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Original Article

Cyto-Histopathological Correlation of Thyroid Lesions- A Retrospective Study

Dr. Kairvi Vasa[1], Dr. Gauravi Dhruva[2], Dr. Milan Purohit[3], Dr. Jagdish Dalsania[4], Dr. Payal Shah[5]

[1]3rd year Resident, Department of Pathology, PDU Medical College and Hospital, Rajkot, India
[2]Professor and Head, Department of Pathology, PDU Medical College and Hospital, Rajkot, India
[3,4,5]Associate Professor, Department of Pathology, PDU Medical College and Hospital, Rajkot, India

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Corresponding Author:

Dr. Kairvi Vasa
3rd year Resident, Department of Pathology, PDU Medical College and Hospital, Rajkot, India

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ABSTRACT

Background: Thyroid nodules are commonly encountered in clinical practice and pose diagnostic challenges due to their diverse etiologies. Fine-needle aspiration cytology (FNAC) plays a vital role in evaluating patients with thyroid nodules. Surgical excision and histopathological evaluation are crucial to establish the diagnosis.
Objective: To review and correlate the cytological and histopathological features of thyroid lesions, with an emphasis on diagnostic accuracy, challenges, and clinical relevance.
Methods: In our 18 month study of thyroid lesions, 55 cases were studied for cytohistological correlation. This article provides a comprehensive overview of the cytological characteristics as seen on fine-needle aspiration cytology (FNAC), alongside their histopathological counterparts. The role of the Bethesda System in cytological classification is discussed, with attention to its correlation with final histopathological diagnoses.
Results: Out of the 55 patients studied, as per cytology 51 were non-neoplastic lesions, 4 were neoplastic [28 Colloid/Nodular goiter, 15 Multinodolar goiter, 6 Thyroiditis, 2 Hashimoto's thyroiditis, 2 follicular carcinoma, 1 Medullary carcinoma, 1 papillary carcinoma]. For the same set of patients, Histopathology showed 50 were non-neoplastic lesions and 5 were neoplastic [27 Colloid/Nodular goiter, 15 Multinodolar goiter, 5 Lymphocytic thyroiditis, 1 Granulomatous thyroiditis, 2 Hashimoto's thyroiditis, 3 follicular carcinoma, 1 Medullary carcinoma, 1 papillary carcinoma]
Conclusion: FNAC is an invaluable tool in management of thyroid lesions. It is a safe, simple and cost effective procedure. Through an integrative approach, we highlight the significance of combining cytology with histopathological confirmation to enhance diagnostic accuracy and improve clinical outcomes in patients with thyroid pathology.

Keywords*: Cyto-Histopathological, Thyroid Lesions, Fine-needle aspiration cytology (FNAC).*

INTRODUCTION

Thyroid lesions are among the most frequently encountered endocrine disorders in clinical and surgical practice, with a global prevalence ranging from 4% to 7%. Although the majority of these lesions are benign, a significant proportion—approximately 5% to 10%—may harbor malignancy. Thyroid nodules are more prevalent in women, and their incidence increases with age, iodine deficiency, and exposure to radiation. Clinically, thyroid disease may present as functional disorders (hyperthyroidism or hypothyroidism) or as a palpable mass.

Given the impracticality and risks of surgically excising all thyroid nodules, effective, non-invasive diagnostic tools are necessary. Fine-needle aspiration cytology (FNAC) has emerged as a first-line investigation for evaluating thyroid nodules, particularly solitary ones. FNAC is a simple, cost-effective, minimally invasive technique that provides valuable preoperative information, helping to reduce unnecessary surgeries for benign conditions. It also aids in identifying the type of malignancy when present, with fairly high diagnostic accuracy. Despite its utility, FNAC has limitations, including issues related to sampling adequacy and interpretation—especially in differentiating between benign and malignant follicular neoplasms due to overlapping cytological features.

Complementary modalities such as ultrasound (USG) and thyroid scans are used to enhance diagnostic accuracy. While USG can detect non-palpable nodules and stratify malignancy risk using systems like ACR TI-RADS, it cannot definitively distinguish benign from malignant nodules. Therefore, histopathological examination remains the gold standard for definitive diagnosis, especially when cytological findings are inconclusive or discordant.

This study aims to evaluate the diagnostic utility of FNAC in thyroid lesions and to analyze cases where cytological and histopathological findings differ, thereby emphasizing the need for a correlational approach to improve diagnostic accuracy and guide appropriate clinical management.

MATERIALS AND METHODS

Study Design

This study was conducted at P.D.U Government Medical College & Hospital, Department of Pathology Rajkot with data collected from August 2023 to July 2025. The study included 55 cases of patients of all ages and gender who presented with thyroid enlargement and underwent both fine-needle aspiration (FNA) and subsequent thyroid surgery.

Type of Study

Retrospective

Procedure

FNAC was performed under all aseptic precaution, with help of 23 gauge needle and disposable 5ml/10ml syringes. Whenever needed USG guided FNAC was done. Smears were prepared, fixed in 95% ethyl alcohol and staining was done using Hematoxylin and Eosin (H&E), Papanicolaou, and May-Grünwald-Giemsa (MGG) stains. FNAC smears were carefully studied and categorized into non neoplastic and neoplastic lesions.

Histopathological specimens were received in formalin, and gross features such as type of specimen, size, weight, nodularity, capsulation, and secondary changes (e.g., hemorrhage, calcification, cystic areas) were noted. Tissue sections of 2–3 mm thickness were taken, with 5–10 sections per case, and stained with H&E. Special stains were applied when necessary.

All smears and histopathology slides were studied and reviewed. Cytology was categorized according to the 2017 Bethesda System for Reporting Thyroid Cytopathology into six categories: non-diagnostic/unsatisfactory (Bethesda I), benign (II), atypia of undetermined significance or follicular lesion of undetermined significance (III), follicular neoplasm or suspicious for a follicular neoplasm (IV), suspicious for malignancy (V), and malignant (VI).

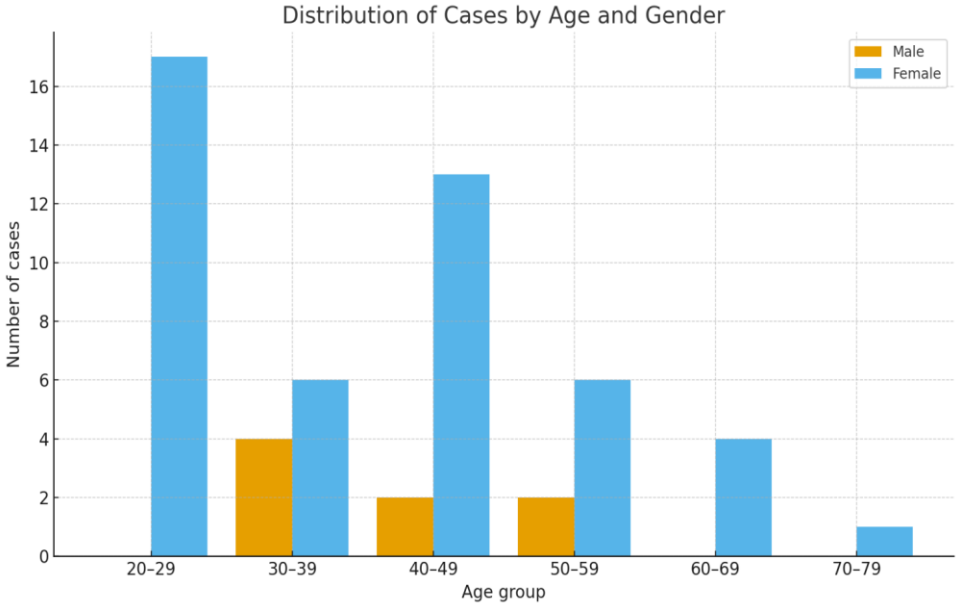
Cases were analyzed for concordance or discordance between cytological and histological diagnoses. Discrepant cases were reviewed to identify causes of diagnostic disagreement, including sampling errors, interpretative errors, poor smear quality, or histological misclassification.

RESULTS

The present study aims to assess the diagnostic accuracy of fine-needle aspiration cytology (FNAC) by correlating it with histopathological findings in patients with thyroid lesions. During the mentioned period, 55 patients underwent FNAC for thyroid swellings and proceeded to surgical excision of the thyroid, and their specimens were subjected to histopathological examination. The study exclusively includes and analyzes these cases to evaluate the concordance between cytological and histological diagnoses.

Age & Sex distribution

Age Group (Years)	Male (n)	Female (n)	Total (n)
20–29	0	17	17
30–39	4	6	10
40–49	2	13	15
50–59	2	6	8
60–69	0	4	4
70–79	0	1	1
Total	8	47	55



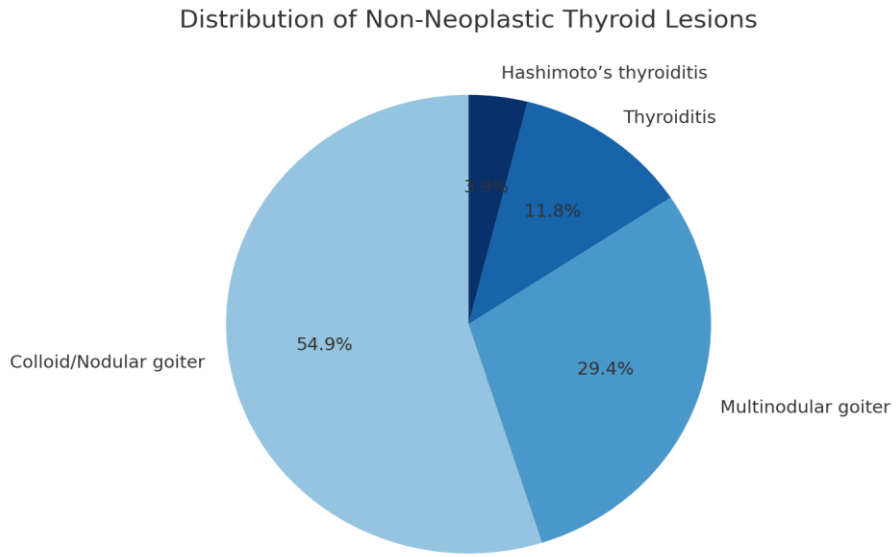
The dataset includes **55 individuals**, comprising **8 males** and **47 females**, giving a **male-to-female ratio of 1:5.9**. The majority of participants were female, particularly in the **20–29** and **40–49** age groups, which together accounted for over half of the total sample.

Males were only present in the **30–59** age range, with no male representation in the youngest (20–29) or oldest (60+) groups. In contrast, females were represented across all age groups. This indicates a clear **female predominance**, especially among younger and middle-aged individuals.

Cytologic Diagnosis

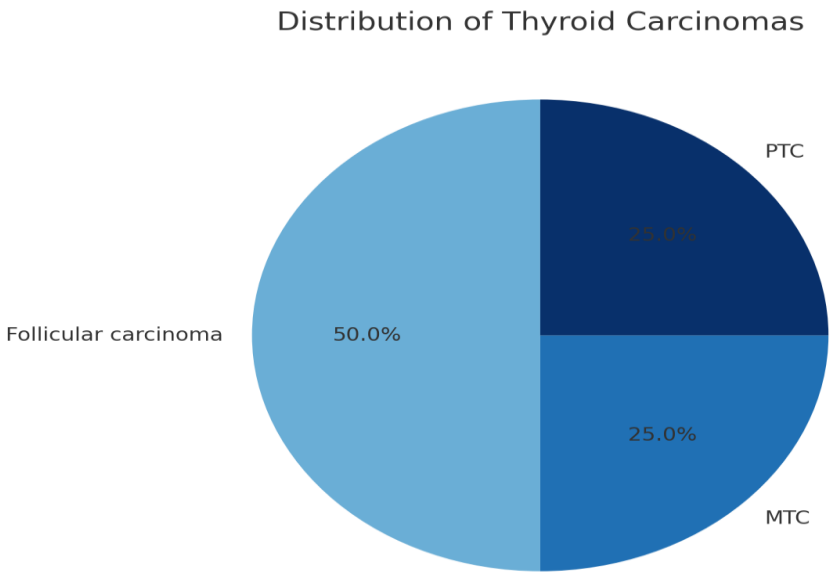
Non Neoplastic Category

Benign thyroid lesions on cytology typically display abundant colloid, which may appear thin or thick depending on the nature of the lesion. Follicular cells are usually seen in cohesive sheets or small, uniform groups, with round nuclei and minimal atypia. The background is generally clean, lacking significant nuclear abnormalities or mitotic figures. Histiocytes or macrophages may also be present, particularly in cystic lesions. These cytological features are commonly associated with benign conditions such as colloid nodules, nodular goiter, acute and chronic thyroiditis.



Neoplastic Category

The category includes both benign and malignant neoplasms. Aspirates showing cell groups with definitive malignant features were considered diagnostic of primary thyroid carcinoma, such as papillary or medullary. However, in cases where cytologic features suggest a follicular neoplasm, histopathologic evaluation is essential, as the definitive diagnosis of malignancy relies on demonstrating capsular or vascular invasion, which cannot be assessed on cytology alone.



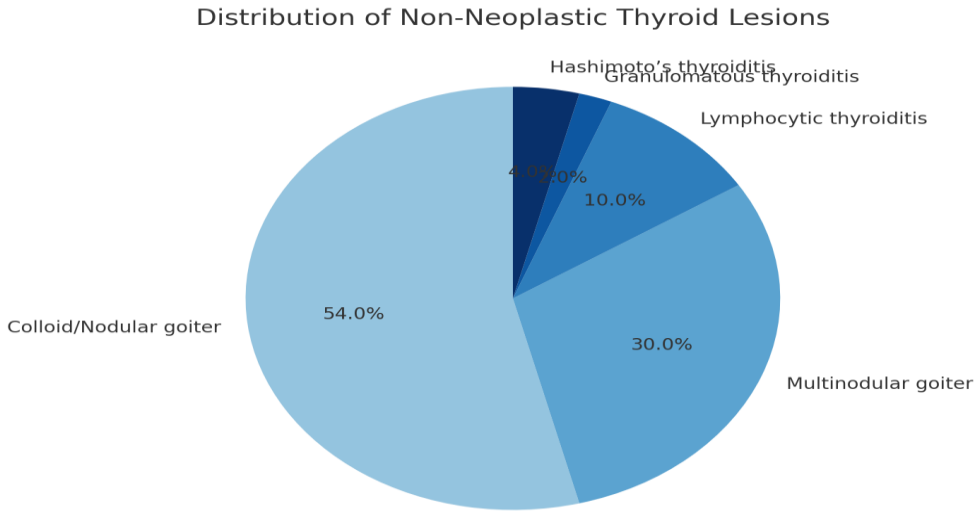
Histopathological Diagnosis

Non Neoplastic Category

On histopathological examination, non-neoplastic thyroid lesions predominantly exhibit colloid-rich follicles of varying sizes, lined by flattened to cuboidal follicular epithelial cells. The colloid is often abundant and may appear dense or pale, depending on the degree of activity. In nodular goiter, areas of follicular hyperplasia, cystic degeneration, hemorrhage, and fibrosis are frequently observed.

Chronic thyroiditis, including Hashimoto's thyroiditis, is characterized by diffuse lymphocytic infiltration with formation of germinal centers, oxyphilic (Hürthle cell) metaplasia of follicular cells, and variable degrees of follicular atrophy. Inflammatory cells, fibrosis, and occasional plasma cells or histiocytes may be noted.

Overall, the microscopic features support benign, non-neoplastic pathology, correlating well with cytological findings such as abundant colloid and absence of significant nuclear atypia.

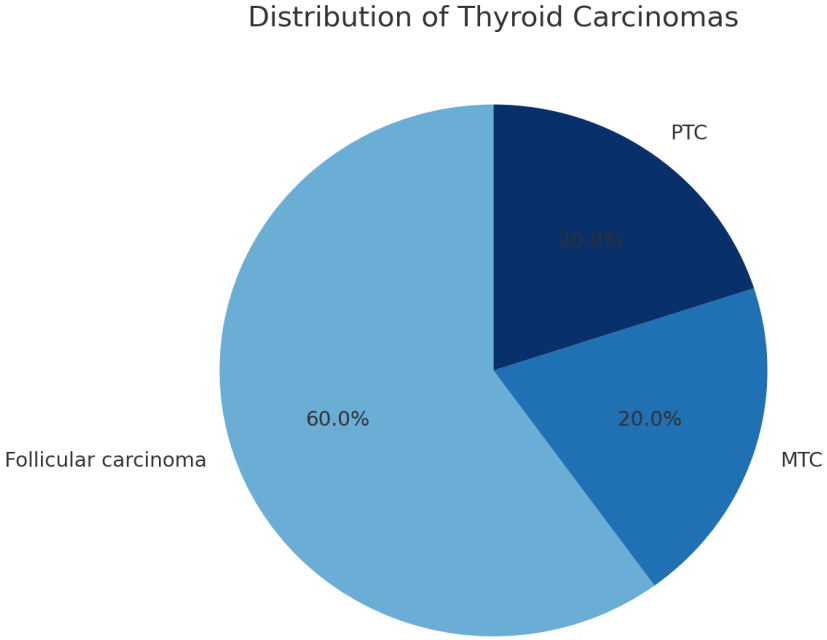


Neoplastic Category
Neoplastic thyroid lesions show cellular proliferation with architectural and cytologic atypia.

Follicular carcinoma are typically encapsulated lesions composed of uniform follicular cells arranged in microfollicular, trabecular, or solid patterns. The follicles often contain scant colloid, and capsular or vascular invasion is a key diagnostic criterion distinguishing follicular adenoma from follicular carcinoma.

Papillary thyroid carcinoma (PTC) shows papillary structures with characteristic nuclear clearing ("Orphan Annie eye" nuclei), grooves, and inclusions.

Medullary thyroid carcinoma (MTC) consists of nests of polygonal cells with amyloid deposition in the stroma.



Cyto-Histopathological Correlation of Thyroid Lesions
The study compares cytological and histopathological diagnoses of thyroid lesions, showing strong overall agreement. Most cases, such as colloid goiter (26 matched cases), PTC, MTC, and others, demonstrated high diagnostic

concordance. However, some discrepancies were noted—two colloid goiter cases as per cytological diagnosis were later identified by histopathology as follicular neoplasm—indicating occasional underdiagnosis. Likewise, one suspicious of follicular neoplasm on cytology turned out to be a benign colloid goiter as per histopathology. These findings highlight the reliability of cytology but also its limitations in distinguishing certain benign and malignant lesions.

HISTOPATHOLOGICAL DIAGNOSIS	CYTOLOGICAL DIAGNOSIS						
	Colloid Goiter	MN Goiter	Thyroiditis	Hashimoto's Thyroiditis	Follicular Neoplasm	PTC	MTC
Colloid Goiter	26	-	-	-	1	-	-
MN Goiter	-	15	-	-	-	-	-
Granulomatous Thyroiditis	-	-	5	-	-	-	-
Lymphoctyic Thyroiditis	-	-	1	-	-	-	-
Hashimoto's Thyroiditis	-	-	-	2	-	-	-
Follicular Neoplasm	2	-	-	-	1	-	-
PTC	-	-	-	-	-	1	-
MTC	-	-	-	-	-	-	1

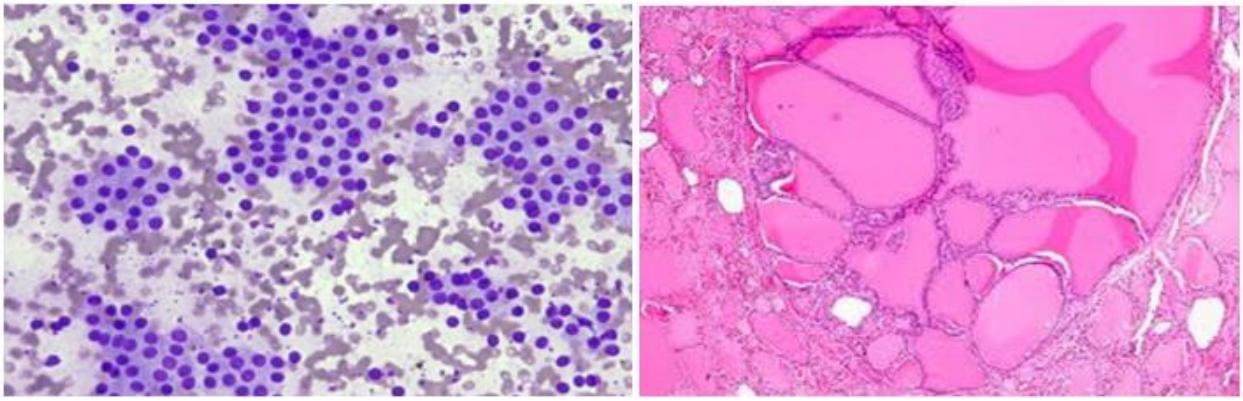


Figure 1 & 2 - Monolayered arrangement of follicular cells with no overlapping or crowding. Each follicle contains thick, pink fluid- colloid. There is also absence of cytoplasmic and nuclear atypia- Colloid Goitre

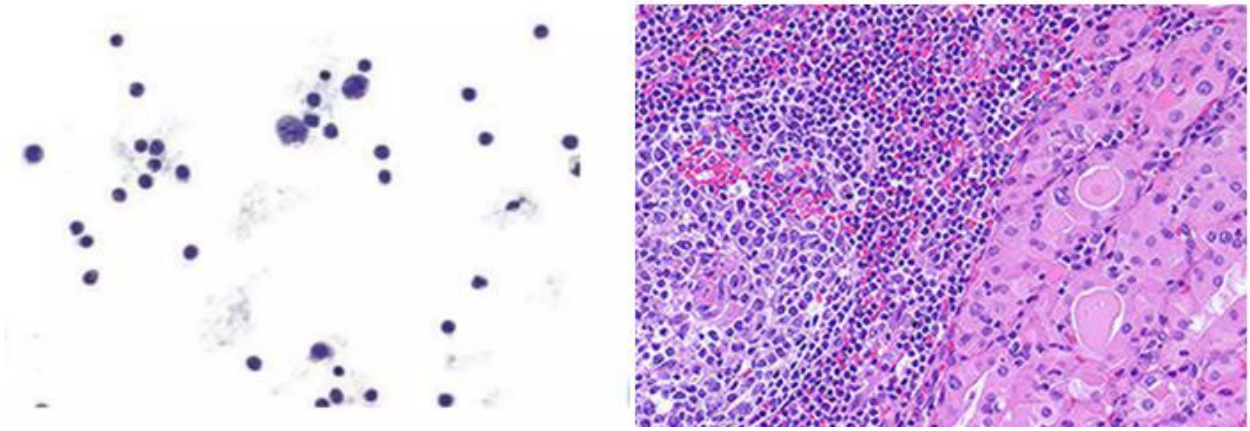


Figure 3 & 4- Mixed population of extensive infiltration by polymorphic lymphocytes and Hurthle cells (having abundant granular cytoplasm, large nuclei and prominent nucleoli) - Hashimoto's thyroiditis

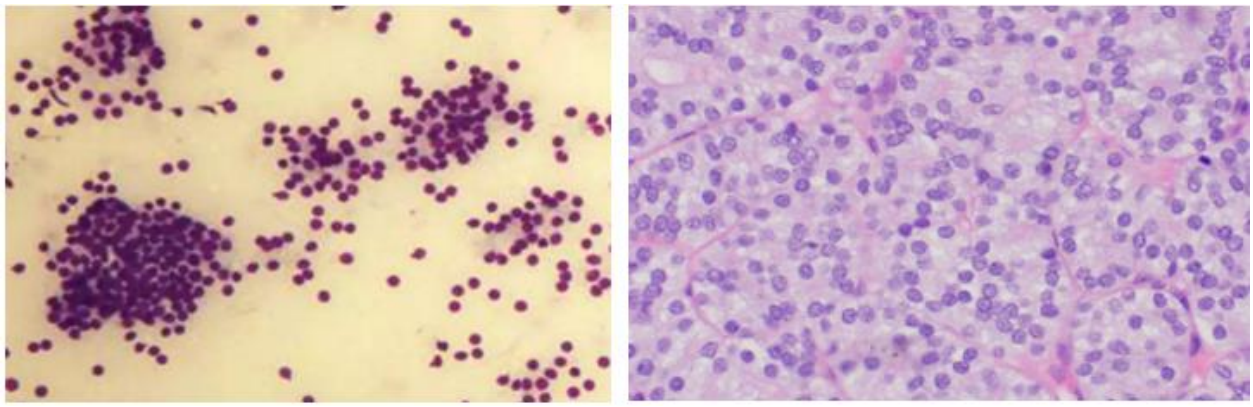


Figure 5 & 6- Cells exhibit follicular growth pattern, arranged in microfollicular pattern, with features of nuclear atypia, increased N:C ratio and scanty cytoplasm- Follicular Neoplasm

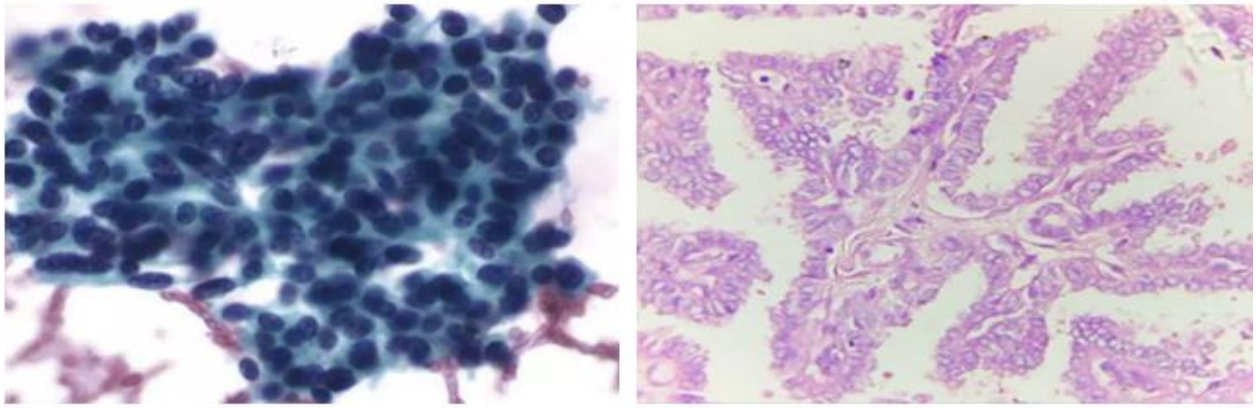


Figure 7 & 8- Papillary architecture with thin delicate fibrovascular core surrounded by neoplastic cells containing nuclear grooving, clearing and intranuclear pseudoinclusions - Papillary Thyroid Carcinoma

DISCUSSION

Thyroid nodules are a frequent clinical finding, particularly in women and in iodine-deficient regions. Although the vast majority of these nodules are benign, the possibility of malignancy—estimated at 5–10%—necessitates a thorough and reliable diagnostic process. In this context, fine-needle aspiration cytology (FNAC) has emerged as the frontline investigation tool due to its simplicity, minimal invasiveness, low cost, and relatively high diagnostic accuracy. Our study, which examined 55 cases of thyroid lesions subjected to both FNAC and histopathological examination, reaffirms FNAC's indispensable role in the initial diagnostic workup.

In terms of demographic patterns, our study reaffirmed the higher prevalence of thyroid lesions in females, with a female-to-male ratio of 5.9:1. This aligns with previous research and epidemiological data, suggesting that hormonal, autoimmune, and environmental factors contribute to this gender disparity. The peak incidence in the 20–49 age group also reflects typical thyroid disease demographics, particularly in iodine-deficient regions or populations with increased diagnostic scrutiny due to routine health screening.

FNAC, when interpreted in conjunction with clinical and radiological findings, has been shown to significantly reduce the number of unnecessary surgeries for benign conditions. In our cohort, the majority of cytological diagnoses showed concordance with histopathological results, particularly in cases of colloid/nodular goiter and Hashimoto's thyroiditis. This indicates that FNAC is highly effective in identifying non-neoplastic thyroid lesions, consistent with global literature that reports FNAC specificity ranging between 72–92% and sensitivity from 80–98%.

Despite this generally high diagnostic accuracy, our study also demonstrates the inherent limitations of FNAC, which were reflected in cases of diagnostic discordance. For example, one case reported as suspicious for follicular neoplasm on FNAC was histopathologically found to be a benign colloid goiter, representing a false positive. Conversely, two cases diagnosed cytologically as colloid goiter turned out to be follicular neoplasm, indicating a false negative. These discrepancies highlight areas where FNAC can mislead diagnosis due to limitations in cellular architecture assessment.

A major diagnostic dilemma in FNAC remains the interpretation of follicular-patterned lesions. The cytological features of follicular adenoma and follicular carcinoma often overlap significantly, as FNAC cannot evaluate the capsular or

vascular invasion required for a definitive histopathological diagnosis. The study underlines the importance of surgical excision and histopathological evaluation in all thyroid lesion cases.

CONCLUSION

In summary, FNAC remains a cornerstone in the diagnosis and management of thyroid lesions due to its high diagnostic accuracy, low complication rate, and utility in triaging patients for surgical intervention. However, it is not infallible. A multimodal approach, including correlation with clinical, radiological, and histopathological data, is crucial to overcome its limitations. Cytohistopathological correlation, as shown in this study, is vital for ensuring accurate diagnosis, minimizing diagnostic errors, and guiding appropriate clinical management in thyroid pathology.

REFERENCES

1. Sakorafas G. Thyroid nodules; interpretation and importance of fine-needle aspiration (FNA) for the clinician - practical considerations. *Surg Oncol.* 2010;19(4):e130–9.
2. Bagga P, Mahajan N. Fine needle aspiration cytology of thyroid swellings: how useful and accurate is it? *Indian J Cancer.* 2010;47(4):437–42.
3. Mangshetty S, Jewargikar R, Andola S. Fine Needle Aspiration Cytology of 220 Thyroid Lesions: Histopathological Correlation. *Int J Res Health Sci.* 2014;2(1):243–53.
4. Nepali R, Banita V, Thakur G. Comparative study of FNAC and histopathology in the diagnosis of thyroid swelling. *Internet J Head Neck Surg.* 2012;5(1):1–10.
5. Gupta M, Gupta S, Gupta V. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodule. *J Thyroid Res.* 2010;2010:1–5.
6. Pandey P, Dixit A, Mahajan N. Fine-needle aspiration of the thyroid: A cytohistologic correlation with critical evaluation of discordant cases. *Thyroid Res Pract.* 2012;9(2):32–9.
7. Bukhari MH, Saeed S, Hamid T. Comparison of fine needle aspiration cytology and thyroid scan in solitary thyroid nodule. *Patholog Res Int.* 2011;2011:1–5. Sharma C. Diagnostic accuracy of fine needle aspiration cytology of thyroid and evaluation of discordant cases. *J Egypt Natl Canc Inst.* 2015;27(3):147–53.
8. Rangaswamy M, Narendra K, Patel S, Gururajprasad C, Manjunath V. Insight to neoplastic thyroid lesions by fine needle aspiration cytology. *J Cytol.* 2013;30(1):23–6.
9. Handa U, Garg S, Mohan H, Nagarkar N. Role of fine needle aspiration cytology in diagnosis and management of thyroid lesions: a study on 434 patients. *J Cytol.* 2008;25(1):13–7.
10. Shenbagavalli S, Muthukumar R. Correlation of fine needle aspiration cytology and histopathological examination in thyroid swellings: a prospective study. *Int J Otorhinolaryngol Head Neck Surg.* 2019;5(10):902–6. [Google Scholar]
11. Manzoor F, Sheikh AR, Sheikh BA. Diagnostic utility of fine needle aspiration cytology in thyroid lesions. *Int J Res Med Sci.* 2020;8(9):3251–6. [Google Scholar]
12. Meena KK, Bordia S, Kanwat P, Meena S, Jakhar P. Diagnostic efficacy of FNAC in thyroid lesions classified according to Bethesda system with cyto-histological correlation. *Asian J Pharm Clin Res.* 2024;17(11):125–9. [Google Scholar]