

Clinicopathological and Radiological Profile of Benign Thyroid Swellings: An Observational Study from a Tertiary Care Teaching Hospital in North Karnataka

Dinesh Valse¹, Sachit Patil², Athira J Sankar³

¹Associate Professor, ^{2,3}Senior Resident,
^{1,2}Dept of Otorhinolaryngology and Head & Neck Surgery, ³Dept of Community Medicine,
ESIC Medical College and Hospital, Kalaburagi, Karnataka, India

Corresponding Author: Dr Sachit Patil

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ABSTRACT

Background: Benign thyroid swellings are among the most common endocrine disorders requiring surgical evaluation. Although ultrasonography and fine-needle aspiration cytology (FNAC) are widely used for preoperative assessment, the clinicopathological spectrum and surgical outcomes vary across populations. This study evaluated the demographic profile, clinical presentation, ultrasonographic characteristics, cytological findings, histopathological diagnoses, and surgical outcomes in patients with benign thyroid swellings in a tertiary care teaching hospital in North Karnataka.

Methods: An observational study was conducted among 40 consecutive patients with benign thyroid swellings who underwent surgical management at a tertiary care teaching hospital. Demographic characteristics, clinical findings, thyroid function tests, ultrasonographic findings including TI-RADS classification, FNAC (Bethesda system), operative procedure, postoperative outcomes, and histopathological diagnoses were recorded.

Statistical analysis was done using descriptive statistics in terms of frequency and percentages.

Results: The mean age of the study population was 39.7 ± 10.8 years, with a marked female predominance (90.0%). Slowly progressive thyroid swelling was observed in 80.0% of patients. Among the study participants, TI-RADS 2 comprised the largest ultrasonographic category (52.5%), Bethesda category II constituted 55.0% of FNAC diagnoses and histopathology showed Hashimoto's thyroiditis (32.5%) as the most common diagnosis, followed by colloid nodules (30.0%), follicular adenoma (27.5%), and Hurthle cell adenoma (10.0%). The most frequently performed surgical procedure for management of benign thyroid swelling among the study participants was hemithyroidectomy.

Conclusion: Benign thyroid swellings predominantly affect women in the fourth decade of life. TI-RADS 2 and Bethesda category II were the most frequent ultrasonographic and cytological category respectively seen among the study participants. Hashimoto's thyroiditis was

the most common histopathological diagnosis, followed by colloid nodules and follicular adenoma. These findings support the use of an integrated diagnostic approach compounding clinical evaluation, ultrasonography, FNAC, and histopathological examination for accurate classification and appropriate management of benign thyroid swellings.

Keywords: Benign thyroid swelling, Bethesda, Fine-needle aspiration cytology, Histopathology, TI-RADS, Thyroidectomy

INTRODUCTION

Thyroid swellings are common clinical entities, detected on examination or incidentally on imaging. Thyroid nodules are palpable in approximately 4–7% of the general population, while ultrasonography identifies nodules in a substantially larger proportion. Although most thyroid nodules are benign, distinguishing benign from malignant lesions and identifying patients requiring surgery remain important clinical challenges. [1,2]

Benign thyroid swellings comprise heterogeneous disorders, including colloid nodules, thyroiditis, follicular adenomas, and Hurthle cell lesions. They may present as solitary or multinodular enlargement, with thyroid dysfunction, compressive or cosmetic symptoms, or no symptoms. Their epidemiological and clinicopathological characteristics may vary across populations because of demographic, environmental, iodine-related, healthcare, and referral differences. Evaluation requires integration of clinical assessment, thyroid function tests, ultrasonography, fine-needle aspiration cytology (FNAC), and, when surgery is performed, histopathological examination. Ultrasonography assesses nodule size, composition, location, and morphology and permits radiological risk stratification using standardized systems such as the Thyroid Imaging Reporting and Data System (TI-RADS). [3]

FNAC is a minimally invasive and cost-effective component of preoperative

assessment and provides valuable cytological information for treatment planning. However, follicular-patterned and Hurthle cell lesions cannot be definitively classified as benign or malignant by cytology alone because capsular and vascular invasion require histopathological examination. Thus, histopathology remains an important reference standard for definitive diagnosis in surgically managed patients. [4]

The clinicopathological spectrum of thyroid swellings varies across geographical and institutional settings. Daimary et al. [5], in a prospective study from Northeast India, reported a predominance of benign lesions with variation in histopathological patterns. Similarly, Santosh et al. [6] reported a marked female predominance and a higher occurrence among younger adults. Pantelic et al. [7] also observed female predominance among surgically treated adolescents; however, their cohort included both benign and malignant thyroid diseases and was restricted to adolescents, limiting direct comparison with adult benign-thyroid populations.

Although ultrasonography and FNAC have improved preoperative assessment, correlation of clinical, radiological, cytological, operative, and histopathological findings remains essential for comprehensive evaluation. Institution-specific data may help characterize regional patterns and support appropriate surgical decision-making.

The present prospective observational study evaluated the clinicopathological and radiological profile of patients with benign thyroid swellings who underwent surgical management at a tertiary care teaching hospital in North Karnataka.

MATERIALS & METHODS

An observational study was conducted in the Department of Otorhinolaryngology and Head and Neck Surgery at a tertiary care teaching hospital in North Karnataka over a period of one year. Adult patients aged ≥ 18 years presenting with clinically detectable

thyroid swelling who underwent clinical evaluation, ultrasonography, preoperative investigations, and thyroid surgery with subsequent histopathological examination were eligible for inclusion. Patients were included after obtaining written informed consent. Patients managed conservatively without surgical intervention, those with recurrent thyroid disease following previous thyroid surgery, and those with incomplete clinical records or unavailable histopathological examination were excluded. Patients with benign thyroid lesions confirmed on final histopathological examination constituted the study population.

Data were entered into Microsoft Excel and analysed using descriptive statistics.

Categorical variables were summarized as frequencies and percentages. The study protocol was reviewed and approved by the Institutional Ethics Committee of ESIC Medical College and Hospital, Kalaburagi, prior to commencement of the study. Written informed consent was obtained from all participants, and confidentiality of participant information was maintained throughout the study. All study procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

RESULT

A total of 40 patients with benign thyroid swellings during the study period were included in the analysis.

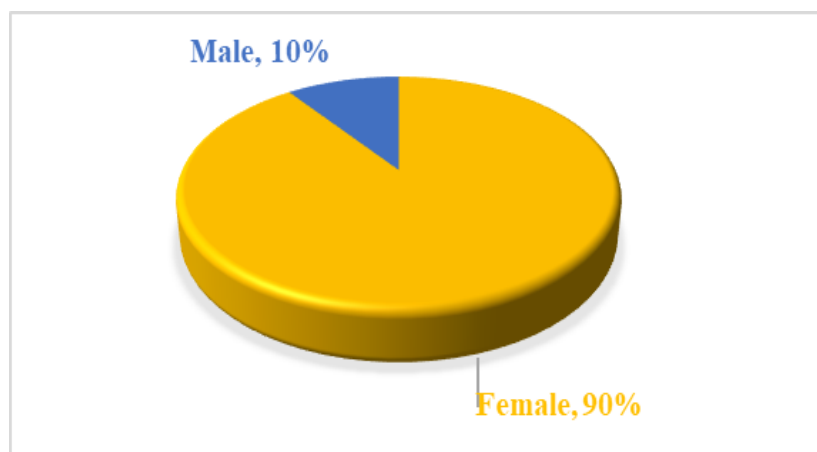


Figure 1: Gender distribution of study participants (N=40)

Participants ranged in age from 18 to 57 years. The mean age of the study population was 39.7 ± 10.8 years, with a median age of 38.5 years (interquartile range: 31.5–48.3

years). Females constituted the majority of the study population (90.0%), while males accounted for 10.0% as shown in figure 1, resulting in a female-to-male ratio of 9:1.

Table 1: Clinical Presentation of the study participants (N=40)

Clinical Feature		Frequency	Percentage (%)
Progression of thyroid swelling	Slowly progressive	32	80.0
	Rapidly progressive	08	20.0
Symptoms	Suggestive of hypothyroidism	03	07.5
	Suggestive of hyperthyroidism	01	02.5
	None	36	90.0
Clinical signs	Suggestive of hypothyroidism	03	07.5
	Suggestive of hyperthyroidism	01	02.5
	None	36	90.0

Table 1 shows clinical presentation of the study participants. The predominant

(80.0%) clinical presentation was a slowly progressive thyroid swelling whereas 20.0%

reported rapid progression. Most (90%) participants did not exhibit clinical manifestations of thyroid dysfunction. Symptoms and clinical signs suggestive of

hypothyroidism were present in 7.5% of participants, while those suggestive of hyperthyroidism were present in 2.5% of the participants.

Table 2: Ultrasonographic TI-RADS and FNAC (Bethesda System) Distribution of the thyroid swelling among the study participants (N=40)

Category		Frequency	Percentage (%)
TI-RADS Classification	TI-RADS 2	21	52.5
	TI-RADS 3	08	20.0
	TI-RADS 4	09	22.5
	TI-RADS 5	02	05.0
Bethesda Cytology	Category II	22	55.0
	Category III	12	30.0
	Category IV	03	07.5
	Category V*	03	07.5

**Bethesda V is suspicious for malignancy but not confirmed, hence included in the study*

Table 2 shows ultrasonographic TI-RADS and FNAC (Bethesda System) distribution of the thyroid swelling among the study participants. Ultrasonographic risk stratification according to the Thyroid Imaging Reporting and Data System (TI-RADS) demonstrated that TI-RADS 2 (52.5%) was the most common category, followed by TI-RADS 4, (22.5%), TI-RADS 3 (20.0%), and TI-RADS 5 (5.0%).

Fine-needle aspiration cytology (FNAC), categorized using the Bethesda System for Reporting Thyroid Cytopathology, showed that Bethesda category II was the predominant cytological category (55.0%), followed by Bethesda category III (30.0%), whereas Bethesda categories IV and V accounted for 7.5% each.

Table 3: Cytology and Histopathology of the thyroid swelling among the study participants (N=40)

Category		Frequency	Percentage (%)
Cytology	Hashimoto's thyroiditis	13	32.5
	Colloid nodule	12	30.0
	Follicular adenoma	08	20.0
	Follicular neoplasm	03	7.5
	Hurthle cell neoplasm	03	7.5
	Hurthle cell adenoma	01	2.5
Histopathology	Hashimoto's thyroiditis	13	32.5
	Colloid nodule	12	30.0
	Follicular adenoma	11	27.5
	Hurthle cell adenoma	04	10.0

Table 3 shows cytology and histopathology of the thyroid swelling among the study participants. The most frequent cytological diagnosis was Hashimoto's thyroiditis (32.5%), followed by colloid nodule (30.0%), follicular adenoma (20.0%), follicular neoplasm (7.5%), Hurthle cell

neoplasm (7.5%), and Hurthle cell adenoma (2.5%). Histopathological examination of the surgical specimens identified Hashimoto's thyroiditis as the most common diagnosis (32.5%), followed by colloid nodules (30.0%), follicular adenoma (27.5%), and Hurthle cell adenoma (10.0%).

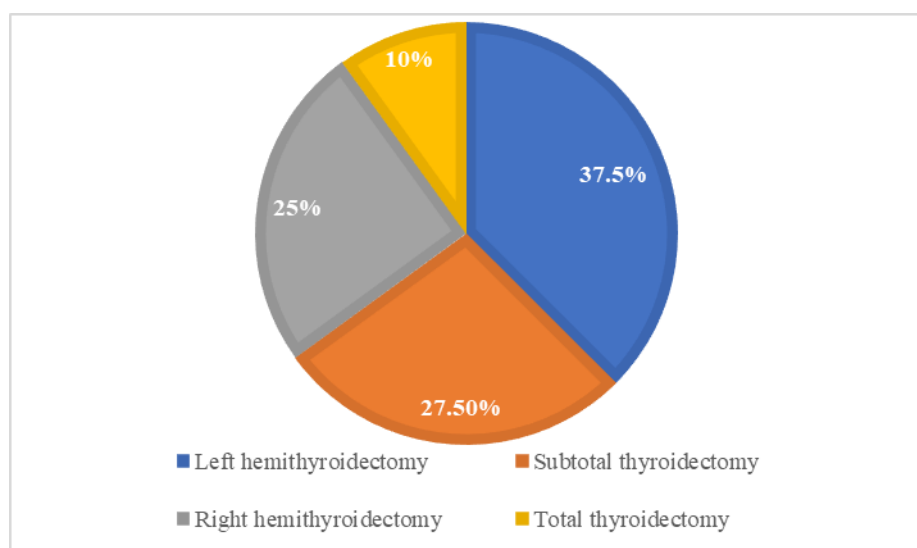


Figure 2: Distribution of intervention among the study participants (N=40)

Figure 2 illustrates distribution of intervention among the study participants. Hemithyroidectomy was the most frequently performed surgical procedure. Left hemithyroidectomy was performed in 37.5% patients followed by subtotal thyroidectomy in 27.5%, right hemithyroidectomy in 25.0%, and total thyroidectomy in 10.0%.

DISCUSSION

The present prospective observational study evaluated 40 patients with benign thyroid swellings who underwent surgical management at a tertiary care teaching hospital.

The study population ranged in age from 18 to 57 years, with a mean age of 39.7 ± 10.8 years and median age of 38.5 years. The concentration of patients around the fourth decade of life is consistent with the observation that thyroid swellings commonly become clinically significant during adulthood. The findings are comparable with those of Choudhary M et.al^[3] where the mean age of study participants was found to be 36.64 years and Daimary et al. ^[5], who reported a median age of 38 years among patients with thyroid swellings. On the contrary, Santosh et al. ^[6] reported the highest incidence of thyroid swellings in the 21–30-year age group, indicating that the age distribution of

thyroid swellings may vary between study populations.

An obvious female predominance was observed in the present study, with a female-to-male ratio of 9:1. Similarly, Santosh et al. ^[6], Choudhary M et al. ^[3], Daimary et al. ^[5], and Pantelic et al. ^[7] reported 90%, 88%, 84.9% and 80% of their study population as females respectively. The consistency of female predominance across these studies supports the observation that benign thyroid disorders are considerably more frequent among women. The majority of patients in the present study had a slowly progressive thyroid swelling, with 80% reporting slow progression and 20% reporting rapid progression. The predominantly slow progression is compatible with the generally indolent clinical presentation of many benign thyroid lesions. Choudhary M et.al ^[3] reported 86% of the study participants were having slow progression of thyroid swelling. Only a minor proportion of the study participants had symptoms or clinical signs of hypothyroidism (7.5%) as well as hyperthyroidism (2.5%). The high proportion of clinically asymptomatic participants is noteworthy because structural thyroid abnormalities may occur in the absence of overt thyroid dysfunction. Pantelic et al. ^[7] similarly reported that approximately 80% of their study

population was asymptomatic, although their study population consisted of adolescents requiring surgical treatment. Santosh et al. [6], in contrast, reported swelling of less than six months' duration as the most common clinical presentation. The differences may reflect variation in age, duration of disease, referral patterns etc.

Ultrasonographic assessment in the present study demonstrated that TI-RADS 2 was the most common category, accounting for 52.5% of lesions, followed by TI-RADS 4 (22.5%), TI-RADS 3 (20.0%), and TI-RADS 5 (5.0%). Thus, more than half of the lesions belonged to the low-risk TI-RADS 2 category. The predominance of lower-risk lesions is consistent with the benign nature of the study population. At the same time, the presence of TI-RADS 4 and 5 lesions demonstrates the importance of ultrasonographic risk stratification in identifying patients who require further cytological or surgical evaluation. Similarly, Choudhary M et al. [3] reported that 68% patients belonged to TI-RADS 2, 16%, 10% and 6% belonged to TI-RADS 3, 4 and 5 respectively.

FNAC findings classified according to the Bethesda System demonstrated that Bethesda category II was the most frequent category, accounting for 55.0% of cases, followed by category III (30.0%), while categories IV and V each accounted for 7.5%. The predominance of Bethesda category II is compatible with the benign nature of the lesions included in the study. FNAC remains an important component of the preoperative evaluation of thyroid nodules because it provides useful cytological information and assists in determining the appropriate management pathway. [4]

The diagnostic utility of FNAC is further supported by the study of Santosh et al. [6], who reported a diagnostic accuracy of 88.5%, with a sensitivity of 78.5% and specificity of 91.07%. However, the present study also highlights the importance of correlating cytological findings with final

histopathology, particularly in follicular-patterned and Hurthle cell lesions.

The cytological spectrum in the present study was heterogeneous. Hashimoto's thyroiditis was the most frequent cytological diagnosis, accounting for 32.5%, followed by colloid nodule (30.0%), follicular adenoma (20.0%), follicular neoplasm (7.5%), Hurthle cell neoplasm (7.5%), and Hurthle cell adenoma (2.5%). Histopathological examination demonstrated Hashimoto's thyroiditis as the most frequent diagnosis (32.5%), followed by colloid nodules (30.0%), follicular adenoma (27.5%), and Hurthle cell adenoma (10.0%).

The predominance of Hashimoto's thyroiditis in the present study differs from the findings of Daimary et al. [5], who reported colloid goitre as the predominant benign lesion, accounting for 62.3% of benign cases, while Hashimoto's thyroiditis and follicular adenoma accounted for 7.5% and 11.3%, respectively. Santosh et al. [6] similarly reported a different histopathological spectrum, with multinodular goitre being the most frequent diagnosis. These differences may be related to variations in study population, geographical characteristics, referral patterns etc.

The relatively high proportion of Hashimoto's thyroiditis in the present study is clinically relevant. Chronic autoimmune thyroiditis may present with thyroid enlargement and may coexist with nodular changes, thereby producing a clinical or radiological presentation that requires further evaluation. The finding also reinforces the importance of histopathological assessment in patients undergoing surgical treatment.

The cytological and histopathological findings demonstrate the complementary roles of these investigations. Although FNAC provides valuable preoperative information, follicular-patterned and Hurthle cell lesions require cautious interpretation because cytological examination cannot determine capsular or

vascular invasion.^[4] Consequently, histopathological examination remains essential for definitive characterization of these lesions following surgery.

The operative findings demonstrated that hemithyroidectomy was the most frequently performed category of surgery. Left hemithyroidectomy was performed in 37.5% of patients, subtotal thyroidectomy in 27.5%, right hemithyroidectomy in 25.0%, and total thyroidectomy in 10.0%. The predominance of hemithyroidectomy reflects the surgical management of appropriately selected patients with predominantly benign thyroid disease, while the use of subtotal or total thyroidectomy may reflect the extent and characteristics of individual thyroid lesions.

The findings of the present study have important clinical implications. Since most of the study participants had slowly progressive and clinically asymptomatic thyroid swellings, the current study highlights the importance of methodical evaluation rather than relying exclusively on symptoms of thyroid dysfunction. Ultrasonography, FNAC, and histopathology offers crucial information regarding structural characteristics, preoperative cytological categorization and confirmatory diagnosis of the thyroid swelling respectively. The integration of these modalities can facilitate more informed and precise management.

Strengths and Limitations

The strength of the present study is that it evaluated patients undergoing surgical management for thyroid swelling and incorporated clinical, ultrasonographic, cytological, operative, and histopathological findings. Histopathological examination was available as the diagnostic reference standard, permitting comprehensive characterization of the lesions.

However, the study was conducted at a single tertiary-care hospital and included only 40 participants, which may limit the generalizability of the findings to other populations and healthcare settings.

CONCLUSION

The present study demonstrated that surgically managed benign thyroid swellings predominantly affected middle-aged women and were generally slowly progressive with few clinical manifestations of thyroid dysfunction. TI-RADS 2 was the most frequent ultrasonographic category, Bethesda category II was the predominant cytological category, and Hashimoto's thyroiditis was the most common histopathological diagnosis, followed by colloid nodules and follicular adenoma. These findings support the use of an integrated diagnostic approach compounding clinical evaluation, ultrasonography, FNAC, and histopathological examination for accurate classification and appropriate management of benign thyroid swellings.

Declaration by Authors

Ethical Approval: Approved

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Conflict of Interest: The authors declare no conflict of interest.

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