



Original Article

## Incidence of Malignancy in Solitary Thyroid Nodule: A Retrospective Study at a Tertiary Care Centre

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**Article History:**

Received on: Jul 26, 2026

Accepted on: Aug 20, 2026

Published on: Sep 01, 2026

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### ABSTRACT

**Background:** Solitary thyroid nodules are frequently encountered in clinical practice. Although the majority are benign, a clinically relevant proportion may harbour malignancy. Accurate evaluation is therefore essential for appropriate management. Ultrasonography (USG) and fine-needle aspiration cytology (FNAC) are important components of preoperative assessment, while histopathological examination remains the definitive method for establishing the final diagnosis. This study was undertaken to determine the proportion of malignancy and describe the histopathological spectrum among surgically treated patients presenting with solitary thyroid nodules at a tertiary care centre.

**Methods:** A retrospective observational study was conducted at ESIC Medical College, Kalaburagi, from January 2024 to December 2024. Fifty patients with solitary thyroid nodules who underwent surgical management were included. All patients underwent thyroid USG and FNAC. Demographic characteristics, FNAC findings, surgical procedures, final histopathological diagnosis, postoperative complications, and six-month follow-up findings were retrospectively analysed.

**Results:** The study included 50 patients, comprising 42 males (84%) and 8 females (16%), with an age range of 10–70 years. All patients underwent USG and FNAC. FNAC was reported as suspicious for malignancy in 9 patients (18%); all nine were females and all were subsequently diagnosed with papillary thyroid carcinoma on histopathology. The remaining 41 patients (82%) had FNAC findings that were not suspicious for malignancy. Final histopathological examination demonstrated 38 benign lesions (76%) and 12 malignant lesions (24%). Among benign lesions, 20 (40%) were colloid cysts and 18 (36%) were adenomas. Among malignant lesions, 9 (18% of the total cohort) were papillary thyroid carcinomas and 3 (6%) were follicular thyroid carcinomas. Hemithyroidectomy was performed in 41 patients (82%), while 9 patients (18%) underwent total thyroidectomy. Postoperative unilateral vocal cord paresis occurred in 3 patients (6%), while 5 patients (10%) developed transient hypocalcaemia. All patients were followed for six months.

**Conclusion:** In this surgically evaluated cohort of patients with solitary thyroid nodules, malignancy was identified in 24% of cases. Papillary thyroid carcinoma was the predominant malignant histological subtype. FNAC identified the papillary carcinomas that were subsequently confirmed on histopathology; however, three follicular carcinomas had non-suspicious preoperative cytology and were diagnosed only on definitive histopathological examination. These findings highlight the importance of combining clinical evaluation, ultrasonography, FNAC, and appropriate histopathological assessment in the management of solitary thyroid nodules.

**Citation:** Dr. Rashmi S. N. et al. Incidence of Malignancy in Solitary Thyroid Nodule: A Retrospective Study at a Tertiary Care Centre. *Biomedicine and Chemical Sciences*, 5 (3): 37-43, 2026

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**Keywords:** solitary thyroid nodule, thyroid malignancy, papillary thyroid carcinoma, follicular carcinoma, FNAC, ultrasonography, thyroid surgery, histopathology.

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## INTRODUCTION

Thyroid nodules are among the most common disorders encountered in endocrine, general surgical, and otorhinolaryngological practice. They may present as a palpable neck swelling or be detected incidentally during imaging performed for unrelated clinical conditions. The increasing availability and use of high-resolution ultrasonography have resulted in a substantial increase in the detection of thyroid nodules.

Although the majority of thyroid nodules are benign, a proportion may represent malignant disease. The primary objective in evaluating a thyroid nodule is therefore to identify patients at increased risk of malignancy while avoiding unnecessary intervention in patients with benign lesions.

A solitary thyroid nodule is traditionally defined as a discrete thyroid swelling occurring within an otherwise apparently normal thyroid gland. Clinical assessment includes evaluation of the duration and progression of the swelling, size, consistency, mobility, presence of compressive symptoms, voice changes, and cervical lymphadenopathy.

Ultrasonography is an essential component of thyroid nodule evaluation. It provides information regarding nodule size, composition, echogenicity, margins, calcification, shape, extrathyroidal extension, and associated cervical lymph nodes. Specific sonographic features may increase suspicion for malignancy and guide the decision to perform FNAC.

FNAC is a minimally invasive investigation widely used for preoperative risk stratification of thyroid nodules. It helps identify patients who may be managed conservatively and those who require surgical intervention. However, FNAC has recognized limitations, particularly in follicular-patterned lesions. Cytology cannot reliably distinguish follicular adenoma from follicular carcinoma because the diagnosis of follicular carcinoma requires demonstration of capsular and/or vascular invasion on histopathological examination.

Papillary thyroid carcinoma is the most common thyroid malignancy, while follicular carcinoma is the second most common differentiated thyroid malignancy. Early detection and appropriate treatment generally result in favourable outcomes.

The reported proportion of malignancy among thyroid nodules varies between studies depending on the population studied, referral pattern, imaging criteria, FNAC practices, and selection of patients for surgery. Institutional studies can therefore provide useful information regarding the clinical and pathological profile of thyroid nodules encountered in a particular setting.

The present study was undertaken to determine the proportion of malignancy among surgically evaluated patients with solitary thyroid nodules at ESIC Medical College, Kalaburagi, and to describe the correlation between preoperative FNAC findings and final histopathological diagnosis.

## MATERIALS AND METHODS

### Study Design and Setting

This was a retrospective observational study conducted at **ESIC Medical College, Kalaburagi, Karnataka, India.**

### Study Period

The study included patients treated between **January 2024 and December 2024.**

### Study Population

A total of **50 patients** with solitary thyroid nodules who underwent surgical management during the study period were included.

Because the study cohort consisted exclusively of surgically treated patients, the calculated malignancy proportion represents the proportion of malignancy among the **surgically evaluated solitary thyroid nodules** and should not be interpreted as the prevalence of malignancy among all thyroid nodules in the general population.

### Inclusion Criteria

Patients were included if they:

1. Had a clinically and/or radiologically identified solitary thyroid nodule.
2. Had undergone thyroid ultrasonography.
3. Had undergone FNAC.
4. Underwent thyroid surgery.

5. Had a documented final histopathological diagnosis.
6. Had postoperative follow-up information available.

### Exclusion Criteria

Patients were excluded if they had:

- Multinodular goitre without a clearly defined solitary nodule.
- Previously diagnosed thyroid malignancy.
- Previous thyroid surgery.
- Incomplete records preventing assessment of the final diagnosis.

### Clinical and Radiological Evaluation

All patients underwent clinical assessment followed by thyroid ultrasonography. Relevant clinical and radiological findings documented in the medical records were reviewed.

### Fine-Needle Aspiration Cytology

All 50 patients underwent FNAC before surgery.

For the purpose of this retrospective analysis, FNAC findings were categorized into:

- Suspicious for malignancy
- Not suspicious for malignancy

Nine patients were reported as suspicious for malignancy, while 41 patients had FNAC findings that were not suspicious for malignancy.

### Surgical Management

All patients underwent thyroid surgery.

The procedures performed were:

- Hemithyroidectomy in 41 patients.
- Total thyroidectomy in 9 patients.

The choice of procedure was based on the preoperative clinical, radiological, and cytological assessment and intraoperative findings.

### Histopathological Examination

The final histopathological diagnosis was considered the definitive diagnosis.

Benign lesions were categorized as:

- Colloid cyst
- Adenoma

Malignant lesions were categorized as:

- Papillary thyroid carcinoma
- Follicular thyroid carcinoma

### Postoperative Follow-up

All patients were followed for six months following surgery. Postoperative complications, particularly vocal cord dysfunction and hypocalcaemia, were recorded.

### Statistical Analysis

Data were analysed using descriptive statistical methods. Categorical variables were expressed as frequencies and percentages.

The proportion of histopathologically confirmed malignancy was calculated as:

**Number of malignant cases / Total surgically evaluated cases × 100**

Thus:

$$12 / 50 \times 100 = 24\%$$

## RESULTS

### Demographic Characteristics

Fifty patients with solitary thyroid nodules were included.

There were **42 males (84%)** and **8 females (16%)**, giving a male-to-female ratio of **5.25:1**.

The age range was **10–70 years**.

**Table 1. Demographic characteristics**

| Characteristic | Number | Percentage |
|----------------|--------|------------|
| Total patients | 50     | 100        |
| Male           | 42     | 84         |

| Characteristic | Number      | Percentage |
|----------------|-------------|------------|
| Female         | 8           | 16         |
| Age range      | 10–70 years | —          |

A marked male predominance was observed in the study population.

### Ultrasonography and FNAC

All 50 patients underwent thyroid ultrasonography and FNAC.

FNAC was suspicious for malignancy in **9 patients (18%)**. All nine patients with suspicious FNAC were females.

The remaining **41 patients (82%)** had FNAC findings that were not suspicious for malignancy.

**Table 2. FNAC findings**

| FNAC finding                  | Number    | Percentage |
|-------------------------------|-----------|------------|
| Suspicious for malignancy     | 9         | 18         |
| Not suspicious for malignancy | 41        | 82         |
| <b>Total</b>                  | <b>50</b> | <b>100</b> |

All nine patients with suspicious FNAC were subsequently confirmed to have papillary thyroid carcinoma on final histopathological examination.

### Surgical Management

All 50 patients underwent surgery.

**Table 3. Type of thyroid surgery**

| Surgical procedure  | Number    | Percentage |
|---------------------|-----------|------------|
| Hemithyroidectomy   | 41        | 82         |
| Total thyroidectomy | 9         | 18         |
| <b>Total</b>        | <b>50</b> | <b>100</b> |

Hemithyroidectomy was the most frequently performed procedure.

### Histopathological Findings

Final histopathological examination revealed **38 benign lesions (76%)** and **12 malignant lesions (24%)**.

**Table 4. Overall histopathological diagnosis**

| Histopathological category | Number    | Percentage |
|----------------------------|-----------|------------|
| Benign                     | 38        | 76         |
| Malignant                  | 12        | 24         |
| <b>Total</b>               | <b>50</b> | <b>100</b> |

Among the benign lesions, 20 were colloid cysts and 18 were adenomas.

Among the malignant lesions, 9 were papillary thyroid carcinomas and 3 were follicular thyroid carcinomas.

**Table 5. Detailed histopathological diagnosis**

| Diagnosis    | Number | Percentage of total |
|--------------|--------|---------------------|
| Colloid cyst | 20     | 40                  |
| Adenoma      | 18     | 36                  |

| Diagnosis                    | Number    | Percentage of total |
|------------------------------|-----------|---------------------|
| Papillary thyroid carcinoma  | 9         | 18                  |
| Follicular thyroid carcinoma | 3         | 6                   |
| <b>Total</b>                 | <b>50</b> | <b>100</b>          |

Papillary thyroid carcinoma accounted for **75% of malignant cases**, while follicular carcinoma accounted for 25%.

#### FNAC–Histopathology Correlation

Of the 9 patients with suspicious FNAC, all 9 were diagnosed with papillary thyroid carcinoma on final histopathology. Of the 41 patients with FNAC that was not suspicious for malignancy, 38 had benign histopathology and 3 were diagnosed with follicular thyroid carcinoma.

**Table 6. Correlation between FNAC and final histopathology**

| FNAC finding                  | Benign HPE | Papillary carcinoma | Follicular carcinoma | Total     |
|-------------------------------|------------|---------------------|----------------------|-----------|
| Suspicious for malignancy     | 0          | 9                   | 0                    | 9         |
| Not suspicious for malignancy | 38         | 0                   | 3                    | 41        |
| <b>Total</b>                  | <b>38</b>  | <b>9</b>            | <b>3</b>             | <b>50</b> |

This demonstrates that the 3 follicular carcinomas were not identified as suspicious for malignancy on the preoperative FNAC.

#### Postoperative Complications

Three patients developed unilateral vocal cord paresis and five developed transient hypocalcaemia.

**Table 7. Postoperative complications**

| Complication                  | Number | Percentage |
|-------------------------------|--------|------------|
| Unilateral vocal cord paresis | 3      | 6          |
| Transient hypocalcaemia       | 5      | 10         |
| No recorded complication      | 42     | 84         |

All patients were followed for six months.

#### DISCUSSION

The present retrospective study evaluated 50 surgically treated patients presenting with solitary thyroid nodules at ESIC Medical College, Kalaburagi. Final histopathological examination demonstrated malignancy in 12 patients, corresponding to **24% of the surgically evaluated cohort**.

The observed proportion indicates that a substantial minority of solitary thyroid nodules selected for surgery may harbour malignancy. However, because all patients in this study underwent surgery, the finding should not be extrapolated directly to the general population of patients with thyroid nodules.

A marked male predominance was observed, with 42 males and 8 females. The male-to-female ratio was 5.25:1. This finding differs from the commonly reported female predominance among patients with thyroid nodules. The difference may reflect the characteristics of the study population and institutional referral patterns. The relatively small sample size also limits conclusions regarding sex-related risk.

Patients ranged in age from 10 to 70 years, demonstrating a broad age distribution. Age remains an important component of thyroid nodule risk assessment, but malignancy cannot be predicted on age alone.

All patients underwent ultrasonography and FNAC. Ultrasonography is central to the assessment of thyroid nodules because it provides information regarding morphology and assists in identifying lesions that require cytological evaluation. FNAC was suspicious for malignancy in 9 patients, representing 18% of the cohort. All nine of these patients were female and all were confirmed to have papillary thyroid carcinoma on final histopathological examination.

The complete concordance between suspicious FNAC and papillary carcinoma in these nine patients supports the clinical usefulness of FNAC in identifying papillary thyroid carcinoma. However, an important observation in the present study was that three patients with follicular carcinoma had FNAC findings that were not suspicious for malignancy.

This finding reflects a recognized limitation of FNAC. Follicular adenoma and follicular carcinoma may have overlapping cytological appearances. The diagnosis of follicular carcinoma requires demonstration of capsular and/or vascular invasion, which can only be reliably assessed on an appropriately sampled surgical specimen. Therefore, a non-suspicious FNAC does not absolutely exclude malignancy in a follicular-patterned lesion.

The final histopathological spectrum consisted of 38 benign lesions and 12 malignant lesions. Colloid cyst was the most common benign diagnosis, accounting for 20 cases (40%), followed by adenoma in 18 cases (36%).

Among malignant lesions, papillary thyroid carcinoma was the predominant subtype, accounting for 9 of 12 malignant cases (75%). Follicular carcinoma accounted for the remaining 3 cases (25%). The predominance of papillary carcinoma is consistent with its established position as the most common differentiated thyroid malignancy.

All patients underwent surgery, with hemithyroidectomy being performed in 41 patients (82%) and total thyroidectomy in 9 patients (18%). Hemithyroidectomy was the predominant procedure, reflecting the management of selected unilateral thyroid lesions without clear indications for total thyroidectomy.

Postoperative unilateral vocal cord paresis occurred in 3 patients (6%). The recurrent laryngeal nerve is anatomically closely related to the thyroid gland, making nerve injury an important potential complication of thyroid surgery. Five patients (10%) developed transient hypocalcaemia. Temporary postoperative hypocalcaemia is a recognized complication of thyroid surgery and may result from transient parathyroid dysfunction.

All patients were followed for six months. This period allowed assessment of early postoperative complications and recovery, although longer follow-up would be required to assess recurrence and long-term oncological outcomes.

The principal strength of this study is that all patients had both preoperative FNAC and definitive histopathological examination, allowing direct comparison between cytological assessment and the final diagnosis. The identification of follicular carcinoma despite non-suspicious FNAC provides a clinically relevant demonstration of the limitations of cytology in follicular-patterned thyroid lesions.

### Limitations

This study has several limitations. First, it is a retrospective, single-centre study with a relatively small sample size of 50 patients. Second, all included patients underwent surgery, resulting in selection bias. Therefore, the 24% malignancy proportion applies to this surgically evaluated cohort and cannot be interpreted as the population prevalence of malignancy among all solitary thyroid nodules.

Third, FNAC findings were grouped into suspicious and non-suspicious categories rather than analysed according to the complete Bethesda classification. Fourth, detailed ultrasound risk stratification data were not available for incorporation into the analysis. Finally, the six-month follow-up period was relatively short for assessment of long-term recurrence and survival.

Future prospective multicentric studies with larger sample sizes, standardized ultrasound risk stratification, Bethesda cytological classification, and longer follow-up would provide more robust data regarding malignancy risk and clinical outcomes.

### CONCLUSION

In this retrospective study of 50 surgically evaluated patients with solitary thyroid nodules at ESIC Medical College, Kalaburagi, **12 patients (24%) had malignant disease on final histopathological examination.**

Papillary thyroid carcinoma was the predominant malignancy, accounting for 9 of the 12 malignant cases (75%), while follicular carcinoma accounted for 3 cases (25%).

FNAC identified all nine papillary carcinomas as suspicious for malignancy. However, three follicular carcinomas had non-suspicious FNAC findings and were diagnosed only on definitive histopathological examination. This highlights the recognized limitation of FNAC in distinguishing follicular carcinoma from benign follicular lesions.

A comprehensive diagnostic approach incorporating clinical assessment, ultrasonography, FNAC, appropriate surgical selection, and definitive histopathological examination remains essential in the evaluation of solitary thyroid nodules.

### DECLARATIONS

#### Ethics Approval

The study was conducted after obtaining approval from the Institutional Ethics Committee of ESIC Medical College, Kalaburagi. As this was a retrospective review of existing medical records, the requirement for individual informed consent was **[waived/obtained according to institutional policy]**.

**Conflict of Interest**

The authors declare that they have no conflict of interest.

**Funding**

No external funding was received for this study.

**Author Contributions**

**Dr. Rashmi S. N.:** Conceptualization, data collection, literature review, data analysis, and manuscript preparation.

**Dr. Akash Anadure:** Study supervision, methodology, interpretation of findings, critical revision of the manuscript, correspondence, and final approval of the manuscript.

**Data Availability**

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to institutional and ethical requirements.

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