e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(10); 26-32

Original Research Article

Study on Fine Needle Aspiration Cytology of Thyroid Lesions and Its Bethesda Categorization: A Prospective Study

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Received: 01-09-2025 / Revised: 15-09-2025 / Accepted: 30-09-2025
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Conflict of interest: Nil

Abstract

Background: Fine needle aspiration (FNA) of the thyroid gland has proven to be an important and widely accepted, cost-effective, simple, safe, and accurate method for triaging patients with thyroid nodules. Fine needle aspirations provide information that guides the management of patients with thyroid nodules by identifying patients who require surgical resection and patients who require no further interventions. The aim of this study was to analyze the thyroid cytology smears by Bethesda system and to assess the frequency of various categories.

Methods: A total of 85 thyroid FNAC samples were examined from March 2025 to August 2025 in the Department of Pathology, Patna Medical College, and Patna Bihar.

Results: A total of 85 cases were reported according to Bethesda system of reporting. Categories were as follows: category I - 5(5.88%), category II - 66(77.65%), category III - 1(1.17%), category IV - 4(4.70%), category V -3(3.52%), category VI - 6(7.05%).

Conclusion: FNAC for thyroid nodules is a safe, quick, and cost-effective outpatient procedure when executed by experts. The Bethesda system provides a unified and comprehensive approach to interpreting results, preventing unnecessary surgeries and promoting more judicious patient care.

Keywords: Fine-needle aspiration cytology, Bethesda, Thyroid.

Introduction

Thyroid cytopathology practice requires communication and collaboration among pathologists and primary clinicians, endocrinologists, radiologists, and surgeons, as well as correlation with surgical pathology interpretations.

Therefore, consistent diagnostic terminology is imperative. While there are minimal difficulties in diagnosing most benign and overtly malignant lesions, diagnostic challenges arise when aspirate samples are quantitatively or qualitatively suboptimal to reliably exclude a neoplastic process.

The management of these types of lesions has been further complicated by the historic lack of universal terminology. Multiple organizations have proposed diagnostic guidelines for reporting thyroid FNA cytology results, including the Papanicolaou Society of Cytopathology Task Force and American Thyroid Association, although none have been necessarily universally accepted.[16]The six diagnostic categories of the Bethesda System for thyroid FNAC are nondiagnostic (ND), benign, atypia of undetermined significance (AUS), follicular neoplasm (FN), suspicious for malignancy (SFM) and malignant. It provides a comprehensive framework for characterizing thyroid lesion.[1] The widespread implementation of the Bethesda System has not only standardized diagnostic terminology in thyroid cytopathology but also provided universally acceptable system for reporting thyroid lesions.[1] This standardization is crucial for fostering consistency in reporting and enhancing communication between healthcare professionals. The evolving landscape of thyroid nodule management underscores the importance of standardized systems for accurate reporting and effective communication within the medical community.[1]

Aim and objectives of the study was to study cytomorphology of thyroid lesions and categorize the lesions according to the Bethesda system.

Material and Methods

This prospective study was conducted in Department of Pathology, Patna Medical College, Patna, Bihar from March 2025 to August 2025.

Patients presenting with thyroid swelling, either diffuse or nodular, attending the Patna medical college and hospital OPD, Patna within the study period were included in the study. Exclusion criteria encompassed patients unwilling to undergo Fine Needle Aspiration Cytopathology (FNAC) for thyroid lesions, even after detailed explanations of the procedure's purpose, utility and consequences. Lesions involving parathyroid, lymph nodes and surrounding structures were also excluded.

A detailed clinical history, radiological findings and written informed consent was obtained from each patient before the collection of data. The FNA procedure was explained to patients and were instructed to refrain from talking or swallowing during the procedure. Clinical examination of the lesion was done. FNA of the thyroid lesion was done in patient lying comfortably in supine position or in sitting position with neck extended. Procedure was performed by palpating and fixing the swelling or under ultrasound guidance with 23-24 gauge needle attached to 10 ml syringe. The sample was collected and smears were made. The smears were air dried and stained with Giemsa stain. The stained slides cytomorphology was studied under microscope and were categorized according to The Bethesda System for Reporting Thyroid Cytopathology, 2023.

Results

The study included a total of 85 cases, with 17.65% (15) being male and 82.35% (70) female.(Table 1)

Table 1: Gender wise Distribution (n=85 cases)

Sex	No. of cases	Percentage
Male	15	17.65%
Female	70	82.35%
Total	85	100%

Age-specific analysis revealed adverse distribution of thyroid lesions across various age groups. Notably, the majority of cases were observed in the 21-30 and 51-60 age groups.(Table 2)

Table 2: Age-specific analysis revealed a diverse distribution of thyroid lesions across various age groups

Age group (in yrs.)	No. of cases	Percentage
1-10	1	1.17%
11-20	12	14.11%
21-30	24	28.22%
31-40	12	14.11%
41-50	12	14.11%
51-60	20	23.52%
61-70	2	2.34%
71-80	2	2.34%

The study encompassed 85 cases, offering a comprehensive insight into the categorization of lesions.

The majority of cases, 77.65% (66 cases), fell under the benign category (Bethesda II). Other categories included Nondiagnostic (Bethesda I) with 5.88%(5 cases), Atypia of undetermined significance (Bethesda III) 1.17 (1 case), Follicular Neoplasm (Bethesda IV) 4.70% (4cases), Suspicious for Malignancy (Bethesda V) 3.52% (3 cases) and Malignant (Bethesda VI) at 7.05%(6 cases).(Table 3)

Table 3: Distribution of Thyroid Lesions based on Cytological Diagnosis according to Bethesda System Categories

Bethesda Group	Category	No. of cases	Percentage
I	Nondiagnostic	5	5.88%
II	Benign	66	77.65%
III	Atypia of undetermined significance (AUS)	1	1.17%
IV	Follicular Neoplasm	4	4.70%
V	Suspicious for Malignancy	3	3.52%
VI	Malignant	6	7.05%

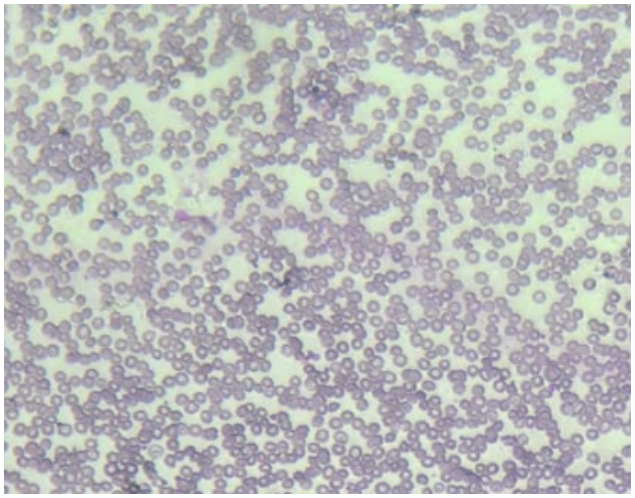

Figure 1: Non diagnostic category, Smear showing only RBC. No follicular cells seen.

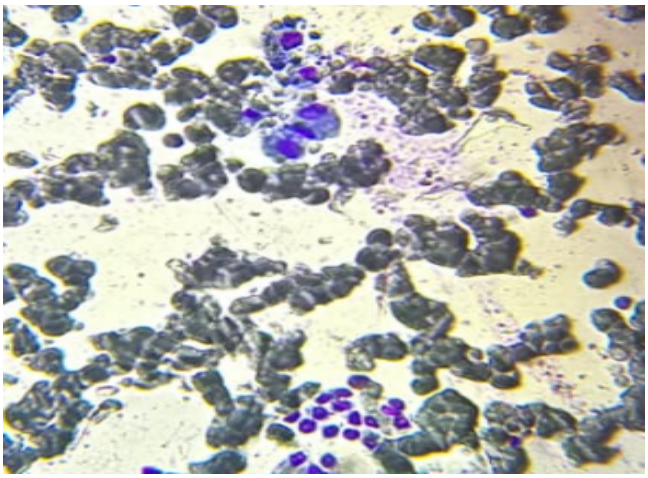

Figure 2: Benign category, Smear showing Follicular cells with cyst macrophages.

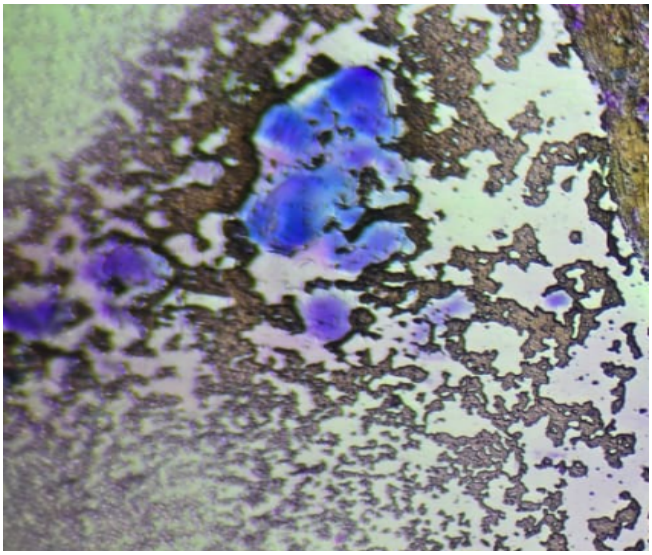

Figure 3: Benign category, Smear showing colloid.

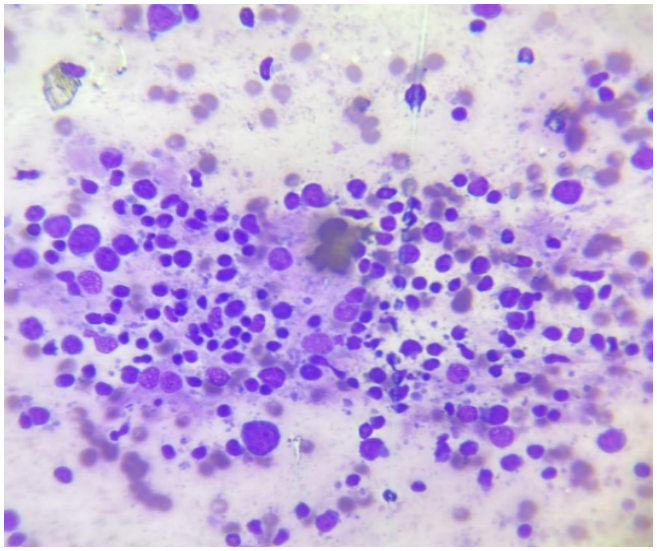

Figure 4: Benign category, Lymphocytic thyroiditis.

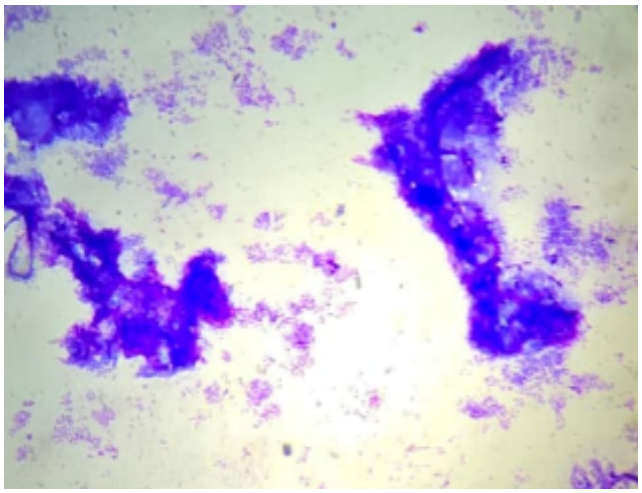

Figure 5: Malignant category, papillary carcinoma thyroid.

The gender wise and age wise distribution of thyroid lesion according to Bethesda categorization was done. Both male and female mainly presented with benign cases.

In the present study, maximum number of cases is 24 which were in the age group of 21-30 age range, followed by 20 cases in the age range of 51-60. Minimum number of patient were in the age group of 1-10 that is 1 patient.

The maximum 18 cases out of 66 benign lesion categories belonged to 21-30 age group followed by 16 cases in 51-60 age group. Among the malignant cases 5 out of 6 cases belonged to age group 21-30.(Table 4 and 5).

Table 4: Gender wise distribution according to Bethesda System Categories

	Bethesda System Categories					
Gender	**I (ND)**	**II (Benign)**	**III (AUS)**	**IV (FN)**	**V (SFM)**	**VI (Malignant)**
Male	3	7	0	1	1	3
Female	2	59	1	3	2	3
Total	5	66	1	4	3	6

Table 5: Age wise distribution according to Bethesda System Categories

Age group (in years)	Bethesda System Categories						Total
	I (ND)	II (Benign)	III (AUS)	IV (FN)	V (SFM)	VI (Malignant)	
1-10		1					1
11-20		12					12
21-30	1	18				5	24
31-40	2	7		1	1	1	12
41-50	1	8		2	1		12
51-60	1	16	1	1	1		20
61-70		2					2
71-80		2					2
Total	5	66	1	4	3	6	

In this present study noteworthy benign categories included colloid nodule, adenomatoid nodule, colloid goiter with cystic degeneration, chronic lymphocytic thyroiditis and granulomatous thyroiditis (Table 6).Follicular Neoplasm (Category IV) included follicular neoplasm and hurthle cell neoplasm (Table 7).

Table 6: Distribution of study participants according to the type of Benign Thyroid Lesion (n = 66)

Benign follicular lesion	No. of cases	Percentage
Colloid nodule	34	51.51%
Adenomatoid nodule	12	18.18%
Colloid goiter with cystic degeneration	10	15.15%
Chronic lymphocytic thyroiditis	8	12.12%
Granulomatous thyroiditis	2	3.03%

Table 7: Distribution of study participants according to the type of follicular neoplasm and hurthle cell neoplasm Lesion (n = 4)

Follicular neoplasm/Hurthle cell neoplasm	No. of cases	Percentage
Follicular neoplasm	02	50%
Hurthle cell neoplasm	02	50%

In Malignant cases (Category VI)all were papillary carcinoma thyroid.

Discussion

The present study aimed to assess the effectiveness of the Bethesda System, a proposed six-tier diagnostic classification system, in reporting thyroid Fine Needle Aspiration Cytology (FNAC) results. The observed male/female ratio (1:5) with predominance of thyroid lesions in females is consistent with study conducted by Nitisureka et al.[13] The highest prevalence in the 21-30 years age group in the current study are consistent with studies conducted by Cibaset al.[1] and Safirullah et al.[4].

The diverse distribution across various age groups in this study is in concordance with a study conducted by Salma et al.[14] and emphasizes the importance of considering age in thyroid lesion assessment.

Table 8: Comparative study of FNAC diagnosis based on Bethesda classification

Studies	Bethesda System Categories					
	I (ND)	II (Benign)	III (AUS)	IV (FN)	V (SFM)	VI (Malignant)
Present study	5.88	77.65	1.17	4.70	3.52	7.05
Bhagat et al.	5.63	87.5	0	3.12	0.63	3.12
Salma et al.	5	66	1	4	3	6
Kantola et al.	15.8	69.2	7.4	2.2	0.7	4.9
Jo et al.	18.6	59	3.4	9.7	2.3	7
Nitisureka et al.	8	61.5	9	7.5	8	6
Salma et al.	6.6	82	2	2.5	1.6	5.1

The distribution of cases across Bethesda System categories in this study aligns with findings from other researches.

In the present study, the percentage in each category of TBSRTC was in accordance with Bhagat et al[15], Nitisureka et al[13] and salma et al[14]. Studies conducted by Cibaset al.[1] and

Yang et al.[5], which also utilized the six-tier classification system, reporting most of the lesions as benign.

In terms of unsatisfactory cases, our study(5.88%) closely mirrored the findings of a study conducted by Salma et al[14] and showed AUS(1.17%)and FN(4.70%) categories in present study in accordance with their reported rates of 1% and 4% respectively. The consistent categorization across studies enhances the robustness of the Bethesda System in standardizing reporting. Suspicious for malignancy and malignant cases in this study showed similarity with the study conducted by Jo et al.[12]

Conclusion

Present study seeks to delineate the distribution of thyroid lesions across Bethesda categories. This exploration is essential for enhancing diagnostic accuracy, ensuring consistent management approaches and contributing to the growing body of evidence supporting the use of FNAC and the Bethesda System in thyroid nodule assessment. This exploration will shed light on the diagnostic accuracy and clinical implications of FNAC, ultimately enhancing our ability to optimize the assessment and management of thyroid disorders in clinical settings.

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