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A cross-sectional analysis of the histopathologic structure of thyroid patients undergoing thyroid surgery

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ABSTRACT

Background: Major health issues in the contemporary world, thyroid illnesses are distinguished by changes in hormone output, thyroid gland hypertrophy, or both. The purpose of this study was to identify thyroid histological patterns in people who had thyroid surgery.

Materials and Methods: At Kathmandu University Hospital, a retrospective study was conducted over a two-year period, from January 10, 2021, to December 30, 2022. This study includes all 300 patients who underwent thyroid surgery. gender, age, residency, the outcome of a fine needle aspiration biopsy (FNAB), and post-operative histological patterns were all taken into account. Patients who underwent FNA exclusively were ineligible.

Results: Participants' average ages ranged from 35.06 ± 15.19 years. Thyroid disorders were more frequently found in females (90%) than in males (10%). Nodular colloid goitre (65.1%), adenoma (5.8%), papillary thyroid neoplasms (25.4%), follicular thyroid carcinoma (6.8%), medullary thyroid carcinoma (8.5%), thyroiditis (9.3%), and anaplastic thyroid cancer (3.9%) were the histopathologic patterns. With a prevalence of 64 (23.1%), papillary thyroid cancer was the most prevalent type. The combined accuracy of the final histology and FNAB was 90.04%. However, 50% of follicular cancer preoperative diagnoses made by FNAB were insufficiently accurate. While FNAB specificity varied from 95.1% to 98.9%, FNAB sensitivity ranged from 75.8% to 90.8%.

Conclusion: The most common thyroid condition is nodular colloid goitre, while papillary thyroid carcinoma is the most common cancer seen in this study. We suggest more research with a bigger sample size to confirm our findings.

1. Introduction

Major health issues, thyroid conditions are characterized by changes in hormone secretion, thyroid gland enlargement (goitre), or both. Goitre, hypo- or hyperthyroidism, thyroiditis, and neoplasms are the most common thyroid illnesses. Thyroid illness incidence and prevalence in a population are variables that depend on a number of circumstances.[1] Each year, 1% of all newly diagnosed instances of cancer are thyroid cancers. In Nepal, 13,500 thyroid cancer cases are identified annually. Women are three times more likely than males to develop thyroid cancer, and thyroid cancer incidence peaks in the third and fourth decades of life. The development of imaging techniques, an increase in the number of patients who underwent fine-needle aspiration biopsy (FNAB), a more common preference for total thyroidectomy over subtotal thyroidectomy, and improved accuracy in the analysis of pathological specimens are all factors contributing to the increased incidence of thyroid

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cancer.[2,3] Medullary thyroid carcinomas (MTCs), papillary carcinomas, follicular carcinomas, anaplastic carcinomas, primary thyroid lymphomas, and primary thyroid sarcomas are the several types of thyroid cancer. In addition to hormonal assays and morphological studies, a thorough clinical examination is required to detect the various types of thyroid illness. In the end, a conclusive diagnosis is provided through histopathologic analysis.[4,5] Previous research predicted that thyroid cancer would rank third among women's cancers in Nepal in 2019.6 This cross-sectional study was done to determine the histological patterns of thyroid illness in people who had thyroid treatments at the hospital.

2. Materials and Methods

2.1. Data collection

All thyroid disease patients who underwent surgery between January 2021 and December 2022 and visited the surgical out clinic at Kathmandu Hospital in Nepal were included in this study. Patients who underwent fine needle aspiration (FNAB) but not thyroid surgery were not included in the study. Patients with dominant or solitary nodules underwent FNAB. Indirect laryngoscopy was performed on all patients prior to surgery to rule out any existing vocal cord pathology. Additionally, final pathology reports were used to verify the accuracy of FNAB. All biopsy samples were embedded in paraffin, fixed in formalin, and stained with hematoxylin and eosin (H&E). The department archives held all of the reports, slides, and blocks. Pathologists made diagnoses and reports on each area. Patients' ages, locations, sexes, FNAB results, histopathologic diagnoses, types of surgeries, and postoperative complications are among the data gathered. Histological criteria were used to categories thyroid conditions into four main groups: nodular colloid goitre, adenoma, thyroiditis, and carcinoma, which includes the subtypes follicular, papillary, medullary, and anaplastic carcinomas.

2.2. Statistics evaluation

The quantitative factors were described using their mean ± SD, and qualitative factors were described using frequency (percent). Using conventional statistical procedures, sensitivity and specificity were estimated. SPSS version 20 statistical software was used to evaluate the data.

3. Results

The average age of the 300 patients who satisfied our criteria during the study period was 35.06 ± 15.19 years. The youngest and oldest patients ranged in age from 20 to 80. With a female to male ratio of 9:1, thyroid illness afflicted more women (90%) than men (10%). Nodular colloid goitre (150 cases, 65.1% of the FNAB report), papillary thyroid neoplasms (65 cases, 25.4%), adenomas (30 cases, 5.8%), follicular thyroid carcinoma (5 cases, 6.8%), thyroiditis (15 cases, 9.3%), and anaplastic thyroid cancer (10 cases, 3.9%) were the other thyroid conditions that were examined. Despite the fact that 20 cases (Table 1) had an unsatisfactory result.

Table 1: Features of All Patients

Gender (%)	
Male	50 (10%)
Female	250 (90%)
Age (mean ± SD)	15.19 ± 35.06 years
Living area (%)	
Urban	120 (40%)
Rural	180 (60%)
FNAB (%)	
Nodular colloid goiter	150 (65.1%)
Adenoma	30 (5.8%)
Papillary thyroid neoplasms	65 (25.4%)
Follicular thyroid neoplasms	5 (6.8%)
Anaplastic thyroid neoplasms	10 (3.9%)
Thyroiditis	15 (9.3%)
Unsatisfactory smear	20 (5.6%)

Abbreviations: FNAB, fine needle aspiration biopsy; SD, standard deviation.

Different types of operation were total thyroidectomy in 120 (45%) of cases, Hemithyroidectomy in 60 (22.7%) of cases, Total thyroidectomy with central cervical LN dissection in 45 (19.2%) of cases, and subtotal thyroidectomy in 75 (13.1%) of cases.

A complication of surgery was transient hypocalcemia in 6 (2.5%) of cases, hoarseness in 3 (0.6%) of cases, stridor in 4 (1.8%) of cases, wound infection in 5 (3.2%) of cases, esophageal injury in 1 (0.4%) of cases, and tracheomalacia in 2 (0.3%) of cases (Table 2).

Table 2: Post-operative complications

Transient hypocalcemia	6 (2.5%)
Hoarseness	3 (0.6%)
Strider	4 (1.8%)
Wound infection	5 (3.2%)
Esophageal injury	1 (0.4%)
Tracheomalacia	2 (0.3%)

The analysis of histopathology revealed nodular colloid goitre in 150 cases (65.1%), adenoma in 25 cases (15.3%), papillary thyroid neoplasms in 45 cases (20.4%), follicular thyroid carcinoma in 15 cases (10.3%), medullary thyroid carcinoma in 20 cases (12,8%), thyroiditis in 35 cases (20.1%), and anaplastic thyroid carcinoma in 10 cases (0.6%). (Table 3).

Patients were mostly between age 20 to 60 with 220 number of cases in this range (77.7%) (Table 4). Rural areas made over 60% of the cases. The most frequent type of thyroid cancer in our analysis, with roughly 60

Table 3: Histopathological patterns of thyroid diseases encountered in 300 thyroidectomy specimens examined.

Nodular colloid goiter	150 (65.1%)
Adenoma	25 (15.3%)
Papillary thyroid neoplasms	45 (20.4%)
Follicular thyroid neoplasms	15 (10.3%)
Medullary thyroid neoplasms	20 (12.8%)
Thyroiditis	35 (20.1%)
Anaplastic thyroid neoplasms	10 (0.6%)

cases (30.4%), is papillary thyroid carcinoma. The overall FNAB accuracy was 90.05%. The thyroid gland's adenoma and anaplastic carcinoma were accurately diagnosed in 100% of cases. More than 85% of thyroid cancer cases are papillary, medullary, and thyroiditis; 91.5% are nodular colloid. Preoperative follicular cancer diagnosis accuracy may be 50%.

The sensitivity of FNAB ranged from 70.8 to 88.8 (81.4%), and specificity ranged from 97.1 to 99.9 (99.5%). PPV (Positive predictive value) ranged from 90.9 to 99.7 (98.3%), and NPV (negative predictive value) ranged from 89.3 to 96.2 (93.6%). Thus, a negative result can mostly rule out the diagnosis of thyroid carcinoma (Table 5).

4. Discussion

Thyroid disorders are a significant public health issue in our nation, and the incidence and prevalence of these disorders in a given population depend on a variety of factors. Nodular colloid goitre was found to be the most common thyroid illness after Tsegaye and associations (2013) examined the histopathologic pattern of thyroid diseases.[1] The most common thyroid illness, according to our analysis, is Nodular Colloid Goitre (NCG). The most frequent thyroid problem, according to earlier data from the west, is simple goitre, which is more common in young women between the ages of 20 and 30. Iodine-deficient locations have a high prevalence of nodular goitre.[6] The current study's greater rate of nodular goitre raises the potential of iodine shortage in some study regions. To determine the causes and pathophysiology in our population, more research may be needed.

This study found a 9:1 female to male ratio, which is slightly higher than that reported in the literature, which ranges from 2:1 to 9:1.[7,8] while being twice the ratio in studies carried out in other nations like Addis Abeba,1 Kenya,[7,9] Ethiopia. Females are more likely than males to develop thyroid diseases, according to this study.[10,11] In our analysis, thyroid conditions, in particular NCG, were prevalent in nearly all age groups, primarily in the 20–50 year age range, which was consistent with surgical textbooks.[4,12]

Our study had some limitations, mostly because other places lacked diagnostic resources and were close to major hospitals. In our study, the geographic distribution of disease primarily impacted rural residents, supporting earlier similar findings in literature and surgical textbooks.1,[13–15] FNAB, which can be carried out with or without ultrasound assistance, has emerged as the single most significant test in the assessment of thyroid masses.[16] In contrast to previously published findings in studies conducted in Pakistan and the United Arab Emirates, respectively, 66.2% of benign thyroid disorders were detected by FNAB in the present study.[16,17] This might be taken to mean the total number of instances, and the population in those studies was different. Since there were more malignant thyroid illnesses detected by FNAB in the current research than in earlier ones,[16,17] this might be related to the rising incidence of cancer in our nation and the expansion of diagnostic resources. Additionally, compared to other research, the prevalence of adenoma in our study is remarkably decreased. Thyroid cancers are rather infrequent. Although some forms, particularly papillary carcinoma, may manifest in childhood, the majority of occurrences involve adults. Patients who get thyroid cancer in their early and middle adult years tend to be female, and the majority of thyroid cancers are well-differentiated varieties. Ionizing radiation exposure is regarded as the main risk factor for developing thyroid cancer, particularly in the first two decades of life. As risk factors, thyroid conditions including nodular colloid goitre and autoimmune thyroid conditions like Hashimoto thyroiditis have been identified. In contrast to popular assumption, thyroid cancer was observed in 70 (28.1%) of the cases in our study. 23.3% of thyroid carcinomas were reported in another investigation.[9] The most prevalent endocrine malignancy is thyroid cancer, which affects around 5% of all cancer cases in Nepal (4% of women and 0.5% of men) and is disproportionately affecting women.[18] Based on variables including location, age, and sex, thyroid cancer incidence fluctuates greatly each year.[12] Our study's findings regarding the age distribution of thyroid cancer were in line with those seen in surgical textbooks.[4,12]

Based on histology, there are four different types of thyroid carcinoma: papillary, follicular, medullary, and anaplastic thyroid neoplasms. Eighty percent of thyroid cancers are papillary thyroid neoplasms.[19] Papillary carcinoma was found to make up (75%) of thyroid carcinomas in our study. 10% of thyroid malignancies are follicular carcinomas, which are more common in places with low iodine levels. According to surgical textbooks, our investigation found a slightly greater frequency of follicular cancer (14.2%).[4,12] Medullary thyroid cancer develops from the parafollicular cells of the thyroid and makes up about 5% of all thyroid cancers.[20] We found 5 cases (7.14%) in our analysis, which is significantly more than what was mentioned in the prior paper.[19] It resembles previous published studies, though.[9,21,22] Although our study found 2.85%, anaplastic carcinoma only makes up

Table 4: The Age Distribution and Histological Categories of 300 Thyroidectomy Specimens

Pathology report n (%)	Age Groups (Year) n (%)						Total Number
	0-20	20-29	30-39	40-49	50-59	60+	
Nodular colloid goiter	15 (11.2)	25 (21.3)	20(12.5)	40 (25.8)	15 (10.3)	35 (22.6)	150
Adenoma	5 (12.7)	3(1.8)	5 (4.8)	2 (1.5)	0 (0.0)	10 (8.5)	25
Papillary	8 (6.3)	10(9.2)	16 (13.5)	3 (2.1)	5 (0.1)	3 (2.3)	45
Anaplastic	0 (0.0)	2 (1.5)	0 (0.0)	3 (2.1)	2 (1.3)	3 (2.5)	10
Follicular	3 (1.2)	0 (0.0)	0 (0.0)	4(2.8)	3 (2.9)	5 (3.5)	15
Thyroiditis	0 (0.0)	8 (3.6)	0 (0.0)	15 (14.1)	10 (8.5)	2 (1.9)	35
Medullary	0 (0.0)	2 (1.9)	6 (3.2)	6 (3.9)	3 (4.4)	3 (2.8)	20
Total	31	50	47	73	38	61	300

Table 5: The accuracy between FNAB and final pathology

Final pathology	FNAB n (%)							
		Nodular colloid goiter	Adenoma	Papillary	Follicular	Anaplastic	Thyroiditis	Unsatisfactory Total
Result of Biopsy n (%)	Nodular colloid	150(95.3)	5(2.3)	2(0.8)	0(0.0)	0(0.0)	0(0.0)	10(6.8) 167
	Adenoma	0(0.0)	13(98.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0) 13
	Papillary	0(0.0)	5(8.3)	50(94.4)	0(0.0)	0(0.0)	0(0.0)	0(0.0) 55
	Follicular	0(0.0)	3(21.8)	0(0.0)	8(42.8)	3(23.5)	0(0.0)	9(8.5) 23
	Anaplastic	0(0.0)	0(0.0)	0(0.0)	0(0.0)	2(100)	0(0.0)	8(4.9) 10
	Thyroiditis	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	15.(89.0)	12(10.4) 27
	Medullary	0(0.0)	0(0.0)	0(0.0)	2(1.5)	0(0.0)	3(2.8)	0(0.0) 5
	Total	150	26	52	10	5	18	39 300

Accuracy = 90.05
Abbreviations : FNAB, fine needle aspiration biopsy.

about 1% of thyroid malignancies in Nepal. The regional distribution of the disease may be the cause of this variation. Thyroiditis, which had a prevalence of roughly 5.38%, was the other histological thyroid condition we found in our study. Previous literate indicated a low prevalence rate of thyroiditis (3% and 1%).[10]

Previous writers claimed that the best surgical option for patients with well-differentiated thyroid cancer was a complete thyroidectomy. It is also advised in individuals with severe ophthalmopathy, hyperthyroidism, a history of radiation in the head and neck, a big thyroid gland, suspected FNAB, and goitre with pressure symptoms.[23–25] A total thyroidectomy or a hemithyroidectomy with counter-lateral near-total resection is also recommended by a number of studies in order to prevent re-operations caused by recurrence and accidental benign malignancies.[26–28] In a similar vein, hemithyroidectomy and complete thyroidectomy made up the majority of our procedure types. Contrarily, Matusz et al. performed 1088 lobectomies and came to the conclusion that lobectomies are a viable alternative to total thyroidectomy for the treatment of papillary thyroid neoplasms patients who are under the age of 45, have tumours that are 4 cm or less in diameter, and who do not have clinical lymph node

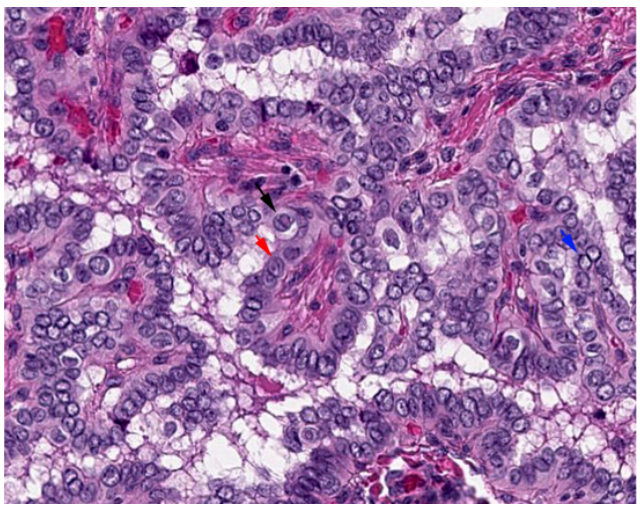

Fig. 1: Classic variant typical nuclear features of papillary thyroid carcinoma, e.g. nuclear enlargement, overlapping, marked nuclear membrane irregularity, nuclear groove (red arrow), nuclearpseudoinclusion (black arrow) chromatin margination (blue arrow).

metastasis or extra-thyroidal invasion.[29] The most frequent and significant side effects of thyroid surgery were hypocalcemia, haemorrhage, and recurrent laryngeal nerve palsy. 0 to 4% of transient recurrent laryngeal nerve paralysis, 0 to 2% of recurrent laryngeal nerve paralysis, 1 to 21% of transient hypocalcemia, 0 to 2% of hematoma, and overall 0 to 26% total complication rates had been observed, according to a systematic meta-analysis assessment of 14 research.[30] In our study, all problems were looked at, and it was shown that 1.5% of patients had transitory hypocalcemia, 0.8% had hoarseness or stridor, 1.2% had wound infections, 0.4% had esophageal injuries, and 0.4% had tracheomalacia.

According to Smadi and associates, FNAB promises good accuracy in the diagnosis of papillary, medullary, and anaplastic thyroid cancer but is insufficient in the pre-operative detection of follicular carcinoma and other types of thyroid cancer. The specificity ranged from 90 to 100%, whereas the sensitivity ranged from 55 to 90%. The fact that follicular carcinoma is angioinvasive and encapsulated accounts for its decreased sensitivity. This outcome was consistent with our study.[17] The current study had a number of drawbacks. First off, our investigation did not cover additional thyroid conditions including thyrotoxicosis and hyperthyroidism. Second, the size of the study's sample precluded us from doing robust statistical analysis. Thirdly, since this report is merely retrospective and observational, it needs to be validated with a bigger sample size. Fourthly, information on thyroid gland volume and post-operative survival rates were not available. Fifthly, this study lacked data on biochemical and metastatic recurrence.

5. Conclusion

The most common thyroid condition is nodular colloid goitre, while papillary thyroid carcinoma is the most common cancer seen in this study. Additionally, FNAB is more effective at separating benign from malignant thyroid nodules when done first. This finding requires confirmation in a broader population research.

6. Ethics Statement

The study's protocol was approved by the Lugansk State University of Medical Sciences' ethics committee. No informed consent was given because the data were analysed in an anonymous manner. The Institutional Committee for the Protection of Human Subjects, which was enacted by the 18th World Medical Assembly in Helsinki, Finland, and its later changes, was followed when conducting the current study.

7. Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

8. Source of Funding

None.

9. Conflict of Interest

None.

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