CLINICOPATHOLOGICAL CHARACTERISTICS AND OUTCOMES OF THYROIDECTOMY AT MUHIMBILI NATIONAL HOSPITAL.

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CLINICOPATHOLOGICAL CHARACTERISTICS AND OUTCOMES OF THYROIDECTOMY AT MUHIMBILI NATIONAL HOSPITAL.

By

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A Dissertation Submitted in Partial Fulfillment of the Requirement for the Degree of Master of Medicine in General Surgery of the

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CERTIFICATION

I, the undersigned, certify that I have thoroughly reviewed and hereby endorse the acceptance of the dissertation titled **"Clinicopathological characteristics and outcomes of thyroidectomy at Muhimbili National Hospital",** in fulfillment of the requirements for the degree of Master of Medicine in General Surgery at Muhimbili University of Health and Allied Sciences.

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ABSTRACT

Background: Thyroid disorders are increasingly becoming common worldwide with a significant portion of the burden falling in Low- and middle-income countries (LMIC). Despite the significant advancements, thyroidectomy is still not without complications. Through continuous follow-up and research on patient characteristics and surgical outcomes, thyroidectomy is increasingly becoming a safer treatment option.

Aim of Study: This study aims at assessing the clinical and pathological characteristics as well as surgical outcomes and their associated factors among patients who underwent thyroidectomy at Muhimbili National Hospital.

Methodology: A 5-year (April 2018-March 2023) retrospective cohort study design was conducted at Muhimbili national hospital. All patients undergoing thyroid surgery were included. Perioperative data such as patient demography, clinical presentation, radiological investigations, cytology results and intraoperative factors. Outcome of interest was the occurrence of post operative complications. Patient records were used to extract data on their surgical outcomes. Analysis was done to identify predictors of post operative complications where P value of < 0.05 was considered significant.

Results: A total of 405 candidates were included in the analysis with a female predominance of 89.6% the mean age was 48years. A total of 108(26.67%) had at least one comorbidity. Anterior neck mass was the most common presenting feature at 98.5%. Thyroid USS was the most widely used investigation. Benign conditions had a higher prevalence at 77% with Nontoxic Multinodular goiter being the most common conditions overall and Papillary carcinoma being the most prevalent among malignant conditions.

Preoperative anemia was seen in 42% of the candidates with only 58% reported to be euthyroid at the time of surgery. Suspicion of malignancy was the most common (43.7%) indication for surgical intervention followed by cosmesis 30.1%. Most patients had undergone lobectomy (27.2%) or Total thyroidectomy (24%). Post

operatively, hypocalcemia was the most prevalent complication (13.3%) observed. Overall complication rate was 15.3%, with a mortality rate of 0.5%(n=2) and a 5-day mean length of hospital stay.

Extensive surgical resections (Total thyroidectomy) and duration of symptoms (>10years) were observed to be statistically significant factors predicting occurrence of post thyroidectomy complications on multivariable Linear regression analysis.

Conclusion: Though considered a safe procedure, thyroidectomy is not without complications. Patients with a long-standing goiter and those requiring extensive resections (undergoing total thyroidectomy) are at a relatively higher risk of such complications. Preoperative preparations and precautions need to be employed to ensure a safe surgical intervention with a short hospital stay.

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LIST OF ABBREVIATIONS

CHF	Congestive Heart Failure
DTC	Differentiated Thyroid carcinoma
ETT	Endotracheal Tube
EBSLN	External Branch of the superior laryngeal Nerve
FLUS	Follicular lesion of undetermined significance
FNAC	Fine Needle Aspiration Cytology
ICU	Intensive Care Unit
LMIC	Low- and Middle-Income countries
MNH	Muhimbili National Hospital
TSH	Thyroid Stimulating Hormone

DEFINITION OF TERMS

Goiter	An abnormal enlargement of the thyroid gland with or without abnormal function [1].
Thyroid nodule	A discrete lesion within the thyroid gland that is radiologically distinct from the surrounding thyroid parenchyma [2]
Thyroidectomy	The surgical removal of the whole or part of the thyroid gland [3]

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

As the largest and most significant endocrine organ in the human body, the thyroid gland accounts for a significant proportion of endocrine disorders. Located on the anterior neck and ranging from 10-20 grams, it is bi-lobed with a central connection called the isthmus [4]. The thyroid gland regulates the basal metabolic rate among other functions hence is responsible for maintaining the overall metabolic homeostasis. This is achieved through the production of thyroxine hormone (T4) and tri-iodothyronine hormone (T3). Both hormones are regulated by the anterior pituitary gland through the release of thyroid stimulating hormone (TSH).

Thyroid pathologies usually present with a vast majority of adverse events that affect multiple systems hence resulting in significant morbidity. These pathologies stem from lower or higher than normal serum concentration of thyroxine hormone [Hypothyroidism or hyperthyroidism respectively]. They may also arise from localized glandular enlargement (Endemic goiter, Multinodular goiter or thyroid nodule), which present with pressure symptoms involving the airway and neuro-vasculature of the neck region.

Thyroid nodules may be malignant or benign. Benign nodules range from follicular adenomas, degenerative cysts, colloid nodules to nodular hyperplasia. Whereas, malignant thyroid lesions include Differentiated thyroid cancer, poorly differentiated thyroid cancer, anaplastic thyroid cancer and medullary thyroid cancer. Papillary thyroid cancer accounts for largest proportion of thyroid cancer, accounting for 84%[5]

The most common presenting symptom for a pathological thyroid gland is its enlargement, clinically referred to as a Goitre. Iodine deficiency plays a key role in the pathophysiology of Goitres. Because of decreased hormone production, a feedback response to the anterior pituitary upregulates TSH production leading to

thyroid follicular hyperplasia presenting as a goitre [6]. This provides the basis for the geographical distribution of endemic goitre among iodine deficient areas.

Thyroid pathologies may also present as discrete thyroid nodules. These are distinct lesions in the thyroid parenchyma easily detectable on palpation and even more so by radiological evaluation. Prevalent in about 50 to 65% of the population (By ultrasound detection)[7], they are mostly seen in women and majority are benign [8,9]. Large goiters or large thyroid nodules may present with anterior neck compressive symptoms such as chocking sensation, dysphagia, difficulty breathing and neck pain. However, the determination of presence of malignancy is the primary goal of thyroid nodule evaluation. Fine needle aspiration cytology has been highly instrumental and is indicated for cytological analysis of all thyroid nodules. Incorporation of ultrasonography in FNAC significantly improves the accuracy of the test [10].

The results from FNAC are categorized according to the likelihood of malignancy using the Bethesda system. This guides further management and eventual follow up of the patient. Results fall in either of these categories: Non-diagnostic or unsatisfactory, benign, atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS), follicular neoplasm or suspicious for a follicular neoplasm, suspicious for malignancy and malignant [11].

Both medical and surgical approaches are available for thyroid disorders. As the most common endocrine surgical procedure, thyroidectomy is indicated for both benign and malignant thyroid conditions. The anatomical location of the thyroid gland at the anterior neck puts it in close proximity to vital structures such as the trachea, esophagus and major neurovascular bundles. This usually necessitates surgical resection of an enlarged thyroid (goiter) due to local compressive symptoms (dysphagia, difficulty breathing, voice changes).

Suspicion of malignancy is still the most commonly reported indication for surgical intervention. Patients with hyperthyroidism with failed medical therapy are also indicated for surgical resection. However, a small subset of patients undergo thyroidectomy purely due to anterior neck disfigurement (cosmesis) [12].

In the context of a specialized facility with skilled and experienced surgeons it confers minimal morbidity and even lower mortality rates. A detailed knowledge on the surgical anatomy of the thyroid gland as well as the possible anatomical variations is essential [13]. During the 1800s, thyroidectomy was associated with a significantly high mortality rate (up to 40%) to warrant a cessation of the practice. With improvement in surgical techniques including hemostatic agents as well as aseptic methods, surgeons like Billroth and Kocher were able to significantly reduce complication rates to invent the safer classic thyroidectomy technique still in practice today [14].

Thyroidectomy surgical technique has changed over time with newer techniques limiting the extent of thyroid gland excision. The extent of thyroid resection is tailored to the primary underlying thyroid disorder. Total thyroidectomy, defined as the removal of the whole gland preserving the parathyroid glands, is reserved for non-papillary thyroid carcinoma. However, a near-total thyroidectomy preserves less than 1gram of remnant glandular tissue on each side to lower the risk of inadvertent injury to RLN and parathyroid glands [15]. Both these procedures are indicated in thyroid malignancy or refractory Grave's disease unresponsive to medical therapy with near-total thyroidectomy having the added advantage of a lower rate of post-operative complications.

Subtotal thyroidectomy extends resection to contralateral lobe preserving 4 – 7gms of normal disease-free thyroid gland. The amount of tissue left may be distributed on either lobe (Bilateral subtotal thyroidectomy) or a complete removal of one lobe may be done with subtotal resection of the contralateral side preserving some normal tissue unilaterally (Hartley-Dunhill procedure). This technique is indicated in benign thyroid conditions and Standard initial treatment for all indeterminate nodules. [13,15][16]

A thyroid isthmusectomy involves the removal of the isthmus (thyroid tissue bridging the two lobes) as well as the pyramidal lobe done for small nodules suspicious of malignancy at the isthmus. [17]

For thyroid malignancy local spread through cervical lymph nodes is common. Preoperative clinical and radiological (neck ultrasound or CT scan) evaluation is instrumental in assessing lymph-node metastasis. As per American thyroid association recommendations of 2009, patients with proven nodal involvement (clinically, radiologically or intraoperatively) or with advanced primary tumor (even without clinical evidence of lymph node metastasis) a therapeutic central compartment lymph node dissection (cervical lymph nodes groups VI and VII) is indicated [18]

A lateral compartment lymph node dissection (cervical lymph nodes level II – V) is less common and only indicated in clinically proven metastatic nodes confirmed through biopsy. A compartment based cervical lymph node dissection (central and lateral neck dissection) is shown to yield a lower recurrence rate compared to non-anatomical selective approach (“berry picking”) [2,18]

Despite significant technological advancements, thyroidectomy is still not without complications. These range from disorders of phonation to increases post operative mortality from airway compromise or excessive bleeding. The delicate and narrow surgical field is implicated in most of the post thyroidectomy complications. The close proximity of the parathyroid glands predisposes to iatrogenic trauma to the glands or their blood supply and in some cases, complete removal. As the parathyroid glands are responsible for regulating serum calcium levels, this leads to post-operative hypocalcemia. Transient post-operative hypocalcemia because of hypoparathyroidism is the most common in-hospital complication of thyroidectomy.

The thyroid gland has a rich arterial supply from the external carotid artery and thyrocervical trunk through the superior and inferior thyroid arteries respectively. In addition, the carotid arteries bound the thyroid laterally. Inadequate hemostasis achievement intraoperatively predisposes to increased risk of post-operative hematoma formation that may result in life threatening complications such as airway compromise [13].

The thyroid gland is well innervated by both sympathetic (Cervical ganglia) and parasympathetic nervous system (Vagus). Injury to the recurrent laryngeal nerve and the external branch of the superior laryngeal nerve (EBSLN) account for the larger portion of iatrogenic nerve injuries during thyroidectomy. Disorders of phonation are hence among the most common complications accompanying thyroid surgery. Vocal cord paralysis (unilateral or bilateral) results from injury to the RLN, which presents with symptoms ranging from minor voice changes to respiratory distress. However, injury to the EBSLN, which innervates the cricothyroid muscles, will present with disorders of voice tone control. [8,19]

Post thyroidectomy tracheomalacia (PTT) is also a commonly encountered post-operative complication. It is usually implicated in more chronic and large goiters that are believed to cause softening and eventual collapse of the tracheal cartilage that maintain airway patency. This poses a great risk of respiratory compromise after extubation post operatively [20]

Post operatively thyroidectomy patients may also succumb to acute life-threatening elevation of serum thyroxine hormone resulting in multiorgan dysfunction. While common among patients with poorly controlled hyperthyroidism, this complication commonly termed thyroid storm, is usually triggered by stress including surgical procedures like thyroidectomy. Currently, proper preoperative patient stabilization and attainment of euthyroid state has proven effective in reducing the incidence of post thyroidectomy thyroid storm cases [21]

Due to the multi-system involvement of the thyroid gland in maintaining homeostasis and normal metabolic state, thyroidectomy patients are at high risk of insufficient circulating thyroxine hormone postoperatively. Post thyroidectomy hypothyroidism is a common complication following total thyroidectomy; however, it has also been reported in a significant number of near-total and subtotal thyroidectomy patients as well [22].

It presents with multi-system dysfunction and is life-threatening if left untreated. Patients may present with features of Myxedema including cardiac, gastrointestinal, respiratory, central nervous system and renal impairment attributed by the low metabolic state. Frequent thyroid function monitoring (TSH,T3,T4) and prompt treatment with hormone replacement is crucial in all suspected patients especially following extensive thyroid gland excision [24].

1.2 Problem Statement

Thyroid disorders are increasingly becoming common worldwide with a significant portion of the burden falling in Low and middle-income countries (LMIC). This is being attributed to nutritional and environmental factors [25]. Thyroid disorders are a major cause of morbidity, resulting in presentations ranging from anterior neck disfigurement to respiratory compromise and even death [26,27]

Thyroidectomy in its many forms and techniques is an invaluable tool in the management of thyroid disorders. Since the advent of the modern thyroid surgery by Theodor Kocher (1850 - 1877), through continuous technique refinement, it has become significantly safer with fewer unfavorable outcomes [14]. There has been a steady increase in the number of thyroidectomies performed, with over 90,000 cases per year being done in the USA alone. In Africa, countries like Zambia and Ethiopia report annual thyroidectomy rates of 7.25% and 11% respectively among surgical cases [28,29].

Unfortunately, this rise in the number of thyroid surgeries has not been accompanied by a simultaneous increase in local studies to characterize the clinical or pathological features of the patients requiring thyroidectomy. The knowledge gap thus created is significant enough to result in a blind spot on the possible factors dictating positive and negative thyroidectomy outcomes.

Though considered a safe procedure in a well-equipped center, thyroidectomy is not without risk of complications, some of which include dysphonia, hypocalcemia and airway compromise [30].

The lack of data on the clinical and perioperative variables that may dictate the success or complication rate of the intervention deems the surgeon unable to ascertain patient safety intra or post operatively.

Insufficient studies on the treatment outcomes of thyroidectomy and its associated factors creates a new subset of patients with thyroidectomy complications whose actual burden to local health systems is yet to be known.

1.3 Conceptual Framework

The pattern of Clinical and pathological characteristics of patients who had undergone thyroidectomy at MNH in a 5-year span (April 1st, 2018 – March 31st, 2023) will be collected retrospectively. These will include clinical data collected preoperatively (demographics, symptomatology, co-morbidities), intra op factors (extent of thyroid resection, length of surgery, estimated blood loss) and pathological factors (size of thyroid gland, biochemical factors, histological type, the surgical indication). The outcome including in-hospital complications of each thyroidectomy will be documented and the associated factors determined.

Following thyroidectomy clinical, pathological or intraoperative variables may play a part in the occurrence of post thyroidectomy complications. This relationship will be examined in the study. Length of hospital stay following thyroidectomy will also be determined.

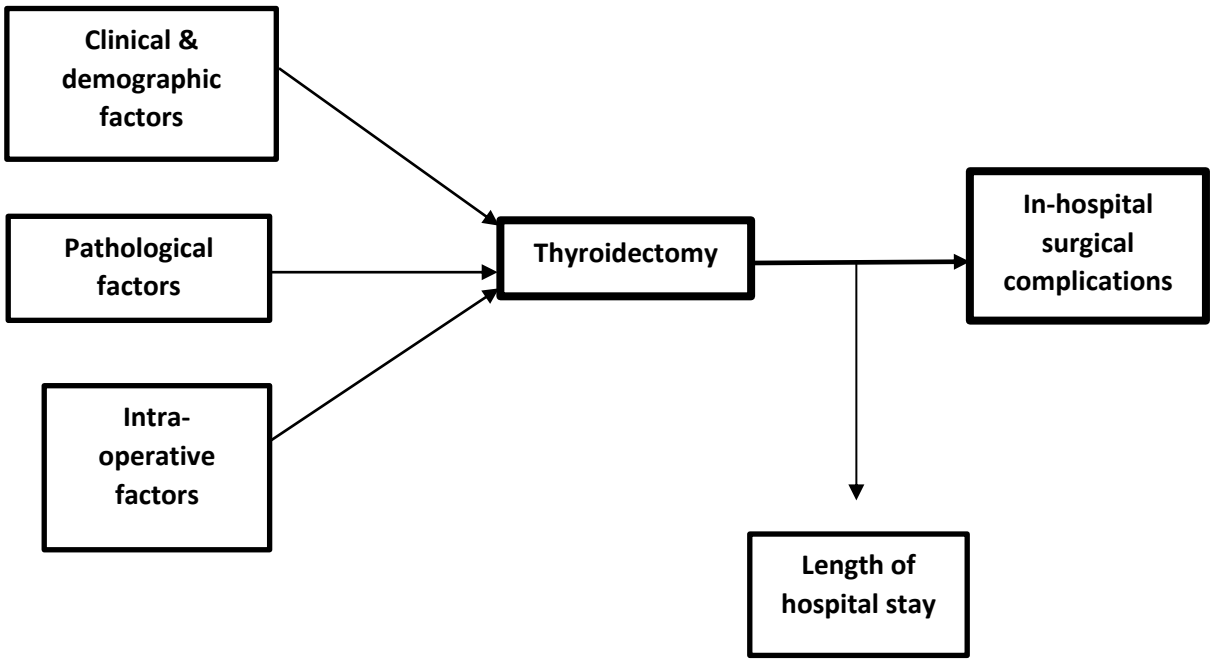


Figure 1: Conceptual Framework.

1.4 Rationale

By assessing the clinical and pathological variables of thyroidectomy patients, this study will shed light on the pattern of outcomes seen at our local setting and its associated factors, hence enabling the identification of areas of improvement to maximize patient safety and quality of life.

The study will help shed light on the possible pre and intraoperative variables that may be adjusted to improve patient safety. Patients with clinical characteristics found to be most commonly associated with post-operative complications may hence be subject to more rigorous preoperative screening and planning prior to surgical intervention. These may include the need for Calcium supplement prophylaxis, ICU care preparations, emergency airway facilities and availability of adequate hemostatic agents [31,32]

Most advanced centers have attained significant reduction of hospital stay for thyroidectomy patients. A study done locally such as this provides invaluable data on the possible modifiable aspects of managing thyroidectomy patients. This has the potential to eventually move local institutions towards same-day thyroidectomy procedures, which are more cost effective to both the patient and the institution.

This study will also help to shed light on the burden of thyroid disorders catered for by surgical intervention. It will ultimately be invaluable in resource allocation for ensuring available surgical services for patients with thyroid disorders and improving surgical techniques. This will also assist in the management and eventual elimination of post-thyroidectomy complications.

This study will provide a platform for the establishment of thyroidectomy databases and studies that will enable continuous monitoring and follow up of thyroidectomy patients at the local setting. These will hence improve the efficiency and safety of local thyroidectomy techniques.

1.5 Research Questions and Hypothesis

1.5.1 Broad research question

- What are the clinicopathological characteristics and outcomes of thyroidectomy at Muhimbili National Hospital?

1.5.2 Specific research questions

1. What are the clinical and pathological characteristics of patients who underwent thyroidectomy at Muhimbili National Hospital?
2. What are the in-hospital surgical outcomes among patients who underwent thyroidectomy at Muhimbili National Hospital?
3. What are the factors associated with treatment outcomes of patients who underwent thyroidectomy at Muhimbili National Hospital?

1.5.3 Hypothesis

Null hypothesis: There is no association between the clinicopathological characteristics of patients who underwent thyroidectomy at MNH and their treatment outcome.

Alternative hypothesis: There is an association between the clinicopathological characteristics of patients who underwent thyroidectomy at MNH and their treatment outcome.

1.6 Research Objectives

1.6.1 Broad objective

To describe the clinicopathological characteristics and outcomes of thyroidectomy at Muhimbili National Hospital from 2018 to 2023.

1.6.2 Specific objectives

1. To describe the clinical characteristics of patients who underwent thyroidectomy at MNH.
2. To describe pathological characteristics of patients who underwent thyroidectomy at MNH.
3. To describe the in-hospital outcomes among patients who underwent thyroidectomy at MNH.
4. To determine the clinical and pathological factors associated with surgical outcomes of thyroidectomy at MNH.

CHAPTER TWO

2.0 LITERATURE REVIEW

Thyroid disorders are among the most common endocrine diseases. Since the introduction of the classic thyroidectomy by Billroth and Kocher, it has been continually evolving to provide a not only effective but also safer option for benign and malignant thyroid diseases [13,14]. Generally thyroidectomy is indicted for hyperthyroid states with failed medical management, enlarged gland (Goiters) with or without pressure symptoms and presence of a thyroid nodule[5].

2.1 Clinical characteristics of patients undergoing thyroidectomy.

As with most diseases, thyroid disorders follow a specific demography and clinical pattern. These patterns are useful in predicting and anticipating the most likely demographic group to be affected and hence facilitate early prevention by screening. Thyroid disorders have a strong predilection to female gender with male to female ratios as high as 1 to 8. Gender has also been shown to have an association with the likelihood of developing certain post-thyroidectomy complications. One Canadian study observed a female to male relative risk ratio of 2.1 for the development of transient post-thyroidectomy hypocalcemia [33]

Most thyroid disorders disrupt the normal function of thyroxin hormone production. An adaptive mechanism of the gland is TSH induced diffuse thyroid hyperplasia resulting in enlargement of the gland. This accounts for an anterior neck mass being observed to be the most common clinical presentation of most thyroid patients undergoing thyroidectomy [26].

Despite this, the most common indication for thyroidectomy has been shown to be suspicion of malignancy. A study done in Saudi Arabia found 76.4% of all the included thyroidectomy patients had anterior neck mass as the chief complaint with 54.5% being operated on due to suspicion of cancer [27]

Iodine deficiency is one of the most common causes of goiter. The lack of environmental iodine in certain areas has been linked to the geographical pattern seen among goiter endemic areas. This predisposes to certain areas to a high prevalence of patients undergoing thyroidectomy. The global prevalence of goiter is 15.8%, however endemic areas such as Asia, Africa and highlands have shown higher incidences [34].

A study done in the southwestern rural region of India (Karnataka) showed a prevalence of 16.6% of Goiter [35]. A study done in a highland district of Tigray (Ethiopia) showed a prevalence of endemic goiter of 71.4% (n = 755), with a higher prevalence shown among females of 80.2% [36]. The overall prevalence of endemic goiter in Africa is estimated to be 28.3% [34]

In Tanzania similar distribution patterns have been seen as a study done the northern part of the country had 47.4% of all thyroidectomy patients presenting with pressure symptoms and cosmetic disfigurement being the most common indication for surgery (23.7%). The female to male ratio was also consistent with the global picture at 11.7:1 with a peak age incidence among the 31-40 years age group [37].

2.2 Pathological characteristics of thyroidectomy patients

Thyroidectomy is indicated in both benign and malignant conditions of the thyroid. The most common indication for thyroidectomy is a suspicion of malignancy [27]. Thyroid cancer is generally a rare malignancy with a steadily rising incidence worldwide [38]. Differentiated thyroid carcinoma (DTC) accounts for about 90% of all thyroid malignancies and has the most common occurrence especially in females.

Papillary Carcinoma accounts for a majority of DTC at 80% incidence. It carries an excellent prognosis with a more than 95% 10 year survival rate [26]. In contrast, anaplastic thyroid carcinoma is a rare but one of the most aggressive diseases with a beyond 2 year survival rate of 12% [39].

Data from Rwanda however demonstrates multinodular goiter being the most common primary diagnosis among patients undergoing thyroidectomy between the years 2017 and 2018. It also showed that pressure symptoms and cosmetic concerns were the most frequently reported complaints necessitating thyroidectomy [40].

In Tanzania however, the prevalence of follicular carcinoma is shown to be 41.7% among patients undergoing thyroidectomy. Simple multinodular goiters were seen to form the majority of the histopathological tissue types (76.3%) for thyroidectomy as compared with other benign or malignant histology [37].

2.3 Length of hospital stay post thyroidectomy.

With the improvement in thyroidectomy technique, the length of hospital stay required post operatively is seen to be declining. The ability to predict and avoid post thyroidectomy complications such as hemorrhage and airway compromise has enabled shorter lengths of hospital stay of up to less than 24 hours [41].

The British Association of Endocrine and Thyroid Surgeons report incidences of thyroidectomies with no overnight stay (True day surgeries) to increase from 3 to 6 percent in the years 2007 and 2012 respectively. Lobectomies form a larger proportion of these procedures while total thyroidectomies were associated with length of hospital stay of more than 48hours [42] .

This is in-line with a 1-year study done in Northwestern Rwanda in 2017 that estimated the average length of stay to be 24 hours post thyroidectomy with no post operative complications reported [40]

This contrasts with our local experience where a study done in northern Tanzania (Bugando Hospital) reported the average length of stay to be 14.4 days with a range of 3 to 34 days [37]. With such a discrepancy, the need for an updated local study with a larger sample size is evident to establish the current average hospital stay post thyroidectomy and the factors influencing it.

2.4 Outcomes and associated factors of patients undergoing thyroidectomy.

Thyroidectomy is increasingly becoming safer with improvement in surgical technique and intra and postoperative care. The complication rates and hence mortality is significantly lower in well-equipped centers with experienced and well-trained surgeons.

In developed countries like the USA the mortality rates as low as 0.2% have been reported post thyroidectomy [43]. Post-operative hypocalcemia is the most common complication following thyroid surgery [44,45] . Although the rate of hypocalcemia has recently declined due to introduction of parathyroid preserving techniques, transient hypocalcemia is still observed among 6.9 to 49% of post thyroidectomy cases [45]. RLN injury and hematoma formation are also readily reported. The extent of thyroid resection, surgeon experience and size of the goiter are all factors that associated with higher rates of post-operative complications**.** Thyroid storm, referred to as excessive thyroxine release in the systemic circulation, is a rare but life-threatening condition seen post thyroidectomy. A Harvard study found an incidence of 6.2% of hypocalcemia among total thyroidectomy patients [43] while that done in Ethiopia showed a prevalence of 3.2% [28]. In a study done in Ghana, over all complication rate of thyroidectomy was 6.1% and with hemorrhage being the most common presenting complication [46].

In Tanzania, a study on pattern of thyroidectomy patients showed a mortality rate of 3.4% of which comorbidities, advanced malignancy and post-operative complications such as tracheomalacia were the major cause of death. The overall post thyroidectomy complication rate was reported to be 7.9% which is consistent with data from most centers within the region [37].

2.5 Factors associated with post thyroidectomy outcomes.

Several factors have been attributed to an increased post thyroidectomy complication rate. These include patient, pathological and surgeon factors. Patients with long standing goiters have been associated with higher complication rates post operatively. A study done in Brazil found higher proportion of post-operative complications among patients who had goiters lasting long enough to present with compressive symptoms [47]

According to the American thyroid association, presence of larger sized goiters and more extensive surgical resections of the gland increase the risk of damage to surrounding structures (E.g. Parathyroids, neurovascular structures) and hence higher incidences of post thyroidectomy complications. In patients with malignant thyroid conditions more radical thyroid excisions are frequently indicated and are hence also associated with higher complication rates including disease recurrence [48].

A study done in India in 2011-2013 also found that patient's preoperative condition (including presence of comorbidities), the extent of thyroid resection and surgeon's experience and expertise are the major factors associated with the presence of post thyroidectomy complications [44]. Inline with this, a study done in Ethiopia found external branch of the superior laryngeal nerve (EBSLNI) injury and hypocalcemia are the most common complications with performance of total thyroidectomy and being operated on by a resident as independent risk factors for these complications [49].

Locally, little has been done to study the factors influencing thyroidectomy outcomes, however a study done in Tanzania in 2008 to 2011 has shown that delayed presentation to the hospital and larger sizes of goiter at the time of surgery is implicated in the higher complication rates seen [37].

CHAPTER THREE

3.0 METHODS AND MATERIALS

3.1 Study Design and Period

The study adopted a retrospective analytical cohort study design with a 5-year span from April 1st ,2018 to March 31st, 2023.

3.2 Study Area

The study was conducted at Muhimbili National Hospital (MNH) which is Tanzania's national referral and teaching hospital. It is located in Dar es Salaam city on the Eastern coast of the country. With a bed capacity of 1500 patients, MNH as the tertiary referral hospital, it receives patients from the whole country for specialized care. On a yearly basis the hospital receives on average 52,000 patients for in-patient care [10]

Patients for surgical intervention fall under the directorate of surgical services. It is equipped with 69 specialized surgeons, with a more than 788 bed capacity. Minor and major surgical interventions are being carried out routinely with well-staffed and equipped supporting services [10,11]. Thyroidectomy procedures are routinely performed under General surgery and ENT departments, with most falling under general surgery.

The hospital is equipped with 8 fully functioning theaters for elective procedures shared across the surgical departments with one extra theater dedicated for emergencies. The hospital also has an 18-bed intensive care unit capable of catering for high dependency as well as critical care adult patients. MNH is also equipped with in-house supportive services including radiology department and laboratory services including diagnostic histopathology services.

3.3 Study Population

The study population was adult patients undergoing thyroidectomy at MNH. Paediatric age groups (below 18years) had been purposely excluded due to significant clinical, molecular, pathological and eventual prognostic differences as compared to adult group for most thyroid disorders especially malignancies [12]. Cut off age of 18 years is in line with the definition of pediatric thyroid malignancy according to The American thyroid Association. Selection of study sample involved including all adult post-thyroidectomy patients admitted from April 1st, 2018, to March 31st 2023 at MNH.

3.4 Sampling strategy

Convenient sampling method was adopted. All patients with available medical records that fit the inclusion and exclusion criteria within the 5-year study period (April 1st, 2018 to March 31st, 2023) were included.

3.5 Sample Size Calculation

Sample size was derived from the following formula:

Sample size; $n = [z^2 p\ (1-p)]$ **/** e^2

Z: Standard normal deviate = 1.96 for 95% confidence level

P: Expected proportion of patients with post thyroidectomy complications. (7.9% in study done in Bugando – 2011)

ε: Margin error = 5%

Calculated sample size will be 112 cases.

Non-response rate of 10% will be added to the calculated sample size.

So, the sample size will be {(10% x n) +n} which is 11+112= 123

Hence, the minimum estimated sample size was **123 thyroidectomy cases.**

3.6 Inclusion and exclusion criteria

3.6.1 Inclusion criteria

1. All patients who underwent thyroidectomy between April 1st 2018 – March 31st 2023 of 18 years and above.

3.6.2 Exclusion criteria

1. Patients with missing histopathology results

3.7 Study Variables

3.7.1 The Dependent variable

A) In-hospital Post thyroidectomy complication development – defined as either one of the following:

1. Hypocalcemia (post operative serum calcium levels less than 2.2mmol/L)
2. RLN or EBSLN injury (Post Operative voice change)
3. Airway compromise needing surgical intervention (retained ETT, reintubation or tracheostomy post operatively)
4. Hematoma at surgical site needing evacuation.
5. Requiring ICU admission post operatively
6. Death

3.7.2 The Independent variables

- Demographic characteristics:

  Age, sex and place of residence

- Clinical characteristics (pre-operatively):

Presenting symptoms, duration from onset of initial symptom, presence of comorbidities,

Biochemical tests – Absolute neutrophil, leucocyte and platelet count, Hemoglobin, hematocrit, TSH, fT3, fT4.

- Pathological characteristics:

  Size of thyroid gland as estimated by radiological investigation or physical examination (largest diameter). Lobes affected (Unilateral vs bilateral disease), Bethesda diagnostic category (FNAC), histopathology subtype.

- Intraoperative variables:

  Surgical indication, Type of thyroid surgery performed (total, near total, subtotal, hemi-thyroidectomy or Dunhill procedure), length of surgery (minutes), extent of lymph node dissection if any.

- Length of hospital stay:
  Expressed in days, from day of admission to date of discharge.

3.8 Data Collection Technique

Patients with thyroid pathologies requiring surgical intervention are usually routinely identified and admitted through the Hospital's outpatient clinics or emergency department. After initial laboratory and radiological investigations are done, these patients are then scheduled for elective surgical intervention (thyroidectomy).

Intraoperatively, progress of the procedure and post operative surgical notes are documented in the patients' medical records. Any post-operative progress and complications are documented daily until the patient is discharged. Final histology from the resected tissue is uploaded into the patient's electronic database for follow-up as outpatient.

This study included all patients admitted from April 1st, 2018 – March 31st, 2023, who have undergone thyroidectomy. Participants were captured using the theater

records of all thyroidectomies done as well as pathology lab records for received thyroid tissue biopsies within the study period.

A checklist containing all the necessary data points of dependent and independent variables was used for data collection after being tested. Collection of data took place from patients' file at the MNH medical records department. Additional data on laboratory results, radiological data and histopathological data was collected through the hospital's integrated Hospital Management Information System (HMIS) application called Jeeva database. Intra operative information were extracted from anesthesia forms and surgeons' hand-written post-operative notes.

Post operative outcome data will be collected according to the reported clinical presentation in the patients' files. Details on the presence of difficulty breathing, retained ETT, changes in voice and hematoma requiring evacuation will be recorded as postoperative complications. Hypocalcemia will be reported in patients with clinical symptoms of hypocalcemia or with serum calcium levels less than 2.2mmol/L.

3.9 Data Analysis Plan

Data from collecting forms was entered and analyzed using SPSS software version 23. Patient demographic and clinical data (including Presenting symptoms and Biochemical test results) was tabulated in frequency distribution tables and charts. Common patterns and **statistics were** noted and commented upon.

Data on pathological characteristics was categorized and analyzed in a frequency table as well. Glandular size was categorized in appropriate ranges and displayed in a frequency table. Lobes affected were presented as unilateral or bilateral disease. Fine needle aspiration cytology was grouped in terms of the Bethesda category.

In-hospital surgical outcomes were assessed, defined by the presence of any one among the mentioned post operative complications. The complication and mortality rates were also calculated. The mean hospital stay was determined along with the appropriate ranges and mode.

Any characteristic that is found significantly associated factor with outcome was evaluated and documented. The association between the dependent and independent variables was established using chi-square test. Statistically significant associations **was** determined when P-value is less than 0.05. Logistical regression was employed for further analysis for statistically significant associations or any variable with a P-Value greater than 0.2.

3.10 Ethical Consideration

3.10.1 Ethical clearance

Ethical clearance was and granted requested from the Muhimbili University IRB (Institutional Review Board). A waiver of informed consent was also provided as the study collected patient information in a retrospective manner.

Through the Muhimbili National Hospital authority, permission was also granted to collect data from patients' records.

3.10.2 Confidentiality

All patient names and hospital identification numbers were anonymized in the data collection process to maintain the safeguarding of their identities.

3.11 Study Limitations

The retrospective nature of the study despite providing a larger scope into the local practice hinders the determination of stronger relationships between the clinicopathological characteristics of thyroidectomy patients and their risks towards the observed outcome.

Since it is a single-centered study, it may not be able to fully account for confounding local and environmental factors that might skew the outcomes observed.

The short follow-up time of the study narrowed the scope of possible outcomes and complications of thyroidectomy. Complications such as recurrence and permanent post-operative complications were not able to be addressed.

CHAPTER FOUR

4.0 RESULTS

4.1 Patient demographic and clinical characteristics

Following the exclusion and inclusion criteria previously described a total of 405 thyroidectomy patients were identified and included in the study. The mean age was 48 ± 13 (18 – 83) years with a peak incidence age group interval falling at 40 - 59 years accounting for 48.4% of the candidates. Among these, females made up the majority corresponding to 89.6% of the population giving a female to male ratio of 8.6:1.

Table 1 also demonstrates the frequency of occurrence of comorbidities among patients undergoing thyroidectomy. There were 108 patients with at least one comorbidity prior to surgery. Among these, Hypertension and Type II diabetes had the highest frequencies corresponding to 86% and 21% of all comorbidities reported respectively.

Most patients had a chronic course of the thyroid pathology with 36 months as the median duration of symptoms (IQR = 12 – 72 months). An anterior neck mass was the most common presentation at 98.5% of all candidates followed by toxic symptoms (22.2%)

Table 1: Demographic and clinical characteristics (n=405)

Variable	Frequency	Percentage
Age at Presentation (years)		
Mean ± SD(Range) = 48 ± 13 (18 – 83) years		
Age groups		
18-39	121	29.9
40-59	196	48.4
60 +	88	21.7
Sex		
Male	42	10.4
Female	363	89.6
Comorbidity		
Hypertension	86	79.6
Diabetes mellitus	21	19.4
HIV/AIDS	9	8.3
Others	18	16.7
Clinical presentation		
Symptom duration (months)		
Anterior neck mass	399	98.5
Toxic symptoms	90	22.2
Voice change	48	11.9
Difficulty swallowing	48	11.9
Difficulty Breathing	41	10.1
Neck pain	18	4.4

4.2 Patient pathological characteristics.

The majority of these patients (96%) had large enough size to be categorized as WHO clinical goiter grade 2. Most thyroid pathologies affected both lobes of the gland (58.5%) with 49 patients (24%) presenting with retrosternal extension of the goiter.

Preoperatively 208 patients (51.4%) underwent at least one radiological evaluation for their thyroid pathology. Thyroid ultrasound was the most used investigation at 34.6%, followed by CT scan at 15% prevalence. Lymphadenopathy was observed in 19 patients (9.3%). Due to lack of uniformity in radiological reporting, only 59 patients were assigned a TI-RADS classification with 145 patients (71%) lacking documentation. Among those reported, TI-RADS II (Not suspicious for malignancy) was predominant (13.2%).

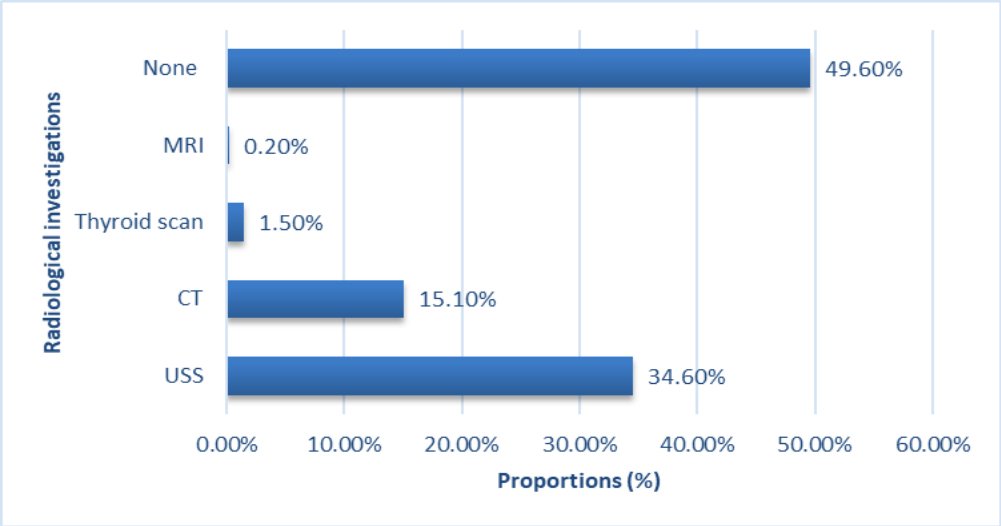


Figure 2: Radiological investigations done preoperatively.

Table 2: Radiological characteristics

Variable	Frequency	Percentage
Disease extent		
Left lobe	86	21.2
Right lobe	82	20.2
Bilateral	237	58.5
Goitre size (WHO Grade)		
Grade 0	7	1.7
Grade 1	9	2.2
Grade 2	389	96.0
Retrosternal extension		
Yes	49	24
No	155	76
Lymphadenopathy		
Yes	19	9.3
No	147	72
Not documented	38	18.7
TI-RADS classification		
TR 1 (Benign)	23	11.3
TR 2 (Not suspicious)	27	13.2
TR 3 (Mildly suspicious)	2	1
TR4(Moderately suspicious)	5	2.5
TR 5 (Highly suspicious)	2	1
Not documented	145	71

Cytology evaluation was done in 234 patients (57.8%) prior to surgery using Fine needle aspiration. All cytology results were assigned a Bethesda diagnostic category. A larger proportion of the cytology results suggested mostly benign thyroid pathologies. This is evidenced by Bethesda category II being the most commonly assigned category (45.2%). while less than 10% of the patients fell in categories IV or above.

Nontoxic Multinodular goiter was the predominant clinical diagnosis reported prior to surgery (45.4%). Post-operative Tissue histopathology results were also collected and they reflected similar findings where 181 patients were diagnosed with simple multinodular goiter accounting for 44.7% of all study candidates. This was followed by simple colloid goiter (24.2%). Papillary carcinoma was the most prevalent malignant histological type at 58 patients (14.3%), followed by follicular carcinoma at 25 patients (6.2%). Overall, Benign thyroid conditions were more prevalent (77%) as compared to malignant pathologies (23%).

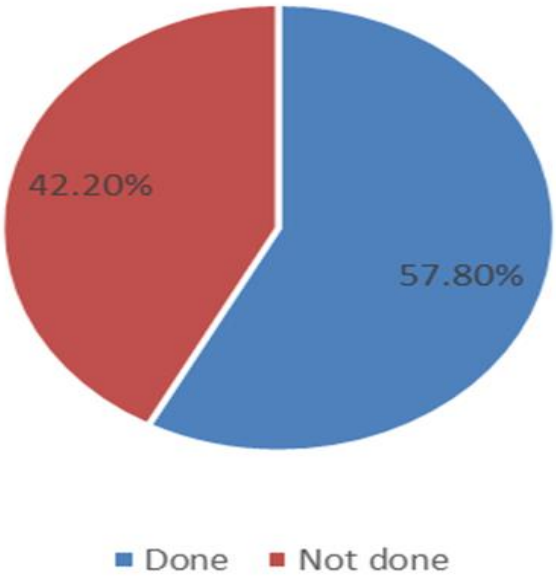


Figure 3: Proportion of Patients with Preoperative FNAC Results

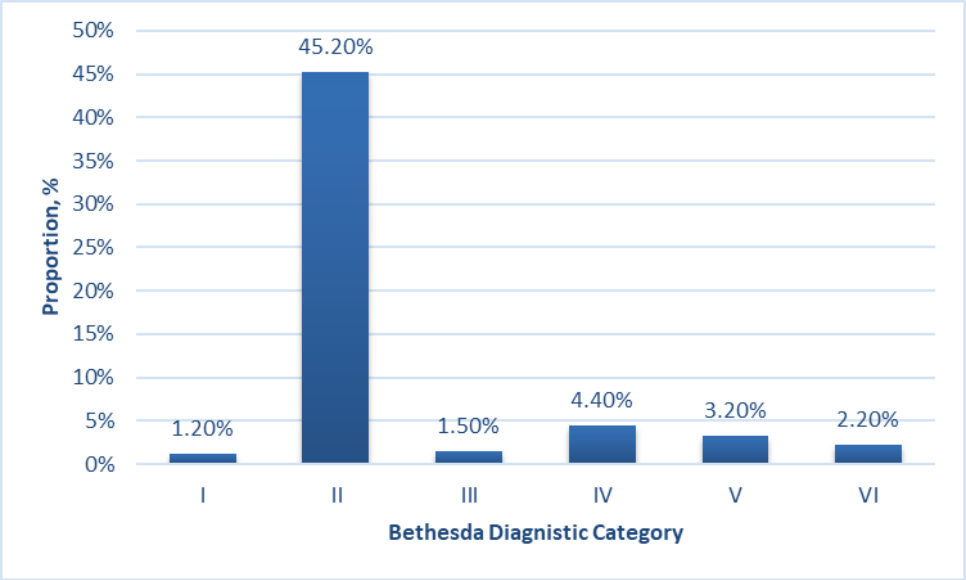


Figure 4: FNAC results classification by Bethesda categories.

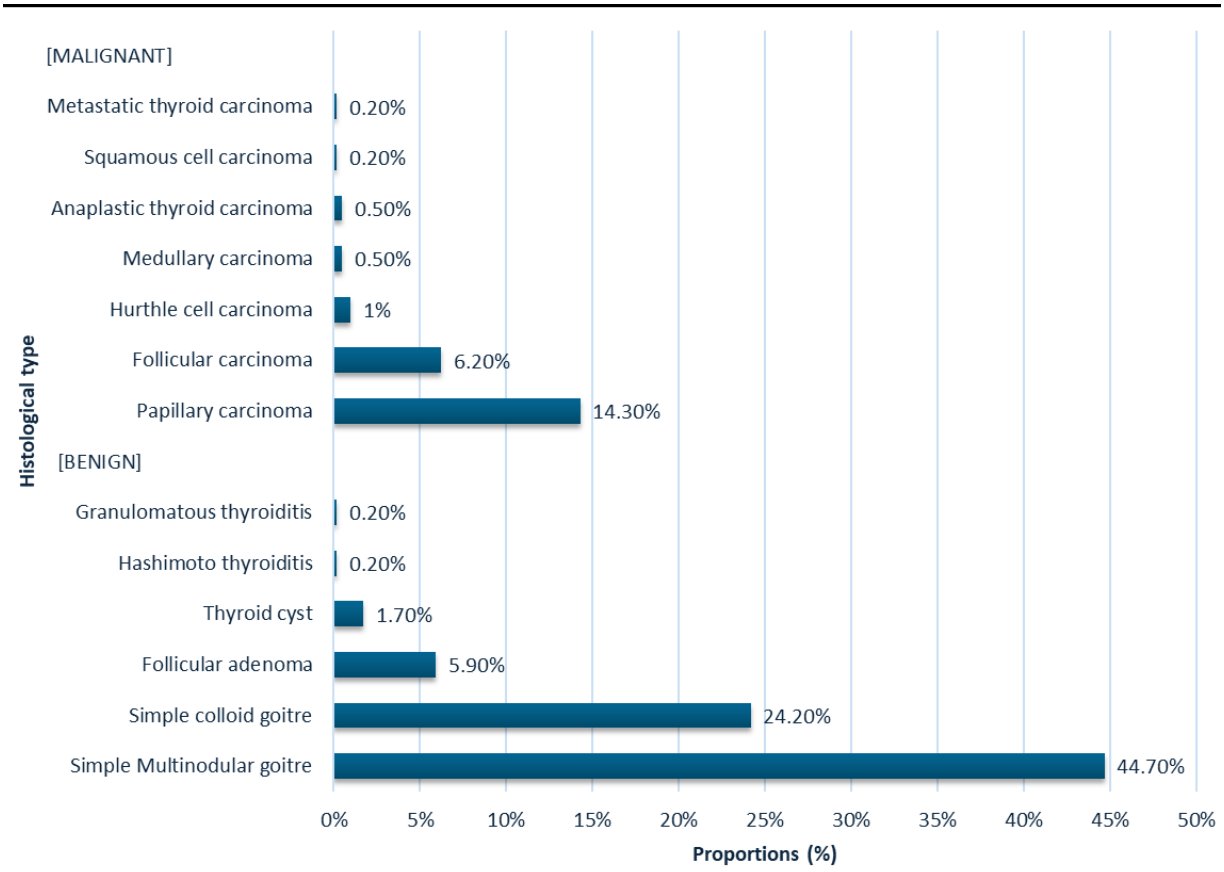


Figure 5: Proportions of Histopathological Diagnosis

Thyroid function tests were observed to be routinely done preoperatively, however 54 patients (13.3%) did not have documented fT3, fT4 or TSH results. Of the 351 patients with Thyroid function test results, 235(58%) were euthyroid preoperatively whereas 93(23%) had biochemical evidence of hyperthyroidism. Only 5.7% patients had hypothyroidism prior to surgery. Moreover, 170 patients (42%) presented with preoperative anemia.

Suspicion of malignancy is observed to be the most common indication for thyroidectomy accounting for about 43.7% followed by cosmesis at 30.1%. A smaller subset of patients had undergone partial thyroid removal prior to this study period and currently had been readmitted for a completion thyroidectomy. These made up the least common indication for thyroid surgery at 4.9%.

Table 3: Preoperative Laboratory Tests and Indications for Surgery

Variable	Frequency	Percentage %
Pre-Op Anemia		
	170	42
Thyroid Function		
Euthyroid	235	58
Hyperthyroidism	93	23
Hypothyroidism	23	5.7
Not documented	54	13.3
Surgical Indications		
Suspicion of malignancy	177	43.7
Pressure symptoms	80	19.8
Completion	20	4.9
Thyrotoxicosis	87	21.5
Cosmesis	122	30.1

All 405 candidates underwent thyroid resection surgery of varying degrees. ***Figure 6*** demonstrates the different types of thyroidectomy techniques employed among the study participants. The mean operating time was 115 ± 45 (40 – 240) minutes. A majority of the patients underwent Lobectomy accounting for 27.2% (n = 110) of all thyroidectomies done. Total thyroidectomy was the second common procedure with 97 candidates (24%). Less common procedures included The Dunhill procedure, isthmusectomy and nodulectomy at a combined 3.9% prevalence. Only 3.5% of the cases had an accompanying lymph node dissection procedure documented to be performed during the thyroidectomy.

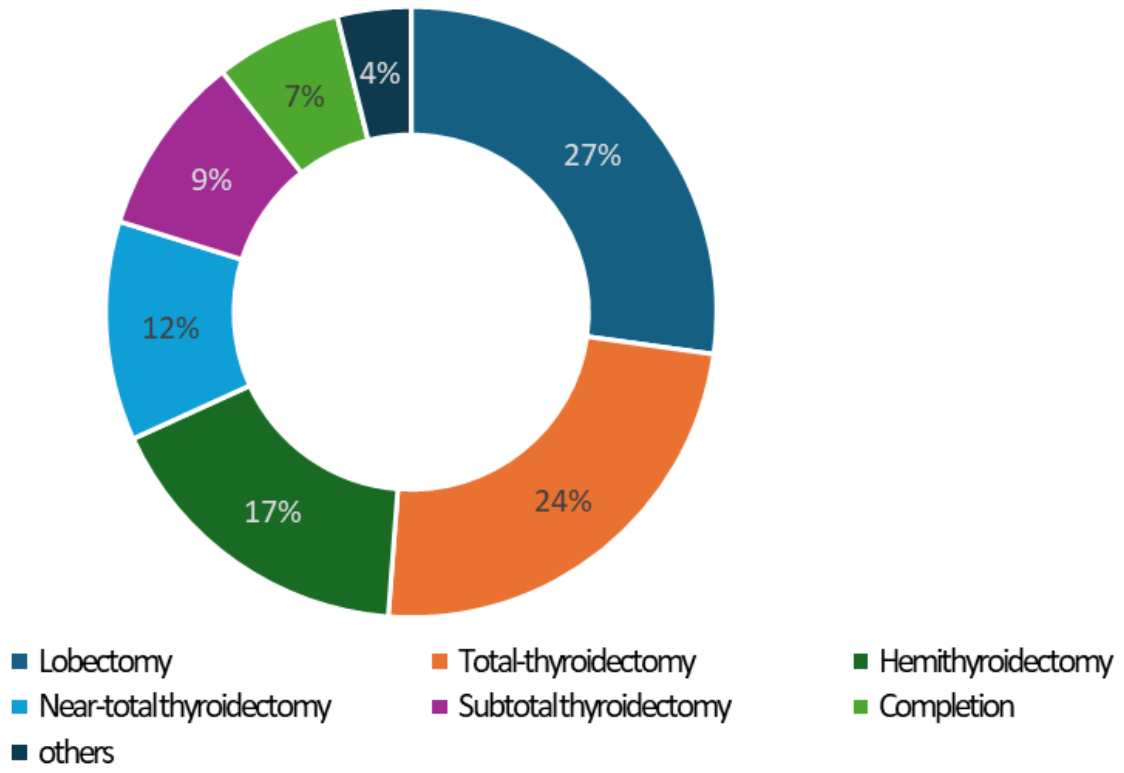


Figure 6: types of thyroidectomies done by extent of resection.

4.3 Post-operative outcome (complications and length of hospital stay)

The overall post thyroidectomy complication rate was 15.3%.

Post operative airway compromise were the most common complications observed at 10.1%. These included patients with retained ETT or reintubated post operatively, those presenting with difficulty breathing and those who eventually required a tracheostomy. , Post Operative hypocalcemia was the second most prevalent complication noted accounting for 4.4%. The ICU admission rate post thyroidectomy was 10.6%. A total of 2 patients died post operatively culminating a mortality rate of 0.5%. Moreover, the overall average length of hospital stay was 5.18 ± 4.6 (1 – 37) days.

Table 4: Post-Thyroidectomy Surgical Outcomes

Post-Operative In-hospital complications	**Frequency**	**Percentage**
Airway compromise	41	10.1
Hypocalcemia	18	4.4
Voice change	15	3.7
Difficulty swallowing	3	0.74
Hematoma	3	0.74
Blood loss (transfusion required)	1	0.2
Complication Rate (n=62)		15.3
Mortality Rate (n=2)		0.5
ICU admission Rate (n=43)		10.6
Length of hospital stay		
Mean **±** SD (range)	**5.18 ± 4.6 (1 - 37) days**	

4.4 Factors associated with Post thyroidectomy complications.

Using chi square test, a number of independent variables were analyzed against the occurrence of any post thyroidectomy complication. Patient's age (p=0.01), Duration of symptoms (p<0.001), extent of the gland pathology whether unilateral or bilateral (p=0.003) and extent of thyroid resection (p=<0.001) were observed to demonstrate a clinically significant association with development of post thyroidectomy complications.

Table 5: Factors associated with post thyroidectomy complications.

Variable	Post-Thyroidectomy Complication "*Yes*" n (%) 62(15.3)	"*No*" n (%) 343 (84.7)	P Value
Age			**0.01**
60 +	22(25)	66(75)	
40 – 59	28(14.3)	168(85.7)	
18 – 39	12(9.9)	109(90.1)	
Comorbidity			0.352
Yes	20(18)	91(82)	
No	42(14.3)	252(85.7)	
Duration of Symptoms			**<0.001**
> 10 years	62(15.3)	33(64.7)	
1 – 10 years	31(13.8)	193(86.2)	
< 1 year	13(10)	117(90)	
Size of Goiter			0.17
Grade 0	0 (0.0)	7 (100.0)	
Grade 1	3(33.3)	6(66.7)	
Grade 2	59(15.2)	330(84.8)	
Goiter extent			**0.003**
Unilateral	15(8.9)	153(91.1)	
Bilateral	47(19.80)	190(80.2)	
Thyroid function Test			0.086
Euthyroid	30(12.8)	205(87.2)	
Hyperthyroidism	21(22.6)	72(77.4)	
Hypothyroidism	4(17.4)	19(82.6)	
Histology			0.288
Malignant	11(11.8)	82(88.2)	
Benign	51(16.3)	261(83.7)	
Extent of Thyroidectomy			**0.001**
Lobectomy	9(8.2)	101(91.8)	
Near-total	10(21.3)	37(78.7)	
Total	27(27.8)	70(72.2)	
Subtotal	2(5.1)	37(94.9)	
Hemithyroidectomy	9(13)	60(87)	
Completion	2(7.4)	25(92.6)	
Others	3(18.8)	13(81.2)	
Sex			0.497
Female	54(14.9)	309(85.1)	
Male	8(19)	34(81)	
Pre-Op Anemia			0.994
Yes	26(15.3)	144(84.7)	
No	36(15.3)	199(84.7)	
Surgery duration			0.073
<120mins	22(11.8)	164(88.2)	
≥120mins	40(18.3)	179(81.7)	

After controlling for confounders using multivariable linear regression analysis it was revealed that having a duration of symptoms for more than 10 years (OR=4.1, CI=1.60 - 10.58, P=0.003) and extensive thyroid resections, specifically total thyroidectomy (OR=3.12, CI=1.08 - 9.02, P=0.035) were independently associated with higher incidences of post operative complications.

Table 6: Multivariable analysis on factors associated with development of post-thyroidectomy complications.

Variable	Unadjusted OR (95%CI)		Adjusted OR (95%CI)	
	POR (95% CI)	**P-value**	**POR (95% CI)**	**P-value**
Age (years)				
60+	3.03(1.4 – 6.5)	**0.005**	1.59(0.63 – 4.03)	0.33
40 – 59	1.5(0.7 – 3.10)	0.258	1.18(0.53 - 2.62)	0.68
18 – 39	Ref		Ref	
Co-morbidity				
Yes	1.39(0.73 – 2.36)	0.353		
No	Ref		Ref	
Duration of symptoms				
> 10 years	4.9((2.18 – 11.04)	**<0.001**	4.115(1.60 - 10.58)	**0.003**
1 – 10 years	1.4(0.73 – 2.87)	0.293	1.9(0.86 - 4.215)	0.111
< 1 year	Ref		Ref	
Goitre extent				
Bilateral	2.5(1.36 – 4.7)	**0.003**	1.57(0.69 - 3.57)	0.286
Unilateral	Ref		Ref	
Thyroid function				
Hyperthyroid	1.99(1.07 – 3.70)	0.029	1.52(0.77 - 2.0)	0.227
Hypothyroid	1.44(0.45 – 4.52)	0.533	1.44(0.42 - 4.9)	0.56
Euthyroid	Ref		Ref	
Malignant Vs benign				
Malignant	0.68(0.34 – 1.38)	0.29		
Benign	Ref			
Extent of thyroidectomy				
Near-total	3.03(1.14 – 8.05)	**0.026**	2.03(0.59 - 6.98)	0.263
Total	4.33(1.9 – 9.76)	**<0.001**	3.12(1.08 - 9.02)	**0.035**
Subtotal	0.6(0.13 – 2.94)	0.535	0.72(0.13 - 3.92)	0.702
Hemithyroidectomy	1.68(0.63 – 4.47)	0.296	1.57(0.5 - 4.9)	0.441
Completion	0.9(0.18 - 4.42)	0.894	0.88(0.16 - 4.94)	0.886
Others	2.59 (0.62 – 10.8)	0.192	2.98(0.59 - 15.15)	0.187
Lobectomy	Ref		Ref	
Pre-op anemia				
Yes	0.998 (0.58 - 1.73)	0.994		
No	Ref			
Surgery duration				
≥ 120mins	1.66 (0.95 – 2.921)	0.075	1.33(0.68 - 2.59)	0.403
< 120mins	Ref		Ref	

CHAPTER FIVE

5.0 DISCUSSION

Our study aimed at highlighting the clinical and pathological features among thyroidectomy patients seen at a tertiary referral hospital (MNH). With the large sample size of 405 patients, most of these characteristics have been well represented ranging from clinical presentation, perioperative factors to immediate post operative outcomes. These have all been studied to try and map out possible factors that may eventually be adjusted to improve patient post operative outcomes and overall quality of care among thyroidectomy patients.

5.1 Clinical characteristics of patients undergoing thyroidectomy.

Findings from our study showed a female predilection towards thyroid disorders with a female to male ratio of 8.6:1. Middle aged individuals seem to be more affected compared to other age groups with majority presenting with an anterior neck swelling prior to seeking medical help. This is inline with a study done in USA that observed a median age of 50 years for most thyroid pathologies requiring thyroidectomy with a female predominance of 61.3% [50]

A study done in northern Tanzania showed a relatively younger population that underwent thyroidectomy (mean age of 38.4 years), however the female gender was still consistently more affected than males at a female to male ratio of 11.7:1 [37]

Among the many clinical and demographic factors analysed in our study, age and duration of symptoms had shown a statistical significance in developing post thyroidectomy complications. However, on controlling for other confounders only symptom duration remained statistically significant. This is inline with a study done in Brazil that showed that patients with longer duration of symptoms are more likely to develop complications post operatively. [47] Longer symptom duration has been associated with a larger goitre and in case of malignancy, more local invasion of significant neighbouring structures like the recurrent laryngeal nerve making surgical complications more likely.

5.2 Pathological characteristics of thyroidectomy patients

Our study highlighted on the inadequate preoperative radiological assessment of thyroidectomy patients. Only 50.4% of patients had some form of imaging done to assess the extent and nature of the goiter. Ultrasound has been shown to be the most commonly used investigative tool most likely due to its less invasive nature and low cost. Despite this, the study showed a significant inconsistency in the reporting of thyroid radiological findings. This lack of uniformity hinders utilization of the TI-RADS system, which is essential in determining patient prognosis, subsequent treatment options or dictating the need for further investigations such as FNAC. This has been a similar trend among African countries where despites its high sensitivity to detect malignancy among thyroid nodules, there is poor utilization of the TI-RADS classification system [51].

Majority of the patients had a benign thyroid pathology as evidenced by the preoperative FNAC and furthermore confirmed by the final histopathology results. Malignant thyroid conditions only accounted for 23% with papillary thyroid carcinoma being the most prevalent (14.3%) followed by follicular carcinoma (6.2%). Simple multinodular Goiter was the most prevalent benign pathology seen (44.7%).

This is in line with most literature where papillary thyroid carcinoma is considered the most prevalent malignancy of the thyroid. Furthermore, benign thyroid disorders are generally more commonly observed. A 2020 Saudia Arabian study showed papillary carcinoma at a prevalence of 41% while multinodular colloid goiter had a 34.5% occurrence among all thyroid pathologies [27]

Not all patients had undergone thyroid function tests immediately prior to surgical intervention, however of those who had TFT results (n=351) 67% were Euthyroid with 26% still in hyperthyroid state. This is mainly due to the medical course of antithyroid medication that these patients are routinely prescribed prior to surgery to achieve this an euthyroid state. Similar findings were observed in Bugando Hospital where 92.1% of their thyroidectomy patients had an euthyroid state prior to surgery [37].

Lobectomy was the most frequently performed type of thyroidectomy at a prevalence of 27% followed by total thyroidectomy and hemithyroidectomy (prevalence of 24% and 17% respectively). Similar patterns have been shown in California state (USA) where lobectomy and total thyroidectomies were the prevalent procedures at 40% prevalence each [50]. However study done in Tanzania in 2011 assessing 148 thyroidectomy patient showed a higher prevalence of near-total and subtotal thyroidectomy (47.3% and 16.2% respectively), while lobectomy and isthmusectomy had a combined occurrence of only 12.2% [37].

This demonstrates a recent shift away from extensive thyroid resections and a predilection to initial lobectomy with subsequent completion thyroidectomy after definitive histopathology results.

5.3 Post-operative complications and associated factors.

Our study found the overall complication rate to be 15.3% with a 0.5% mortality rate. 43 patients were admitted to ICU post operatively. This was slightly lower compared to a 1 year Ethiopian study done in 2021 where they observed an 18.6% complication rate with 2.5 days length of hospital stay and 0% mortality rate [49]. A similar article done in Tanzania reported lower rate of complication of 7.9%. The reported mortality rate was 3.4% (5 patients). This reflects a much higher mortality rate despite the shorter (1 year) study time compared to our current study of 5 years. The study further described a longer length of hospital stay of 14.4 days (range 3 – 34 days). This showed a significant improvement in the surgical management of thyroid disorders in Tanzania [37]

In this study post operative airway complications were the most prevalent at 10.1% followed by hypocalcemia which was observed among 18 patients (4.4%). This differs slightly from most literature where post operative hypocalcemia is seen more frequently post thyroidectomy [52,53] [45]

The analysis of symptom duration revealed that patients with symptoms lasting more than 10 years had a notably higher complication rate of 15.3%, which was statistically significant compared to shorter durations. This finding is consistent with results from other studies that suggest chronicity of thyroid disease may lead to more complicated surgical cases and adverse outcomes[54]. One reason for this association could be the potential for more extensive disease or anatomical changes resulting in increased surgical complexity and subsequent higher complication rates.

In conjunction with this, the extent of thyroid resection has also been statistically significant in both Bivariable and multivariable regression analysis. Patients undergoing total thyroidectomy have a 3.12 times higher risk of post thyroidectomy complications as compared to those undergoing only lobectomy (p=0.035).

Literature attributes a wider variety of factors contributing to post thyroidectomy complications than observed in our current study. Size of the goiter, presence of comorbidities , malignancy and surgeon experience are all factors that have been shown to associate with a higher rate of post thyroidectomy complications [37][44][47][49].

As seen in our study, the extent of thyroid resection is the most widely reported associated factor for developing post thyroidectomy complications. However, in our study most of these factors lack the statistical significance to be attributed to post thyroidectomy complications. Size of the gland and malignancy have been indirectly associated with post operative complications due to these cases requiring extensive tissue dissection and gland resection.

CHAPTER SIX

6.0 STUDY LIMITATIONS, MITIGATION, CONCLUSION AND RECOMENDATION

6.1 Study Limitations and Mitigation

In light of the retrospective nature of the study, accuracy and completeness of data on a number of variables was greatly compromised.

Furthermore, a number of laboratory, cytological and radiological information was either missing or inconsistently reported making it difficult to fully analyze all possible contributing factors towards development of post-operative complications. However, all patients had final histological data as well as clinical presentation information well recorded and this will be very helpful in future follow-up studies.

6.2 Conclusion

Thyroidectomy is an invaluable tool in the management of a variety of thyroid diseases. Though generally considered a safe procedure in a well-equipped center wit well trained health care providers, it is not without complications.

Long existing thyroid symptoms have been shown to expose the patient into extensive surgery which would risk such patients to longer hospital stay, ICU admission and various post thyroidectomy complications.

Preoperative assessment of thyroidectomy patients is essential and may help to avoid or at the very least assist in anticipating and plan for post-operative complications. This will help to ensure a safe surgical intervention with a short hospital stay among patients undergoing thyroidectomy.

6.3 Recommendations

Proper preoperative workup for all thyroidectomy patients to identify those most likely to encounter post-operative complications will greatly improve quality of thyroidectomy outcomes. Proper structured and standardized history taking forms

may assist to reduce missing data with the added advantage of identifying high risk individuals such as those with long standing goiters.

Improvements in the performance and reporting of radiological investigations will assist in guiding the surgeon on the proper management path to take. With a standardized reporting system such as the TIRADS, patient care will be able to be streamlined across institutions and help standardize and improve the quality of care.

Patients with longstanding anterior neck masses and those planned for extensive thyroid resection should be considered to be at a higher risk of post operative complications. Meticulous dissection intraoperatively with close post operative monitoring and investigations for complications should be emphasized to improve surgical outcomes.

Community sensitization and health education provision on early presentation of thyroid diseases is of paramount importance to curb the post operative complications, ICU admissions and longer hospital stay related to thyroid surgery.

Further studies, preferably prospective in nature are highly recommended to help mitigate the shortcomings of the retrospective nature of this study.

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APPENDIX:

Appendix I: Structured Checklist for Data Collection

CHECKLIST FOR CLINICOPATHOLOGICAL CHARACTERISTICS AND OUTCOMES OF PATIENTS WHO UNDERWENT THYROIDECTOMY AT MUHIMBILI NATIONAL HOSPITAL.

April 1st, 2018 – March 31st, 2023

1. Candidate serial Number: …….
2. File Number: …….
3. Date of admission: ……

Demographics

4. Age: …….
5. Sex: M
   F
6. Area of residence: ……

Symptomatology

7. Duration of presenting symptoms…….
8. Presenting symptoms- (*circle whichever applies*)
   a. Anterior neck swelling
   b. Difficulty swallowing
   c. Difficulty breathing
   d. Voice changes
   e. Features of thyrotoxicosis
   f. Others (*Mention*)

   ……
   ……
   ……
9. Presence of comorbidities
   a. None
   b. Yes (*circle whichever applies*)
      i. Diabetes
      ii. Hypertension
      iii. coronary heart disease
      iv. others *(mention*):
      ……
      ……
      ……

Pathological characteristics

10. Size of goiter
    a. By Physical exam: ……. Cm (largest diameter or dimensions.
    b. By USS: …….

11. Extent of disease.

    a. Unilateral

    b. Bilateral

FNAC Results

12. FNAC done

    Yes

    No

13. Bethesda category: (*Circle*)

    [i] [ii] [iii]

    [iv] [v] [vi]

Biochemical Tests

14. Pre-Operative:

Neutrophil count: ……

Lymphocytes count: ……..

Platelet count: …….

Hemoglobin: ……..

Hematocrit: …….

TSH: ……

fT4: ……

fT3: ……

Serum Calcium: ……

15. Pre-Op diagnosis

……..

Intra operative varibles

16. Date of Surgery (dd/mm/yy):

……

17. Indication(s) of surgery:

……

……

18. Extent of thyroid excision

Total

Near-total

Subtotal

Dunhill procedure

Isthmusectomy

Lobectomy

Other:……..

19. Lymphnode dissection done

a. No

b. Yes

Level of dissection attained.

……..

c. Not documented.

20. Surgery duration: …… mins

Post-Operative Outcomes

21. ICU admission0

Yes

No

22. ETT retained post op

Yes

No

23. Reintubated post operatively

Yes

No

24. Tracheostomy done

Yes

No

25. Reported difficulty in breathing

Yes

No

26. Changes in voice (If ‘yes’ characterize)

Yes

No

……

……

27. Surgical site hematoma needing evacuation

Yes

No

28. Blood loss requiring transfusion

Yes

No

29. Died

Yes

(Date of death):

……

No

30. Post Op biochemical tests

Neutrophil: ……

Lymphocytes: ……..

Platelet count: …….

Hemoglobin: ……..

Hematocrit: …….

TSH: ……

fT4: …….

fT3: ……

Serum Calcium (Lowest recorded): ……..

31. Final Histopathological Diagnosis (subtype)

……

……..

32. Date of hospital discharge (dd/mm/yy)

……

Appendix II: Ethical Clearance

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/1822 Date: 24/07/2023

MUHAS-REC-07-2023-1822
ALBERT EZRA LAZARO
SCHOOL OF MEDICINE
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: CLINICOPATHOLOGICAL CHARACTERISTICS AND OUTCOMES OF THYROIDECTOMY AT MUHIMBILI NATIONAL HOSPITAL

Reference is made to the above heading,

I am pleased to inform you that the Chairperson has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 24/07/2023
EXPIRATION DATE OF APPROVAL: 24/07/2024

STUDY DESCRIPTION:
Purpose:

The purpose of this cross sectional cohort study is to determine the clinical and pathological characteristics of thyroidectomy patients and how they affect the in hospital outcomes.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:

https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014936.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
8. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
9. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
10. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Dr. Nahya Salim Masoud,
Chairperson, MUHAS Research and Ethics Committee



Appendix III: Introduction Letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.265/2021 07th August, 2023

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM

MUHIMBILI NATIONAL HOSPITAL
RECEIVED
07 AUG 2023
REGISTRY
File No:.....

Re: INTRODUCTION LETTER

We would like to inform you that the bearer of this letter is **Albert Ezra Lazaro** with Reg. No. **HD/MUH/T.265/2021** is a student at Muhimbili University of Health and Allied Sciences (MUHAS) "pursuing **MMed. General Surgery.**

As part of his studies, he will be doing an elective research titled: "**Clinicopathological Characteristics and Outcomes of Thyroidectomy at Muhimbili National Hospital.**" he is being supervised by Dr. Moses Byomuganyizi from MUHAS and Dr. Godbless Massawe from MNH.

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

c.c Albert Ezra Lazaro

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix IV: Permission Letter

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote;

Ref. No.: MNH/CRTCU/Perm/2023/457 **Date: 9th August, 2023**

Head of Department,
Medical Records,
Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH.

Name of Student	**Albert Ezra Lazaro**
Title	**"Clinicalpathological Characteristics and Outcomes of Thyroidectomy at Muhimbili National Hospital".**
Institution	Muhimbili University of Health and Allied Sciences
Supervisors	Dr. Moses Byomuganyizi (MUHAS)
Co - Supervisor	Dr. Godbless Massawe (MNH)
Period	09th August, 2023 to 07th October, 2023

Approval has been granted to the above mentioned student to collect data at MNH. **A final study report should be lodged with Clinical Research, Training and Consultancy Unit.** Dissemination of study findings to MNH stakeholders shall be overseen by **Ms. Amina Chipanga** (MNH) Co – supervisor.

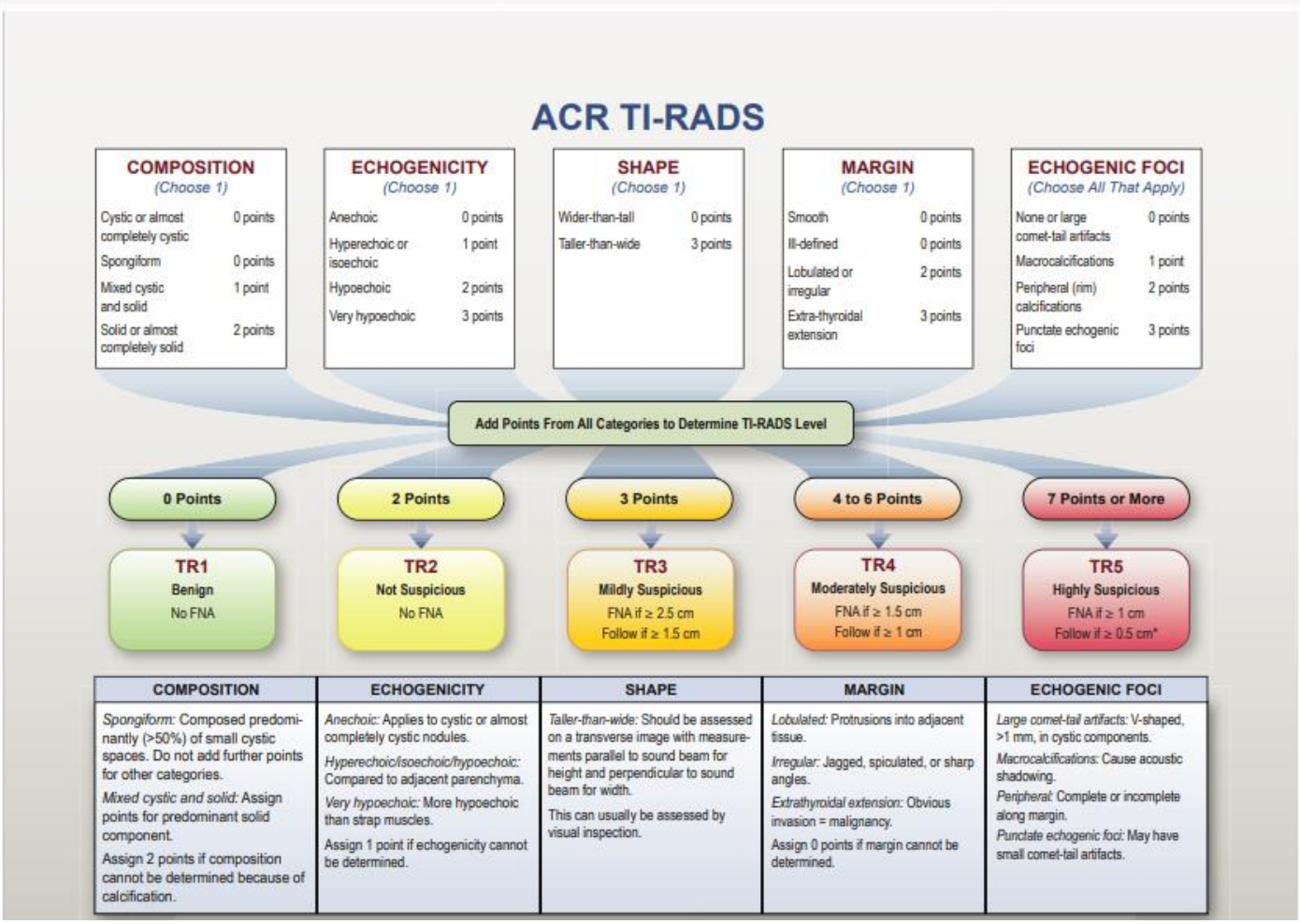
Kindly ensure that the student abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Jessie Mbwambo
Head of Clinical Research, Training and Consultancy Unit

c.c. DICT
c.c. Dr. Godbless Massawe
c.c. Albert Ezra Lazaro

Appendix V: ACR Thyroid Imaging, Reporting and Data System (TI-RADS)



Appendix VI: WHO Grading of Goiter by palpation

Grade O:	No palpable or visible goitre.
Grade 1:	A mass in the neck that is consistent with an enlarged thyroid that is *palpable but not visible* when the neck is in the normal position. It moves upward in the neck as the subject swallows. Nodular alteration(s) can occur even when the thyroid is not visibly enlarged.
Grade 2:	A swelling in the neck that is *visible when the neck is in a normal position* and is consistent with an enlarged thyroid when the neck is palpated.

Appendix V: The 2017 Bethesda system for reporting thyroid cytopathology implied risk of malignancy and recommended clinical management.

Diagnostic category	*Risk of malignancy if NIFTP ≠ CA (%)*	*Risk of malignancy if NIFTP = CA (%)*	*Usual management*[a]
Nondiagnostic or unsatisfactory	5–10	5–10	Repeat FNA with ultrasound guidance
Benign	0–3	0–3	Clinical and sonographic follow-up
Atypia of undetermined significance or follicular lesion of undetermined significance	6–18	~10–30	Repeat FNA, molecular testing, or lobectomy
Follicular neoplasm or suspicious for a follicular neoplasm	10–40	25–40	Molecular testing, lobectomy
Suspicious for malignancy	45–60	50–75	Near-total thyroidectomy or lobectomy[b,c]
Malignant	94–96	97–99	Near-total thyroidectomy or lobectomy[c]