low (e.g., ≤ 0.2)	9 (8.7%)
	Low/Mid-Normal (e.g., 0.37 - 2.9)	14 (13.6%)
	Elevated (e.g., ≥ 6.2)	16 (15.5%)
	Normal	1 (1.0%)
12. Last Results (if available): T3	Ranges	
	Low (e.g., ≤ 1.5)	6 (5.8%)
	Mid-range (e.g., 1.7 - 5.9)	7 (6.8%)
	High (e.g., ≥ 6.5)	11 (10.7%)
	Normal	1 (1.0%)
12. Last Results (if available): T4	Ranges	
	Low (e.g., ≤ 1.1)	5 (4.9%)
	Mid-range (e.g., 3 - 9.6)	14 (13.6%)
	High (e.g., ≥ 11)	11 (10.7%)
	Other specific values / qualitative	6 (5.8%)
	None	57 (55%)
	Normal	1 (1.0%)

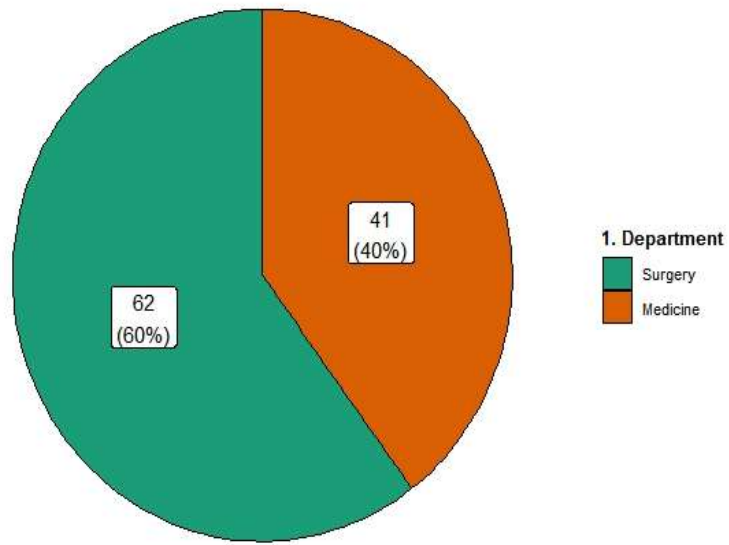


Figure 1: Department Distribution of the study participants

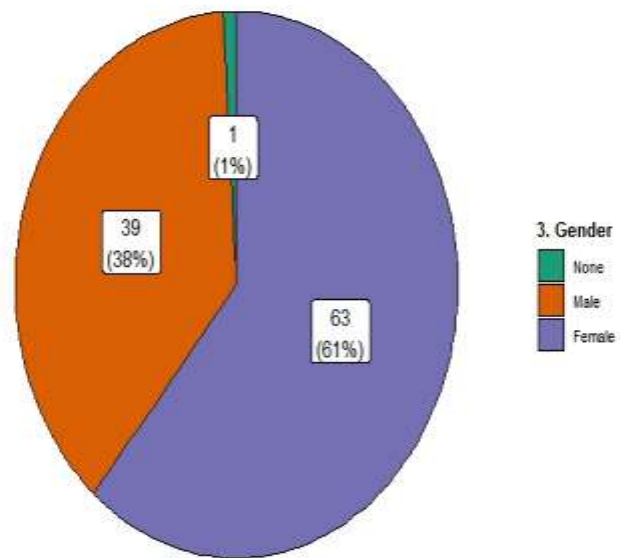


Figure 2: Gender Distribution of the study participants

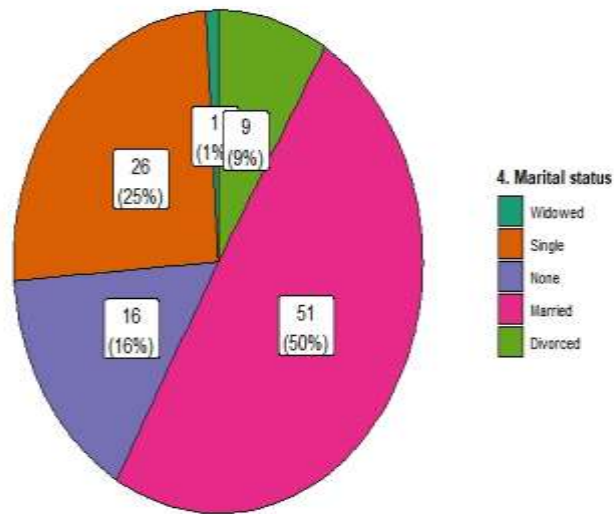
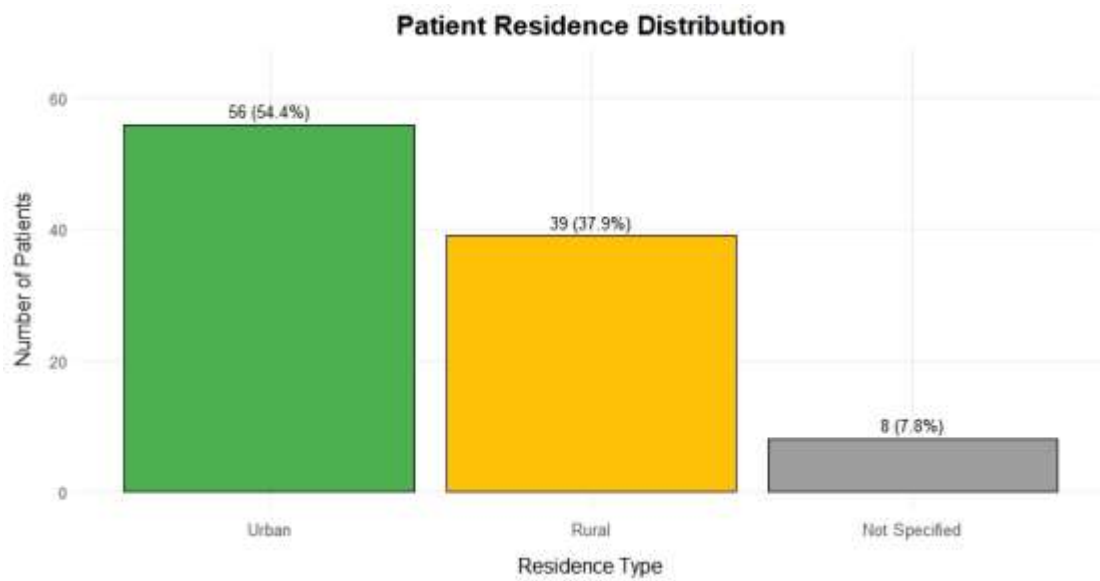
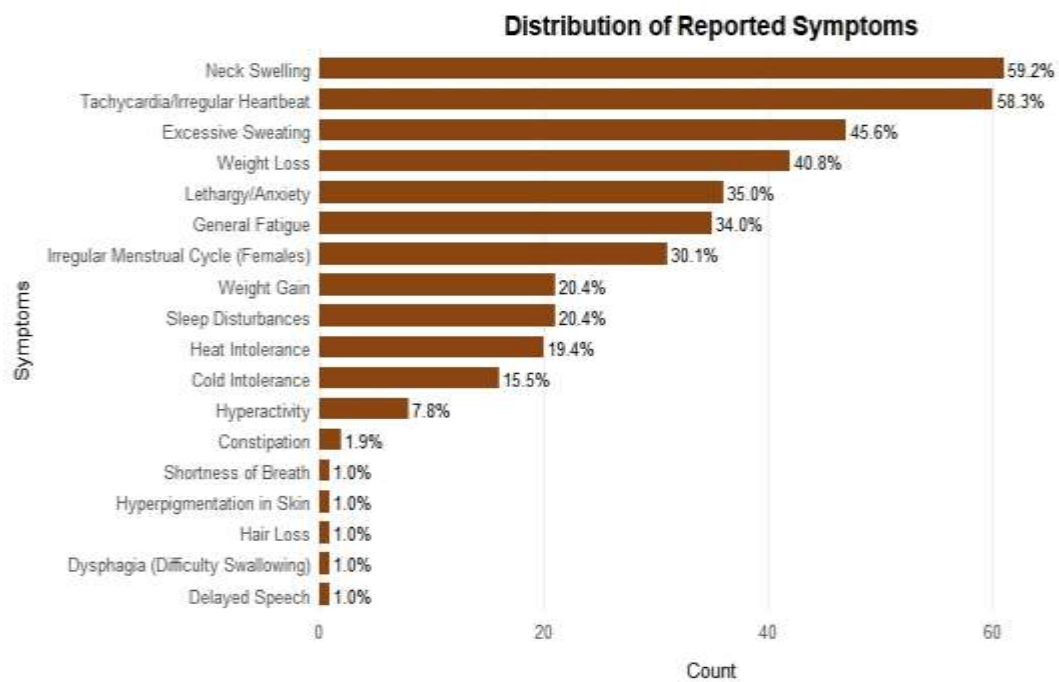
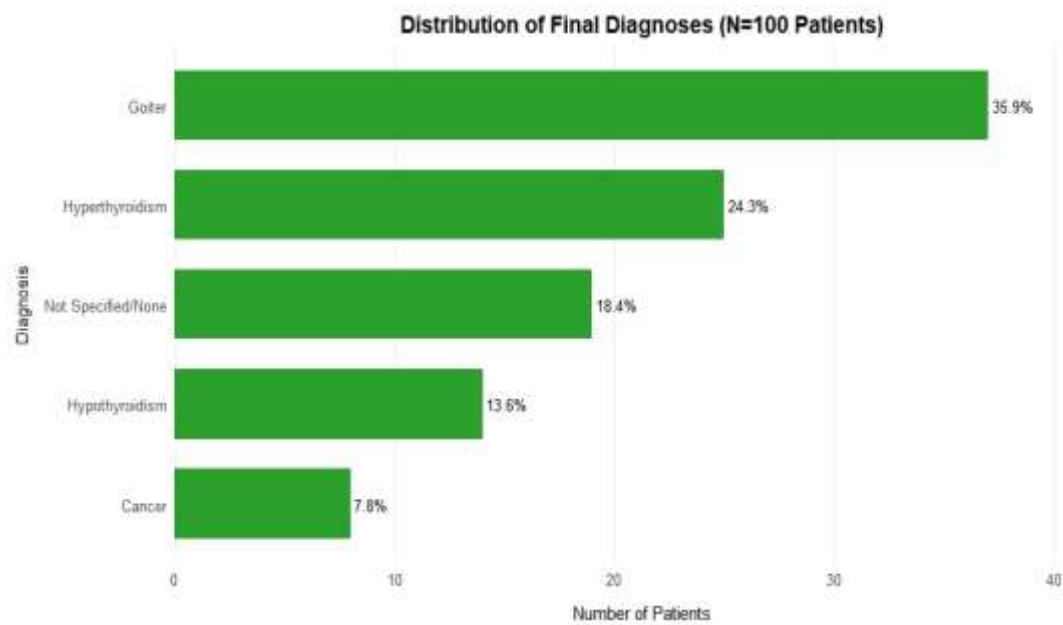
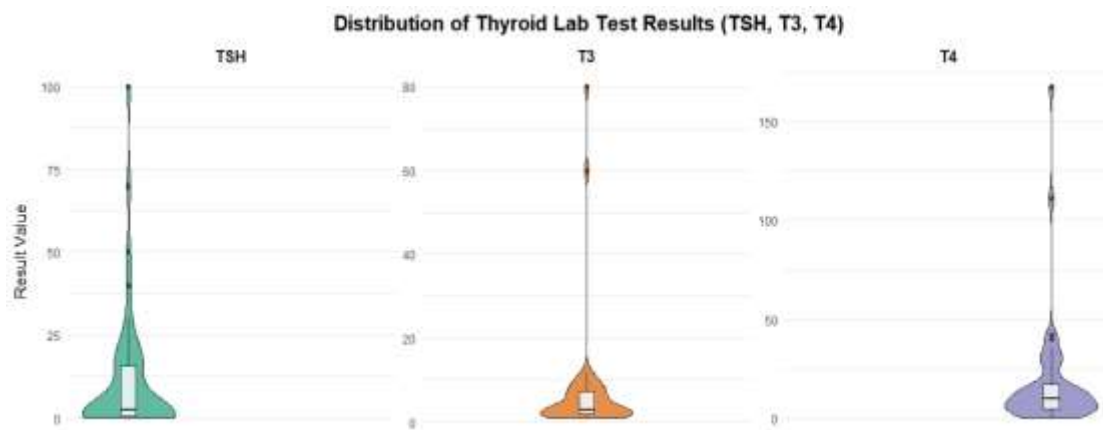
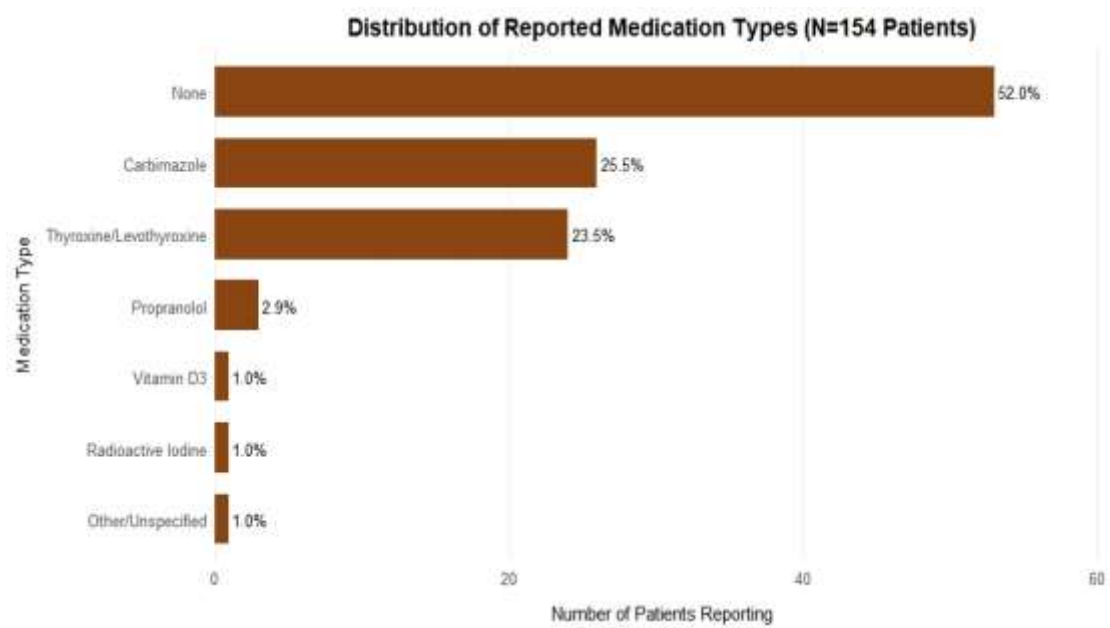
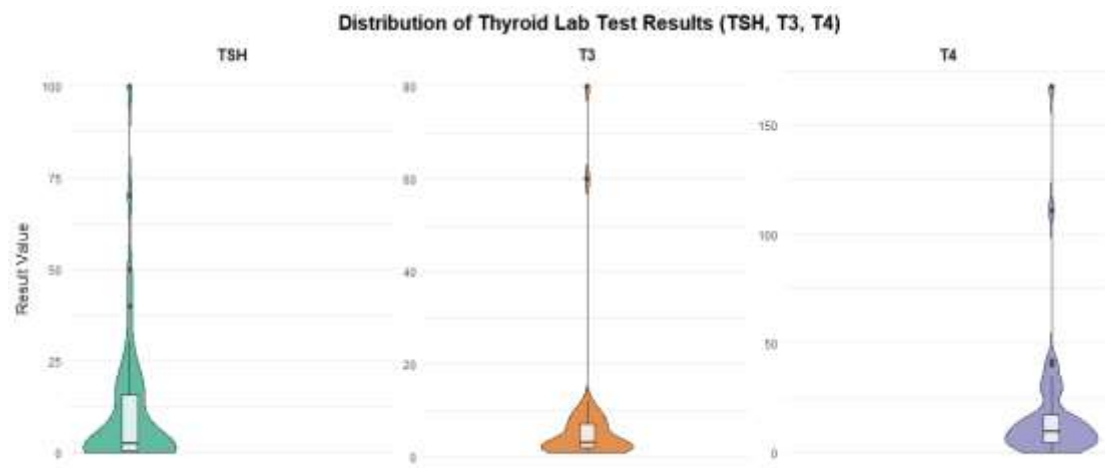
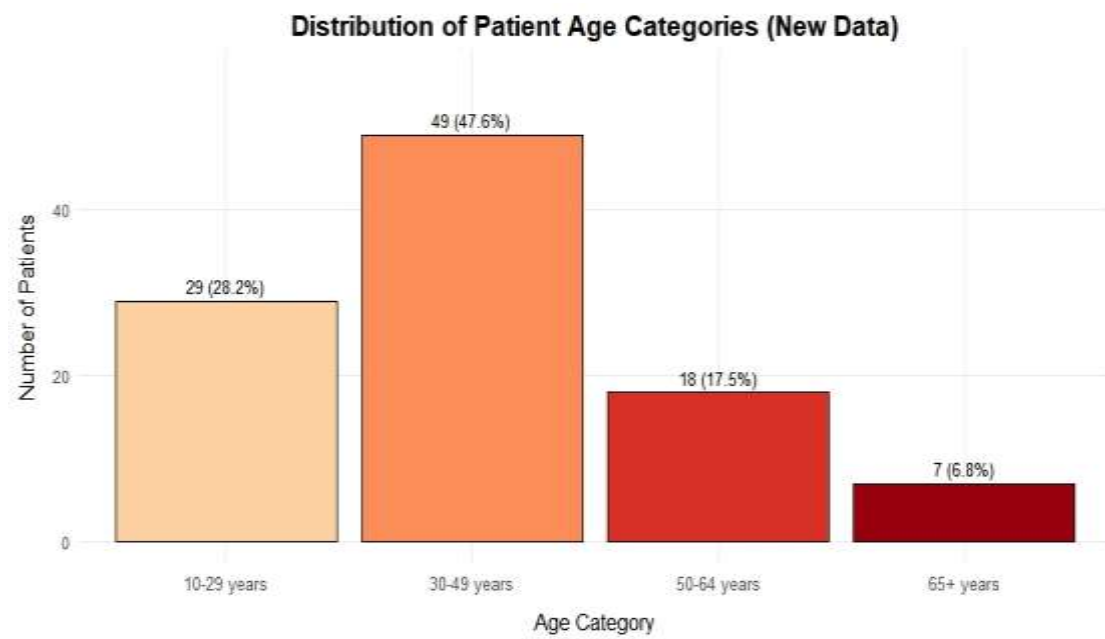


Figure 3: Marital Status Distribution of the study participants







3.Results:

This analysis of a cohort of 103 individuals reveals specific demographic characteristics. The cohort is primarily divided between two departments: Surgery, which accounts for 62 individuals (60%), and Medicine, comprising 41 individuals (40%). The median age of the cohort is 35 years, with an interquartile range of 27 to 48 years. The gender distribution shows a majority of females, with 63 individuals (61%), followed by males at 39 individuals (38%), and 1 individual (1.0%) identifying as "None." In terms of marital status, married individuals constitute the largest group with 51 individuals (50%), followed by single individuals at 26 (25%). Divorced individuals account for 9 (8.7%), those with "None" specified for marital status are 16 (16%), and 1 individual (1.0%) is widowed. The residence distribution indicates that the majority, 55 individuals (53%), reside in urban areas, with 39 individuals (38%) living in rural areas. A small number, 8 individuals (7.8%), have "None" specified for residence

Table 1: Demographic Characteristics of University Students (N=117)

Table 2: Interpretation of Thyroid-Related Characteristics in the Cohort (N=103)

This analysis of 103 individuals reveals a diverse spectrum of thyroid conditions and related medical histories. The most frequently specified thyroid condition is Goiter, affecting 26 individuals (25%), followed by Hypothyroidism at 25 individuals (24%), and Hyperthyroidism at 18 (17%), with various other specific types of Goiter, Hyperthyroidism, and Thyroiditis also present. Regarding current medication use, 31 individuals (30%) are currently taking thyroid medications. Carbimazole is the most common medication type, prescribed to 14 individuals (14%), followed by various forms of Levothyroxin and Thyroxin. Conversely, 48 individuals (47%) are not on medication, and 24 (23%) have "None" specified. A significant majority, 71 individuals (69%), report no family history of thyroid disease, while 27 (26%) do, with Hypothyroidism (9 individuals, 8.7%) being the most commonly specified familial condition. Thyroid surgery has been undergone by a substantial portion of the cohort, with 61 individuals (59%) having had surgery, most frequently for Cancer (7 individuals, 6.8%) or Hyperthyroidism (4 individuals, 3.9%). Lastly, 11 individuals (11%) are currently planned for surgery, while 54 (52%) are not, and 38 (37%) have "None" specified for planned surgery.

Prevalence of Symptoms in the Cohort (N=103)

This analysis of 103 individuals reveals the prevalence of various symptoms. Neck swelling is the most frequently reported symptom, with 48 individuals (46.6%) experiencing it, while 14 individuals (13.6%) do not. Tachycardia is also notably present, affecting 29 individuals (28.2%), with 33 individuals (32.0%) not experiencing it. Weight loss is reported by 23 individuals (22.3%), and General fatigue by 22 individuals (21.4%). Excessive sweating is experienced by 20 individuals (19.4%). Other symptoms are less common. Heat intolerance affects 15 individuals (14.6%), and Lethargy or anxiety is reported by 13 individuals (12.6%). Irregular menstrual cycle (Females) is experienced by 10 individuals (9.7%), Weight gain by 8 individuals (7.8%), and Cold intolerance by 7 individuals (6.8%). The least frequently reported symptoms are Irregular heartbeat and Sleep disturbances, each affecting 6 individuals (5.8%), and Hyperactivity, reported by 4 individuals (3.9%). The "No" responses for most symptoms are considerably higher, indicating that a majority of the cohort does not experience these specific symptoms.

TABLE 4 : Thyroid Function Tests and Surgical Planning (N=103)

Interpretation of Thyroid Function Tests and Surgical Planning in the Cohort (N=103)

This analysis of 103 individuals provides insight into their thyroid function testing and surgical planning. Regarding future surgery, 54 individuals (52%) are not planned for surgery, while 11 (11%) are, and 38 (37%) have "None" specified. A significant majority, 65 individuals (63%), have undergone thyroid function tests (TSH, T3, T4), with 27 (26%) not having done so, and 11 (11%) having "None" specified. For TSH results, a substantial portion (54%) had "None" specified. Among those with available results, a small number (9 individuals, 8.7%) showed very low TSH levels (e.g., ≤ 0.2), while 14 individuals (13.6%) had results in the low to mid-normal range (e.g., 0.37 - 2.9). Conversely, 16 individuals (15.5%) exhibited elevated TSH levels (e.g., ≥ 6.2), suggesting potential hypothyroidism. For T3 results, 65 individuals (63%) had "None" specified. Among the reported values, 6 individuals (5.8%) had low T3 levels (e.g., ≤ 1.5), 7 individuals (6.8%) were in the mid-range (e.g., 1.7 - 5.9), and 11 individuals (10.7%) showed high T3 levels (e.g., ≥ 6.5). For T4 results, 57 individuals (55%) had "None" specified. Among the reported values, 5 individuals (4.9%) had low T4 levels (e.g., ≤ 1.1), 14 individuals (13.6%) were in the mid-range (e.g., 3 - 9.6),

and 11 individuals (10.7%) showed high T4 levels (e.g., ≥ 11). The varied TSH, T3, and T4 results, particularly the presence of both very low and elevated values, suggest a significant proportion of the cohort experiences thyroid dysfunction, consistent with a patient population undergoing investigation or treatment for thyroid conditions.

Chapter Four

Discussion

4.1. Discussion :

Our study extensively characterized the demographic and clinical profiles of 103 patients with thyroid diseases seen at Atbara Teaching Hospital between 2024-2025. The population was female-majority, representing 61% (N=63) of participants, with a median age of 35 years (interquartile range, IQR: 27-48 years) [Our Study, Table 1]. The majority of patients belonged to urban residence (53%, N=55) [Our Study, Table 1]. The most frequently reported thyroid disorder was Goiter at 25% (N=26), followed by Hypothyroidism at 24% (N=25), and Hyperthyroidism at 17% (N=18) [Our Study, Table 2]. High levels of participants had a history of thyroid surgery, with 59% (N=61) having undergone an operation, and 30% (N=31) on thyroid medication [Our Study, Table 2]. Symptom burden was considerable, with 46.6% (N=48) reporting swelling in the neck, 28.2% (N=29) reporting tachycardia, 22.3% (N=23) reporting weight loss, and 21.4% (N=22) reporting generalized fatigue [Our Study, Table 3]. Thyroid function tests (TSH, T3, T4) showed a wide range of abnormal results, including 15.5% (N=16) with increased TSH, 8.7% (N=9) with very low TSH, 10.7% (N=11) with elevated T3, and 10.7% (N=11) with elevated T4 among those tested [Our Study, Table 4]. Together, these findings highlight a high prevalence of thyroid dysfunction within the cohort, consistent with evidence of a significant public health problem affecting mainly women in regions like Sudan [1–7].

The prevalence of goiter (25%), hypothyroidism (24%), and hyperthyroidism (17%) among our relatively young (median age 35 years), predominantly female Sudanese population reflects a high and heterogeneous burden of thyroid disease. Swelling in the neck (46.6%, N=48) [Our Study, Table 3] is a typical manifestation of goiter, which has long been endemic in many regions of Sudan due to widespread iodine deficiency. The female predominance (61%) and presentation in early to mid-adulthood (median age 35 years) are expected, as autoimmune thyroid disorders such as Graves' disease and Hashimoto's thyroiditis are more frequent in women and often present during these ages. The heterogeneous TSH, T3, and T4 levels—including low TSH (8.7%) and elevated TSH (15.5%), T3 (10.7%), and T4 (10.7%)—further illustrate the variation of thyroid dysfunction within the cohort, reflecting patients actively under evaluation or treatment for diverse disorders.

A high proportion of patients (59%, N=61) had previously undergone thyroid surgery, often for cancer (6.8%, N=7) or hyperthyroidism (3.9%, N=4) [Our Study, Table 2], with 11% (N=11) scheduled for future surgery [Our Study, Table 4]. Similarly, 30% (N=31) were receiving thyroid medication, including Carbimazole (14%, N=14) and Levothyroxine/Thyroxine (multiple preparations) [Our Study, Table 2], reflecting the chronic nature of these diseases and ongoing need for pharmacological management. These findings underscore the high individual and healthcare system burden of thyroid disorders in this population.

Identification of Goiter (25%), Hypothyroidism (24%), and Hyperthyroidism (17%) as the most prevalent dysfunctions aligns with the broader understanding of thyroid disease in Sudan and other iodine-deficient regions. Abbas et al. (2023) provides a recent context by examining thyroid function in Sudanese women during the first trimester of pregnancy. Although our study population was not exclusively pregnant, the varied TSH, T3, and T4 findings in our cohort (e.g., 15.5% elevated TSH, 8.7% very low TSH, 10.7% high T3, 10.7% high T4) [Our Study, Table 4] are broadly consistent with their reported thyroid dysfunction, highlighting the heterogeneous nature of thyroid function across different groups.

Yadav et al. (2021), investigating thyroid disease in diabetic patients in rural South India, observed a lower prevalence of hyperthyroidism (2.9%) compared to our 17%. While subclinical plus clinical hypothyroidism prevalence (17.2%) was similar to our 24%, differences in study population and

setting likely explain the variation. Diabetic patients often have comorbidities that can affect thyroid function.

Similarly, Abbas et al. (2023) reported high rates of elevated TSH (24.4%) in pregnant women, compared with 15.5% high TSH, 8.7% very low TSH, 10.7% high T3, and 10.7% high T4 in our general population [Our Study, Table 4]. Differences may reflect the specific physiology of pregnancy and assessment of iron deficiency, which were not evaluated in our cohort.

Public health interventions are urgently required, including reinforcement of universal salt iodization programs, which have proven effective in preventing iodine-deficiency-related thyroid disorders.

4.2.Conclusion :

Overall, our findings strongly suggest a significant burden of thyroid disease as reflected in high goiter (25%), hypothyroidism (24%), and hyperthyroidism (17%) prevalence among a young (median age 35 years), predominantly female (61%) hospital ,based patient population in Atbara-and Aldamar Teaching Hospital .Sudan ,This is consistent with the known epidemiology of thyroid disease in the region .although with some variation in reported frequency compared to other investigations The very high rates of surgery (59%) and ongoing medication (30%) indicate the high clinical burden. More large-scale, longitudinal observational studies with the application of objective diagnostic criteria, precise measurement of iodine status, and the addition of autoimmune markers are required to confirm these observations, to establish the precise etiologies involved, and to appropriately inform targeted public health and clinical interventions for the prevention and total care of thyroid dysfunction .in Sudan

4.3.Limitations of the Study

Despite these strengths, our study is not exempt from limitations. The cross-sectional design does not permit the determination of causality or the longitudinal progression of thyroid disorders over time. The relatively small sample size of 103 participants while enabling detailed information, may limit the applicability of our findings to the broader Sudanese population, particularly as it is a hospital-based sample that may not be entirely representative of the general population. The reliance on self-reported symptoms and medical history for some of the variables has the potential for recall bias. Moreover, the research did not assess underlying etiologies of thyroid dysfunction, such as specific autoimmune markers (e.g., anti-TPO antibodies) or a comprehensive evaluation of iodine status, that are crucial for an in-depth understanding of thyroid epidemiology . However, these aspects are unlikely to have had a major impact on the main descriptive findings regarding the prevalence of .diagnosed conditions and reported symptoms in this specific patient group

,Overall, our findings provide strong evidence of a heavy burden of thyroid disease ,with high rates of goiter, hypothyroidism, and hyperthyroidism, in a young predominantly female, hospital population in Sudan. This is in keeping with the known epidemiology of thyroid disease in the region, albeit with some variation in reported frequencies compared to other studies. The high rates of surgical intervention and ,ongoing medication indicate the significant clinical burden. Further large-scale longitudinal studies with objective diagnostic criteria, careful assessment of iodine status and autoimmune markers, are required to confirm these findings, elucidate the etiologies involved, and adequately inform targeted public health and clinical .interventions for prevention and holistic management of thyroid dysfunction in Sudan

4.4. Recommendations:

- Increase Public Awareness: Organize and reinforce public health campaigns that raise awareness about thyroid disorders, symptoms, early detection, and treatment, and target specifically the general population in River Nile State.
- Enhance Early Screening Programs: Develop and enforce targeted screening programs for thyroid dysfunction, especially for those at high risk, such as young to middle-aged women, because they have a relatively higher prevalence of such diseases.
- Improve Access to Diagnostic Services: Ensure equal and timely access to complete thyroid function tests (TSH, T3, T4) and other diagnostic modalities (e.g., ultrasound, specific autoimmune markers) in Atbara Teaching Hospital and in the nearby healthcare facilities. This includes removing the instances of "None" recorded for test results.
- Enhance Treatment Regimens: Review and update clinical guidelines and treatment protocols for the management of a variety of thyroid conditions (goiter, hypo- and hyperthyroidism) to bring them in line with international best practice and availability of resources locally.
- Strengthen Iodine Supplementation Programs: Evaluate the region's iodine status and, if warranted, strengthen or reestablish universal salt iodization programs to combat iodine deficiency, a major underlying cause of goiter and hypothyroidism.
- Develop Gender-Specific Health Education: Focus on health education and screening programs specifically for women, highlighting the specific impact of thyroid disease on the reproductive health and general well-being of women.
- Conduct Advanced Etiological Research: Future research should investigate deeper into the root etiologies of thyroid disease among the Sudanese population, including the assessment of specific autoimmune markers (e.g., anti-TPO antibodies) and population-level iodine status.
- Perform Large-Scale, Longitudinal Studies: To counter the limitations of a single-center, cross-sectional study, future studies should encompass multicenter, large cohorts and longitudinal design to determine the actual prevalence, incidence, progression, and long-term outcome of thyroid diseases in Sudan.

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Questionnaire

Frequency of thyroid disorders among patients in ATBARA and ELDAMER teaching hospitals in 2024_2025

Section 1: Personal Information

Age: _____ Years .1

Gender: ☐ Male ☐ Female .2

Department: ☐ Medicine ☐ Surgery .3

_____/_____/_____:Date of hospital admission .4

Marital status: ☐ Single ☐ Married ☐ Divorced ☐ Widowed .5

Residence: ☐ Urban ☐ Rural .6

Section 2: Medical History

Have you ever been diagnosed with a thyroid disease? ☐ Yes ☐ No .7

If yes, specify the type

_____ Hyperthyroidism ☐ Hypothyroidism ☐ Goiter ☐ Thyroiditis ☐ Other ☐

Are you currently taking thyroid medications? ☐ Yes ☐ No .8

If yes, type of medication

Is there a family history of thyroid disease? ☐ Yes ☐ No .9

_____ If yes, specify the type if known

Have you undergone thyroid surgery? ☐ Yes ☐ No .10

If yes: ☐ Cancer ☐ Hyperthyroidism

Have you planned to surgery? ☐ Yes ☐ No

Section 3: Clinical Symptoms

:Do you experience any of the following symptoms? (Select all that apply) .11

General fatigue ☐ Weight gain/loss ☐

Lethargy or anxiety ☐ Excessive sweating ☐

Neck swelling ☐ Irregular menstrual cycle (females) ☐

_____ :Sleep disturbances ☐ Irregular heartbeat ☐ Other ☐

Section 4: Investigations & Diagnosis

Have you undergone thyroid function tests (TSH, T3, T4)? ☐ Yes ☐ No .12

Test Results (if available) .13

_____ :TSH: _____ T3: _____ T4

:Final Diagnosis .14

Normal ☐ Hypothyroidism ☐ Hyperthyroidism ☐ Goiter ☐ Cancer ☐ Not specified ☐

Section 5: Additional Notes (Optional)

_____ :Disease progression

_____ :Type of date

_____ :Another additional