

# Histopathological Patterns and Early Postoperative Complications among Patients with Surgically Treated Thyroid Diseases at Bugando Medical Centre, Mwanza, Tanzania

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## Abstract

**Background:** Thyroid diseases are among the leading endocrine disorders affecting a large proportion of people worldwide and show geographical variation in incidence and histopathological pattern related to age, sex, dietary and environmental factors. Histopathological patterns of surgically treated thyroid diseases play an important role in early diagnosis and management of these diseases. There is, however, limited published data regarding histopathological reports on thyroid disease in our local setting. This study aimed to determine the histopathological patterns and highlight early postoperative complications among patients with surgically treated thyroid diseases at Bugando Medical Centre (BMC). **Methods:** This was a longitudinal study involving all patients with surgically treated thyroid diseases seen at BMC over a period of 6 months from October 2019 to March 2020. **Results:** A total of 84 patients were studied. Females outnumbered males by a female to male ratio of 11:1. The median age of patients was 44 [IQR, 35 - 54] years old, the youngest was 14 years old and the oldest was 76 years old. Colloid goiter was the most common non-neoplastic lesion accounting for 34 (44.7%) patients. Among the neoplastic lesions, follicular adenoma was the most commonly encountered benign pathologies (n = 16; 21.1%), while papillary carcinoma was the most commonly encountered malignancy (n = 4; 50%). Following thyroidectomy, 12 (14.3%) patients developed early complications, of which hemorrhage sometimes requiring blood transfusion was the leading intra/postoperative complications accounting for 4 (33.3%) patients. Other

complications include temporary recurrent laryngeal nerve palsy 2 (16.7%), surgical site infection 2 (16.7%) and tracheomalacia, bronchospasm, thyroid abscess and respiratory obstruction in 1 (8.3%) patient each, respectively. In this study, malignant thyroid lesion ( $p < 0.001$ ), total thyroidectomy ( $p = 0.012$ ), duration of surgery ( $p = 0.024$ ) and use of drains ( $p = 0.002$ ) were associated with increased risk of early postoperative complications. **Conclusion:** This study demonstrated that colloid goiter was the most common non-neoplastic lesion, and on the neoplastic category, follicular adenoma was the most common benign lesion, while papillary carcinoma was the most frequent malignant lesion.

### Keywords

Thyroid Diseases, Histopathological Patterns, Early Postoperative Complications, Tanzania

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## 1. Introduction

The thyroid gland is the largest of all endocrine organs which plays wide and vital physiological roles in the body and can be affected by a broad variety of diseases ranging from functional, immunologically mediated enlargements to neoplastic conditions [1] [2]. The diseases of the thyroid gland are among the common endocrine disorders worldwide secondary only to diabetes mellitus and Tanzania is no exception [3]. The spectrum of thyroid diseases includes simple goitre, toxic goitre, thyroiditis, adenoma and cancers and may present clinically either as an alteration of hormone secretion (*i.e.* hyper, hypo or euthyroidism) or as an enlargement (mass lesion) of the thyroid gland [4]. They vary from non-neoplastic to neoplastic lesions [5].

Thyroid disease is being increasingly diagnosed with greater awareness and is one of the chronic non-communicable diseases affecting women more, though males are not spared of the ailment [4] [6]. The prevalence and pattern of the diseases depend on various factors including sex, age, ethnic and geographical patterns [4]. Thyroid disorders are endemic in mountain regions, where the soil, water and food contain little iodine [7]. Although surgically treated thyroid swellings vary widely from one geographical area to another, thyroid disorders are common in Africa [4] [5] [6]. The prevalence areas of thyroid swellings mainly from iodine deficiency are common highlands. Currently, most African countries, including Tanzania, are implementing universal salt iodization programs to tackle the condition [3].

In clinical practice, most of the thyroid disorders are benign in nature and thyroid enlargements are seen more common in females than in males [4] [6]. Globally, approximately 4% to 7% of general population presents clinically as externally visible thyroid nodules [8] [9]. Majority of thyroid nodules are benign in nature and around only 5% may be malignant [4]. Therefore, a distinction of

benign from malignant is of paramount importance for patient and proper management [6] [9]. Lesions affecting the thyroid can be accurately diagnosed by a careful histopathological examination of thyroidectomy specimen which is a very helpful tool in differentiating the benign nodule from the malignant [4]. Histological classification of thyroid lesions especially neoplastic conditions is essential for further therapy and prognosis [9]. The histopathological pattern of surgically treated diseases is changing in most developing countries with increased awareness among the patients and improved health facilities. This makes it essential that studies are made periodically in every region to define the local data base of its histopathological profile with the idea to establish the diagnosis and prompt treatment at an early stage of the disease [9].

Thyroid surgery has been reported to be the mainstay of the treatment of surgical and is considered as a safe procedure in well equipped settings with suitable experience to anticipate and avoid the occurrence of possible surgical complications [10] [11]. Thyroid operations are the most common endocrine surgeries performed all over the world, and the procedure has undergone tremendous evolution to enhance patient safety. Despite the fact that thyroid surgery is one of the most commonly performed operative procedures in surgical practice, it may be associated with complications if not performed by experienced surgeons [11]. Complications associated with thyroid surgery are mostly avoidable if the procedure is carefully performed and the postoperative management strictly and conscientiously adhered to [12] [13] [14] [15]. There are limited data in Tanzania regarding surgically treated thyroid diseases in respect to histopathological pattern and postoperative complications. These data are predominantly from the western countries and given the differences in demography, lifestyle and possibly genetics, they may not be representative of the pattern in our setting. Furthermore, given the increased availability of iodized salt, flour and food supplements in Tanzania due to government adoption of the universal salt iodination strategy for reduction of iodine deficiency disorders and the new information in international literature of change in the pattern of thyroid lesions as communities transit from iodine deficiency to iodine sufficiency status, there is need to document the histopathological pattern of thyroid lesions in this region. This study aimed to determine the histopathological patterns and highlight early postoperative complications among patients with surgically treated thyroid diseases at Bugando Medical Centre (BMC).

## **2. Methods and Patients**

### **2.1. Study Design and Setting**

A hospital based longitudinal study of patients who had thyroidectomies performed at BMC during a six-month period between October 2019 and March 2020 was carried out. BMC is a consultant, tertiary care, Zonal and a teaching hospital for the Catholic University of Health and Allied Sciences (CUHAS) and has 1200 beds for patients' admission. It is located in Mwanza City along the shore of

Lake Victoria, serving a population of approximately 18 million people from neighboring regions in northwestern Tanzania.

## **2.2. Study Population, Eligibility Criteria, Sample Size Estimation and Sampling Procedure**

The study included all patients who were admitted and subsequently underwent thyroid surgery at BMC during the period of study. Patients who were operated outside BMC were excluded from the study. The Yamane Taro formula [*i.e.*  $n = N/1 + Ne^2$ , where;  $n$  = sample size;  $N = 96$  (patients who underwent thyroid surgery in 2017/2018) (from BMC database unpublished data (eHMS)) and  $e$  = marginal error, 0.05] was used to calculate the minimum sample size. The minimum sample size calculated was 77. Convenient sampling procedure for the patients who met inclusion criteria were performed until the sample size was reached.

## **2.3. Recruitment of Study Patients**

Recruitment of patients to participate in the study was done in the Otorhinolaryngology and Head/Neck wards of Bugando Medical Centre. Patients who met inclusion criteria were, after an informed written consent sought from the patients enrolled into the study. A complete history of the patient pertaining to complaints was obtained from all recruited patients. The clinical details were recorded as per the Performa along with ultrasonographic (USG) findings and related investigations were taken into consideration. Plain neck and chest radiographs were performed in patients suspected to have retrosternal goitres. Ultrasound and radioactive imaging of the thyroid gland were not performed routinely. Computed tomography scan of the neck and chest in patients with massive, retrosternal or clinically malignant goiter, or in a suspected posterior extension of the nodules was not performed due to its unavailability.

All recruited patients were operated under general anesthesia with endotracheal intubations and muscle relaxation. Preoperatively, all patients underwent preoperative anesthetic assessment using the American Society of Anesthesiology (ASA) classification [16]. Intra-operatively, recurrent laryngeal nerves (RLN) were routinely identified on both sides and every attempt was made to identify and preserve the parathyroid glands. Those glands with compromised blood supply were excised, diced and re-implanted in the sternocleidomastoid muscle. All wounds were closed with rubber drains left in situ. Intra-operative findings were documented by the operating surgeons. The weights of the thyroid specimens removed at operation were recorded. Surgeon's assessment of the patients' voice was a reliable method to suspect vocal cord palsy during the postoperative period. Laryngoscopic examination was advised postoperatively in patients with hoarseness or loss of voice quality. Postoperative serum calcium levels were selectively checked in all patients undergoing total thyroidectomy. In the absence of any complication all patients were discharged on the third day. All patients were followed until discharge or death.

## 2.4. Histopathological Examination

All postoperative thyroid tissues specimens removed surgically were subjected to histopathological examination for diagnostic confirmation. The slides were prepared from the thyroidectomy specimens which were fixed in 10% formalin. Routine processing of representative areas were done after thorough grossing of the specimens.

Paraffin embedded blocks were sectioned using microtome. The 5 µm thick sections were stained with Haematoxylin and Eosin. The disorders of thyroid were then classified on histological basis into non-neoplastic and neoplastic lesions which were further sub-classified as benign and malignant as per the World Health Organization (WHO) classification of tumors of endocrine organs [17].

## 2.5. Data Collection and Statistical Analysis

The collected data were entered in Epi-Data 3.1 computer software and later transferred into STATA Version 13 for analysis according to the objectives of the study. Data were summarized in form of proportions, and frequency tables, for categorical variables, while measures of central tendency were used to summarize continuous variables. The 95% confidence intervals and *p*-values were used to delineate results. Chi-square ( $\chi^2$ ) test was used to test for the significance of the association between the independent (predictor) and dependent (outcome) variables in the categorical variables. The level of significance was considered as  $p < 0.05$ .

## 2.6. Ethical Consideration

Ethical clearance was sought from the Joint CUHAS/BMC Research, Ethics, and review committee (CREC/363/2019). Permission to conduct the study was obtained from the hospital authority and anesthesia department. In this study, patients were requested to sign an informed written consent form the study. Patients were assured that the information collected was maintained under strict confidentiality. Patients had the right to withdraw from the study at any time during the study. There was full disclosure of risks and benefits to all study participants. Histopathological results were given to all patients including those who found with thyroid malignancy following histopathology results, where it was shared to the attending doctor for further specific management. The study did not interfere with the decision of the attending doctor/Nurse.

## 3. Results

### 3.1. Socio-Demographic Characteristics

During the study period, a total of 84 patients with surgically treated thyroid were studied. Of these, 77 (91.7%) and 7 (8.3%) were female and male patients, respectively (M:F = 11:1). The median age of patients was 44 [IQR, 35 - 54] years, the youngest was 14 years old and the oldest was 76 years old. Two thirds

(66.7%) of patients came from the rural areas (**Table 1**).

### 3.2. Histopathological Patterns of Thyroid Lesions Following Thyroid Surgery

In the present study, out of 84 patients, 48 (57.1%) were diagnosed as non-neoplastic and remaining 36 (42.9%) as neoplastic. Among the non-neoplastic cases, colloid goiter comprising 34 (70.8%) cases was found to be the most common lesion followed by nodular goiter 7 (14.6%), Hashimoto thyroiditis 4 (8.3%) and lymphocytic thyroiditis, Grave's disease and thyroid abscess in 1 (2.1%) each, respectively. Out of 36 cases with neoplastic lesions, 28 (77.8%) were benign lesions and 8 (22.2%) were malignant lesions. Of the benign lesions, follicular adenoma, 16 (57.1%) was the most common neoplastic lesion, while papillary carcinoma was the most common malignant lesion 4 (50.0%) as shown in **Table 2** below. In the present study, benign neoplastic lesions were more common than malignant lesions with benign-malignant lesion ratio of 3.5:1. The peak age of occurrence for non-neoplastic cases was 31 - 40 years. The peak age of occurrence of benign neoplasms was 31 - 40 years, while the peak age of occurrence

**Table 1.** Socio-demographic and clinical characteristics of study patients at BMC.

Socio-demographic characteristics	Number (n)	Percent (%)
<b>Age-group in years</b>		
10 - 30	11	13.1
31 - 50	47	56.0
51 - 70	22	26.2
>70	4	4.8
<b>Age in years</b>		
Mean (SD)	44.38 ± 13.47	
Median (IQR)	44 (35 - 54)	
Min-max	14 - 76	
<b>Sex</b>		
Male	7	8.3
Female	77	91.7
<b>Area of residence</b>		
Urban	28	33.3
Rural	56	66.7
<b>Duration of illness</b>		
<1	23	27.4
1 - 5	41	48.8
>5	20	23.4
<b>Indications for surgery</b>		
Pressure symptoms	46	54.8
Cosmetic disfigurement	28	33.3
Suspicious malignancy	8	9.5
Toxic goiter	1	1.2
Thyroid abscess	1	1.2

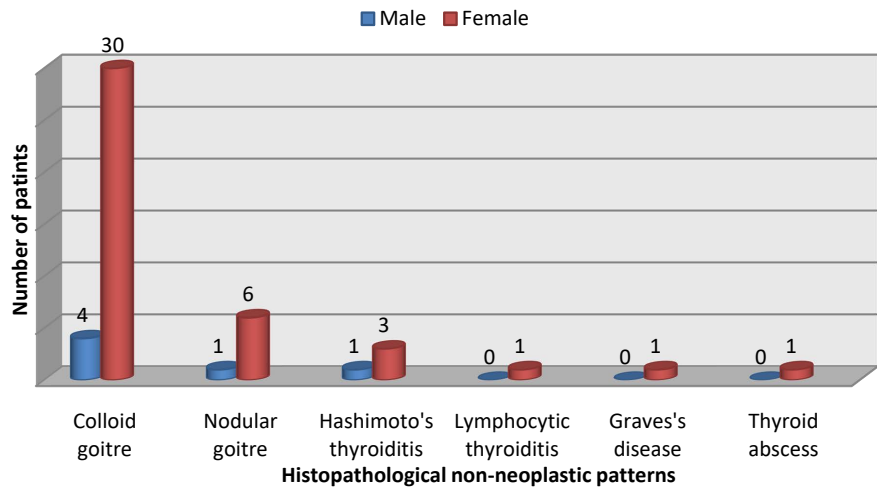
of malignant neoplasms was 21 - 30 years (**Table 3**). Both non-neoplastic and neoplastic lesions show female predominance (**Figure 1 & Figure 2**).

**Table 2.** Histopathological patterns of thyroid lesions at BMC.

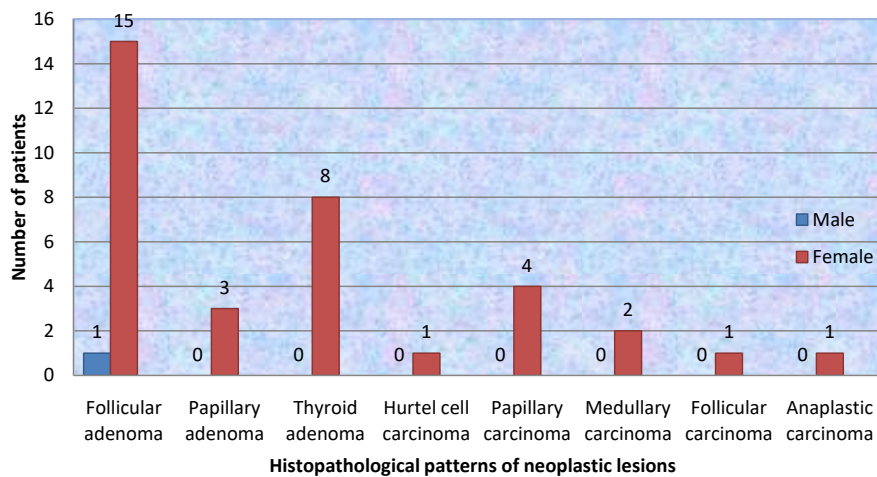
Histopathological patterns	Number of patients (n)	Percentage (%)
<b>Non-neoplastic lesions</b>	48	57.1
Colloid goiter	34	70.8
Nodular goiter	7	14.6
Hashimoto's thyroiditis	4	8.3
Lymphocytic thyroiditis	1	2.1
Grave's disease	1	2.1
Thyroid abscess	1	2.1
<b>Benign neoplastic lesions</b>	28	33.3
Follicular adenoma	16	57.1
Hurtle cell adenoma	1	3.6
Papillary adenoma	3	10.7
Thyroid adenoma	8	28.6
<b>Malignant neoplastic lesions</b>	8	9.5
Papillary carcinoma	4	50.0
Medullary carcinoma	2	25.0
Follicular carcinoma	1	12.5
Anaplastic carcinoma	1	12.5

**Table 3.** Histopathological patterns v/s age group following thyroid surgery at BMC.

Histopathological patterns	Age group (years)						Total number of patients
	11 - 20	21 - 30	31 - 40	41 - 50	51 - 60	>60	
<b>Non-neoplastic lesions</b>							
Colloid goiter	0	1	24	4	5	0	34
Nodular goiter	0	0	3	3	1	0	7
Hashimoto's thyroiditis	0	1	2	0	1	0	4
Lymphocytic thyroiditis	1	0	0	0	0	0	1
Grave's disease	0	1	0	0	0	0	1
Thyroid abscess	0	0	1	0	0	0	1
Total	1	3	30	7	7	0	48
<b>Benign neoplastic lesions</b>							
Follicular adenoma	0	0	7	6	1	1	16
Hurtle cell adenoma	0	0	1	0	0	0	1
Papillary adenoma	0	0	2	1	0	0	3
Thyroid adenoma	1	1	2	2	1	1	8
Total	1	1	12	9	2	2	28
<b>Malignant neoplastic lesions</b>							
Papillary carcinoma	0	0	2	1	1	0	4
Medullary carcinoma	0	2	0	0	0	0	2
Follicular carcinoma	0	1	0	0	0	0	1
Anaplastic carcinoma	0	1	0	0	0	0	1
Total	0	4	2	1	1	0	8



**Figure 1.** Sex distribution versus histopathological non-neoplastic lesions.



**Figure 2.** Sex distribution versus histopathological non-neoplastic lesions.

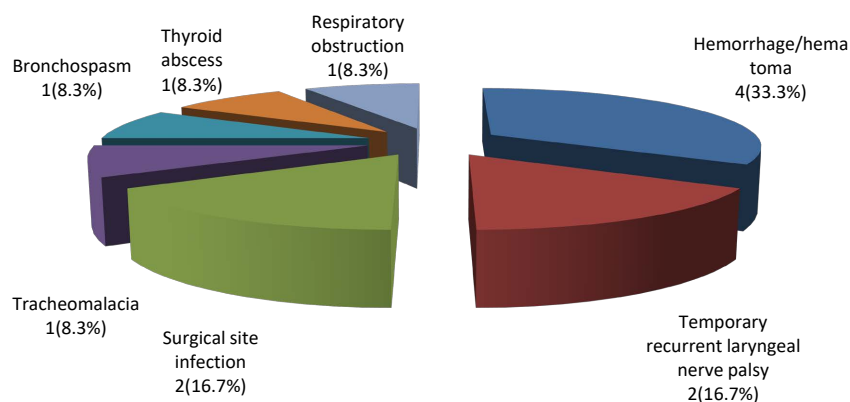
### 3.3. Early Complications Following Thyroid Surgery

Out of 84 patients enrolled in the study, 12 developed complications following thyroid surgery, giving an overall complication rate of 14.3%. As shown in **Figure 3** below, intraoperative hemorrhage requiring post-operative blood transfusion (33.3%) was the most common postoperative complications. Other complications include temporary recurrent laryngeal nerve palsy 2 (16.7%), surgical site infection 2 (16.7%) and tracheomalacia, bronchospasm, thyroid abscess and respiratory obstruction in 1 (8.3%) patient each, respectively.

### 3.4. Factors Associated with Early Complications Following Thyroid Surgery

In this study, malignant thyroid lesion ( $X^2 = 67.872$ ;  $p < 0.001$ ), total thyroidectomy ( $X^2 = 8.432$ ;  $p = 0.012$ ), duration of surgery ( $X^2 = 8.116$   $p = 0.024$ ) and use of drains ( $X^2 = 9.332$ ;  $p = 0.002$ ) were associated with increased risk of early postoperative complications (**Table 4**).





**Figure 3.** Early complications following thyroid surgery.

**Table 4.** Factors associated with early complications following thyroid surgery at BMC.

Patient variable	Complications		Chi-square	p-value
	Yes n (%)	No n (%)		
<b>Age</b>				
≤50	9 (15.5)	49 (84.5)	0.563	0.083
>50	4 (15.4)	22 (84.6)		
<b>Sex</b>			0.985	0.067
Male	2 (28.6)	5 (71.4)		
Female	10 (13.0)	67 (87.0)		
<b>Area of residence</b>			1.864	0.875
Rural	6 (10.7)	50 (89.3)		
Urban	2 (7.1)	26 (92.9)		
<b>Type of thyroid disease</b>			67.872	<0.001
Non-malignant	5 (6.6)	71 (93.4)		
Malignant	7 (87.5)	1 (12.5)		
<b>Type of thyroidectomy</b>			8.432	0.012
Non-total thyroidectomy	4 (8.0)	46 (92.0)		
Total thyroidectomy	8 (36.4)	14 (63.6)		
<b>ASA class</b>			1.229	0.187
1 - 2	11 (14.5)	65 (85.5)		
≥3	1 (12.5)	7 (87.5)		
<b>Duration of surgery (minutes)</b>			8.116	0.024
<60	3 (12.5)	21 (87.5)		
61 - 120	7 (21.9)	25 (78.1)		
>120	2 (7.1)	26 (92.9)		
<b>Use of drains</b>			9.332	0.002
Yes	10 (19.2)	42 (80.8)		
No	2 (6.2)	30 (93.8)		

## 4. Discussion

In this study, the age distribution of patients shows that the majority of patients

were in their third and fourth decades of life. This age distribution is in agreement with other studies done elsewhere [18] [19] [20] as well as in a study which was done more than a decade ago at our centre [3]. Thyroid lesions have been reported in several studies to affect both the sexes with female preponderance [21] [22] which was also seen in all the lesions in our study. The female to male ratio found in this study was 11:1, which compares with 11.7:1 that was reported previously by Chalya *et al.* [3] at the same centre, but it is higher than 7:1, 6.2:1, 6:1 and 5.7:1 from studies conducted by Nzegwu *et al.* [23], Nggada *et al.* [18] and Abdulkareem *et al.* [24] respectively. These female to male ratios in these studies vary significantly in these studies reflecting different study populations. This preponderance of thyroid lesions in females may be attributed to the higher demand of iodine for physiologic needs in this age group especially during puberty, pregnancy and lactation, and possibly the dietary iodine deficiency which is the case in many low and middle income countries [25].

In the present study, more than half of patients were diagnosed as having non-neoplastic lesions. This observation is consistent with findings from Chung *et al.* [26], Sreedevi & Sheela [27] and Hill *et al.* [28] which was 62.5%, 84.1% and 60.5% respectively. Colloid goitre is the prevailing lesions among the non neoplastic thyroid lesions with recorded incidence ranging from 56.9% to 76% [4] [6] [27]. Colloid goiter occurs as a result of prolonged period of iodine deficiency resulting in the accumulation of colloid material in the gland and lead to colloid goiter. The puberty goiter, pregnancy goiter, and colloid goiter if left untreated will change to multinodular goiter [4] [27]. In keeping with other studies done elsewhere [4] [26] [27], the results of this study show that colloid goiter was the most common non-neoplastic lesion. However, this finding is contrary to what was reported earlier at our centre that simple multinodular goitres was the most common type of goitres seen at this centre [3] reflecting change in the histopathological pattern of non-neoplastic lesions of thyroid disease.

As reported in several studies regarding neoplastic diseases of the thyroid [29], the present study demonstrated that benign neoplastic lesions were more common than malignant lesions. In this study, as in other studies [27] [30] [31], follicular adenoma was the most common neoplastic lesion, while papillary carcinoma was the most common malignant lesion. The histopathological pattern of malignant lesions in this study is at variance with what was reported previously at BMC [3] and elsewhere [13] [14] that follicular carcinoma was the commonest type of malignant neoplastic lesion. It is known that papillary carcinoma is the predominant type in areas without iodine deficiency, and its frequency is said to increase in regions with high iodine uptake, unlike follicular carcinoma which is said to follow long-standing iodine deficiency goitres and its incidence is more common in areas of endemic goiters [12], suggesting that in some cases, nodular goiter may predispose to the development of the neoplasm.. Further studies are therefore needed to explain the reason for this difference in histopathological pattern of thyroid malignancies in this region.

It is well known that the indication for thyroid surgery is determined by the prevalence of goitre in a certain locality [27]. In this study, pressure symptoms and cosmetic disfigurement were the most common indications for surgery. This finding is similar to studies done at BMC [3] and elsewhere [13] [14] [32]. This is contrary to Acun *et al.* [33] in Greece who reported toxic symptoms as the most common indication for thyroidectomy.

Thyroidectomy has been reported to be a well established surgical procedure and the main stay of treatment of goiters [10] [11]. However, regardless of the improvements in surgical technique and technical support, complications still occur [11]. The post-operative complication rate in the present study is in agreement with other studies reported elsewhere [12] [13] [14] [15]. However, the overall complication rate of 14.3% in the present study is low compared to 27.9% and 34.64% that were reported by Samwel *et al.* [10] and Miguel *et al.* [34], respectively. The reasons for the low overall complication rate in our study may be attributed to the strict selection criteria, good preoperative screening of patients, good theatre/anesthetic and ward facilities, and competent surgical/medical staff of the hospital.

Hemorrhage/hematoma following thyroidectomy is a life-threatening early complication of thyroid surgery in various series and its incidence rate is reported to be 0.3% - 1.5% [35]. In the present study, hemorrhage sometimes requiring blood transfusion was the most common immediate complication which is comparable with other studies [12] [14]. This is due to the presence of huge goitres with highly vascularized thyroid tissue in most of our patients and the presence of advanced thyroid malignancies. Our result is contrary to Samwel *et al.* [10] who reported temporary recurrent laryngeal nerve palsy as the most common early complication.

Recurrent laryngeal nerve (RLN) injury is one of the most feared complications of thyroid surgery. The incidence of RLN injury after thyroidectomy widely varies, ranging from 4% to 7% for temporary paresis and from 1% to 4% for permanent paralysis [36]. Unilateral RLN paralysis commonly manifests clinically as hoarseness, weakness, and breathiness of the voice [37]. In our study, temporary recurrent laryngeal nerve palsy was the second most common complication following thyroid surgery accounting for 16.7% of cases and all fully recovered on conservative measures within few months. None of them developed unilateral or bilateral vocal cord paralysis due to transection of recurrent laryngeal nerve. The use of nerve stimulators minimizes the risk of injury to recurrent laryngeal nerve.

Surgical site infections (SSIs) after thyroidectomy are rare complications with the incidence reported to be between 0.5% and 3% in most series [38] [39] [40] [41]. Thyroid surgery is considered a clean procedure with a very low incidence of SSIs. The presence of SSIs due to thyroid surgery is a rare complication; however, it is associated with increased morbidity and mortality, increased length of hospital stay, higher readmission rates and increased hospital costs [42]. In this

study, SSIs also accounted for 16.7% of cases.

Several factors have been reported in the literature to be associated with early complications following thyroid surgery [43] [44] [45]. It has been reported in several studies that thyroid surgery performed for malignant neoplastic lesion of the thyroid is associated with increased risk of postoperative complications [45]. In this study as well as other studies [42] [45], thyroid surgery performed for malignant neoplastic lesion was found to be associated with increased risk of postoperative complications. Malignant pathology is associated with increased vascularity, immunosuppression, and poor wound healing predisposing this to increased risk of postoperative complications [45]. The result of this study would highlight malignant pathology as a critical consideration for surgeons and support the establishment of guidelines to only perform total thyroidectomy for malignant disease in the inpatient setting.

The surgical technique is one of the important factors affect operative complication [43]. As reported in other studies [43] [44], total thyroidectomy as compared to subtotal thyroidectomy was associated with high risk of postoperative complications. This can be explained by the fact that total thyroidectomy is associated with prolonged duration of operation and theoretically this increases the susceptibility of the wound to SSIs by increasing bacterial exposure and the extent of tissue trauma (more extensive surgical procedure) and decreasing the tissue level of the prophylactic antibiotic.

Previous studies have shown a strong association between ASA status and early post-thyroidectomy complications [43] [46]. Increased ASA scores have been reported to be associated with an increased risk of early postoperative complications in the recovery room [46]. In this study, we found no strong association between ASA III and early post-thyroidectomy complications. Lack of statistical significance between ASA III and early post-thyroidectomy complications in this study may be due to a small number of patients with ASA III.

A recent meta-analysis has shown that the use of drain in thyroid surgery is associated with high rate of SSI, prolonged hospital stay and a high pain score [47]. Drains neither prevented post-operative bleeding nor did they facilitate early diagnosis of bleeding [3] [48] [49]. In this study, the use of drain in thyroid surgery was associated with early postoperative complications. This is in line with other studies which have suggested that routine use of drains after thyroid surgery is unnecessary and contributes to the discomfort of the patients, increase the rate of surgical wound infections, prolong the length of the hospital stay and thereby increase the cost, and deteriorate the cosmetic result [50] [51].

The duration of surgery has been reported to affect the incidence of postoperative complications, with more frequent complications being reported after longer operations. With increasing duration of surgery and anesthesia, the risk of postoperative complications increases [46]. In this study, we observed a strong association between the duration of operation and the incidence of post-operative complications such as SSIs. This finding is in keeping with previous reports in

the literature [41]. The exact mechanism by which SSI incidence is increased because of prolonged operative time is not fully understood, however, several studies postulate logical reasons such as increased operative time, patients' open incisions to the environment longer. These increase the risk of bacterial contamination with associated decrease in tissue concentrations of antibiotics as the procedure continues [52]. It is therefore likely that the duration of operation is a dependent risk factor due to the time required for thyroidectomy.

The potential limitations of this study were small sample size and that it was carried out in a single tertiary care hospital in the northwestern part of Tanzania; hence this may not represent the entire population of this region.

## 5. Conclusion

In conclusion, this study demonstrated that the histological pattern of thyroid diseases at BMC is similar to that seen around the world with colloid goiter the most common non-neoplastic lesion, and on the neoplastic category, follicular adenoma was the most common benign lesion, while papillary carcinoma was the most frequent malignant lesion. Thyroidectomy is one of the most common surgical procedures done at BMC and has been performed with low post-operative complication rate. It is therefore recommended that similar studies with a larger sample size should be conducted in multiple centers which would provide a clearer picture of the thyroid lesions in Tanzania.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this article.

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