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Original Article

"A Retrospective Observational Cytological Study of Thyroid Gland FNAC Using the Bethesda System at A Tertiary Care Hospital"

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Abstract:

Introduction:

Fine Needle Aspiration Cytology (FNAC) is a crucial diagnostic tool for evaluating thyroid nodules. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) standardizes FNAC reporting, enhancing diagnostic accuracy and guiding clinical management. This study retrospectively analyzes thyroid FNAC cases from a tertiary care hospital in Indore, classified according to the Bethesda system, to determine the epidemiological distribution and diagnostic outcomes.

Aims and Objectives:

To evaluate the cytomorphological features of thyroid lesions using TBSRTC and to analyze the epidemiological distribution of these lesions at a tertiary care hospital in Indore.

Methodology:

A retrospective observational study was conducted over two years (January 2022 - December 2023) in the Department of Pathology at Index Medical College, Indore. The study included all patients referred for thyroid FNAC, with slides stained using Giemsa and Papanicolaou methods. Cases were classified according to the six Bethesda categories, and data were analyzed for age, gender distribution, and diagnostic outcomes.

Results:

Out of 100 FNAC cases, the distribution across Bethesda categories was as follows: Category I (23%), Category II (64%), Category III (4%), Category IV (7%), Category V (1%), and Category VI (1%). The female-to-male ratio was 4.8:1, with a mean age of 43 years. The most common lesion was colloid goiter (48%) in Category II.

Conclusion:

The Bethesda System significantly improves the accuracy of thyroid FNAC interpretation, aiding in clinical decision-making. This study's findings highlight the importance of standardized cytological reporting in managing thyroid lesions, with a focus on accurate risk stratification and appropriate therapeutic intervention.

Keywords:

Thyroid nodules, Fine Needle Aspiration Cytology, Bethesda System, Cytopathology, Epidemiology, Diagnostic accuracy, Thyroid lesions, Tertiary care hospital.

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Introduction:

Thyroid nodules are a common clinical finding, and the accurate assessment of their nature is crucial for appropriate management. Fine Needle Aspiration Cytology (FNAC) has become the preferred initial diagnostic method due to its simplicity, cost-effectiveness, and minimal invasiveness. The introduction of the Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) has further standardized FNAC interpretation, providing a clear framework for categorizing thyroid lesions and associated malignancy risks. This system not only enhances diagnostic accuracy but also aids in the clinical management of thyroid nodules by correlating cytological findings with specific therapeutic guidelines, thereby reducing unnecessary surgeries and improving patient outcomes[1-3]. A recent study conducted in a tertiary care hospital highlighted the utility of TBSRTC in classifying thyroid lesions and stressed its role in guiding appropriate clinical interventions[4]. This retrospective study aims to analyze thyroid FNAC data from a tertiary care hospital in Indore, utilizing the Bethesda system to categorize cytological findings. The study focuses on the epidemiological distribution of thyroid lesions and assesses the utility of TBSRTC in guiding clinical management.

Methodology:

Study Design:

This retrospective observational study was conducted over a two-year period, from January 2022 to December 2023, at the Department of Pathology, Index Medical College, Indore. The study involved all patients who underwent FNAC for thyroid lesions, regardless of age or gender.

Inclusion Criteria:

- Patients with thyroid lesions referred for FNAC.
- Cases with adequate clinical history and examination details.

Exclusion Criteria:

- Incomplete or unsatisfactory cytological samples.
- Patients with prior thyroid surgery or treatment.

Procedure:

FNAC was performed using a 22G or 23G needle, with or without aspiration, under imaging guidance when necessary. Slides were prepared and stained using Giemsa and Papanicolaou (PAP) methods. Cytological findings were categorized according to the Bethesda System into six categories:

1. Non-diagnostic/unsatisfactory
2. Benign
3. Atypia of undetermined significance/follicular lesion of undetermined significance (AUS/FLUS)
4. Follicular neoplasm/suspicious for a follicular neoplasm (FN/SFN)
5. Suspicious for malignancy
6. Malignant

Data Analysis:

Data were analyzed for age, gender distribution, and diagnostic outcomes across the Bethesda categories. Descriptive statistics were used to summarize the findings, and comparisons were made with other studies to assess consistency and variations in the distribution of thyroid lesions.

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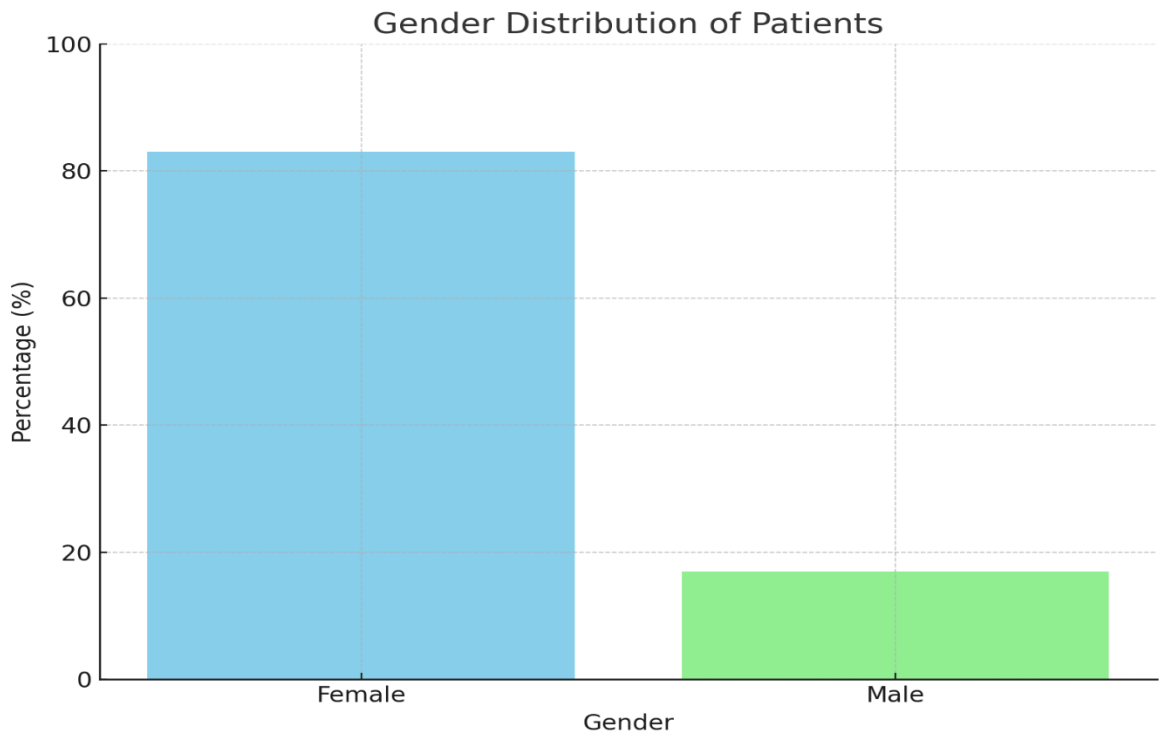
Results:
Demographic Distribution:

Table-1: Demographic Distribution
Table-1a Gender Distribution of Patients

Gender	Number	Percentage (%)	P-value
Female	83	83	<0.01
Male	17	17	<0.01
Total	100	100	

Out of the 100 patients analysed, 83 (83%) were female, and 17 (17%) were male, with a female-to-male ratio of 4.8:1.

Interpretation:
table show that 83% of the patients were female, while 17% were male, with a statistically significant P-value of <0.01. This indicates a significant gender disparity in the prevalence of thyroid lesions within the study population, with females being more affected.



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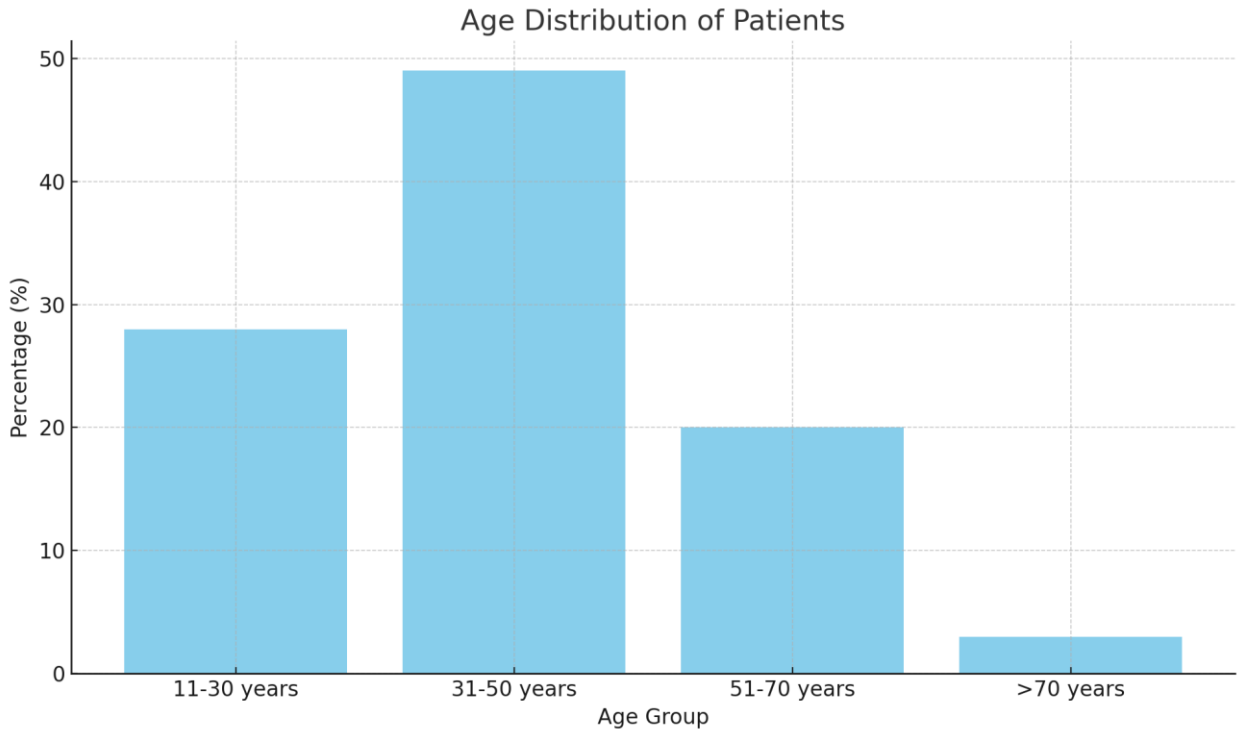
Interpretation: The bar graph shows a significant gender disparity, with 83% females and 17% males, highlighting females' higher prevalence.

Table-1b

Age Group	Number	Percentage (%)	P-value
11-30 years	28	28	<0.05
31-50 years	49	49	<0.01
51-70 years	20	20	<0.05
>70 years	3	3	NS
Total	100	100	

Interpretation:
The age distribution reveals that the majority of patients (49%) are in the 31-50 years age group, indicating this group has the highest prevalence of thyroid lesions. The distribution is statistically significant for younger age groups, particularly 31-50 years.



Interpretation- Age Distribution of Patients: The bar chart shows that most patients fall within the 31-50 age group (49%), followed by 11-30 years (28%). A smaller percentage of patients are in the 51-70 years (20%) and >70 years (3%) age groups.

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Bethesda Category Distribution:
Table- 2 Bethesda Category Distribution

Bethesda Category	Number	Percentage (%)	P-value
Category I	23	23	<0.05
Category II	64	64	<0.01
Category III	4	4	NS
Category IV	7	7	<0.05
Category V	1	1	NS
Category VI	1	1	NS
Total	100	100	

Interpretation:
Category II (Benign) dominates the Bethesda classifications, representing 64% of cases, indicating that most thyroid FNAC results in this study are benign. This high percentage underscores the role of FNAC in effectively identifying non-malignant thyroid conditions. However, the lower prevalence of Categories III to VI, which collectively account for only 13% of cases, emphasizes their critical importance in identifying potential malignancies. These categories, though less frequent, are crucial for risk stratification and guiding further clinical management, particularly in cases where malignancy is suspected.

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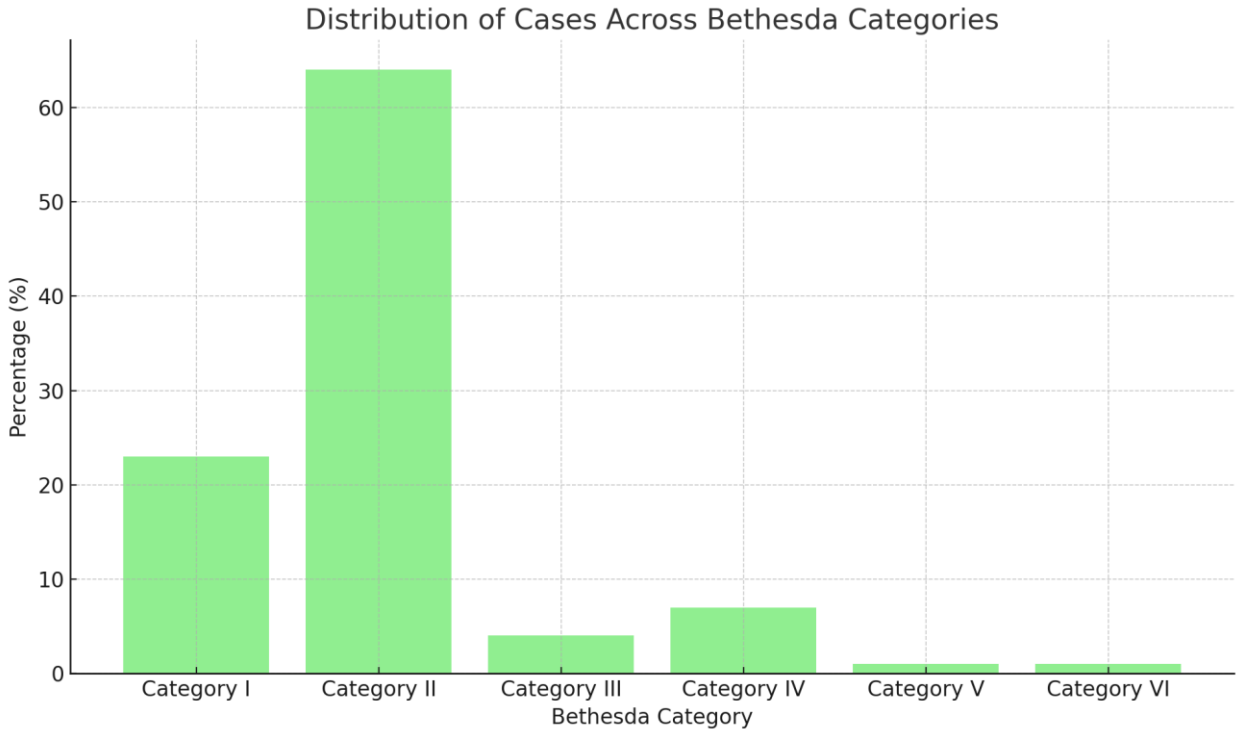

Interpretation- Distribution of Cases Across Bethesda Categories: This chart highlights that most cases fall under Category II (64%), indicating benign lesions. Categories I, III, IV, V, and VI are less common, with Category I (23%) being the next most prevalent.

Detailed Analysis of Category II (Benign):

Table 3 Detailed Analysis of Category II (Benign)

Benign Condition	Number	Percentage (%)	P-value
Colloid goiter	32	50	<0.05
Colloid goitre with cystic degeneration	16	25	<0.05
Graves' disease	6	9.375	> 0.05
Hashimoto's thyroiditis	8	12.5	> 0.05
de Quervain's thyroiditis	2	3.125	> 0.05
Total	64	100	

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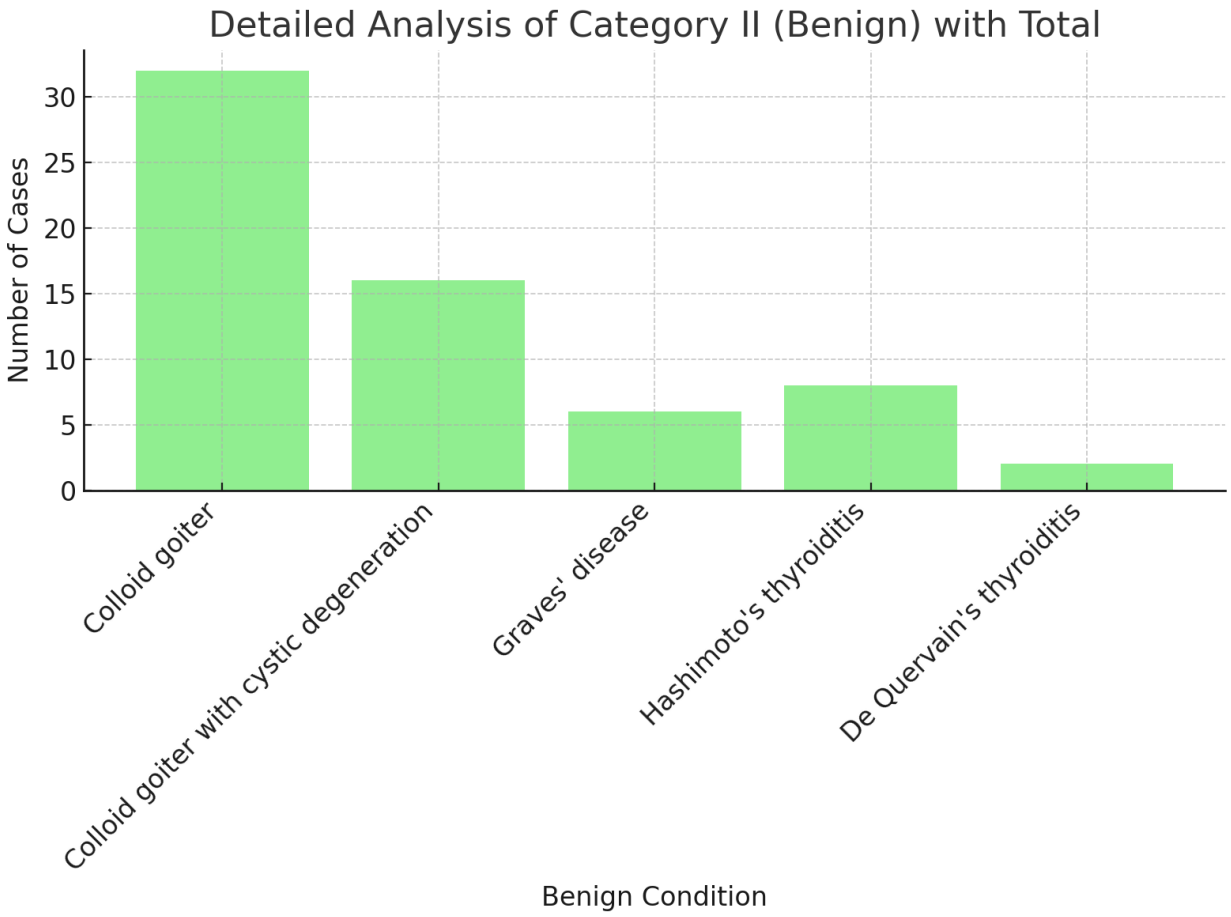
Interpretation:
The table shows that colloid goiter is the most common benign condition in Category II, accounting for 50% of cases, followed by colloid goiter with cystic degeneration at 25%. Graves' disease and Hashimoto's thyroiditis occur less frequently, at 9.375% and 12.5%, respectively, while De Quervain's thyroiditis is the least common, with 3.125%. Statistically significant differences ($p < 0.05$) are observed for colloid-related conditions, emphasizing their predominance among benign thyroid lesions.



Interpretation-The graph highlights colloid goiter as the dominant condition (50%) in Category II, followed by colloid goiter with cystic degeneration (25%). Graves' disease and Hashimoto's thyroiditis show lower prevalence, while De Quervain's thyroiditis is the least frequent. This underscores the predominance of colloid-related lesions in benign thyroid FNAC results.

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Comparison of Bethesda Categories Across Studies:

study Name	Bethesda Cat I (%)	Bethesda Cat II (%)	Bethesda Cat III (%)	Bethesda Cat IV (%)	Bethesda Cat V (%)	Bethesda Cat VI (%)
Bhat et al.[2]	6.6	82	2	2.5	1.6	5.1
Khatib et al.[3]	0.68	88	3.4	4.5	1.4	2.06
Park et al.[4]	13.3	40.6	9.1	0.4	19.3	17.3
Patel et al.[6]	-	6.4	-	50	-	100
Present Study	23	64	4	7	1	1

Interpretation:

The present study shows a higher percentage of non-diagnostic cases (Category I at 23%) compared to previous studies, suggesting challenges in sample adequacy. Category II (Benign) in the present study (64%) aligns with Bhat et al. (82%) and Khatib et al. (88%), indicating consistent identification of benign lesions across studies. The lower rates in Categories III to VI in the present study highlight fewer indeterminate and malignant cases compared to others, such as Park et al., where higher malignancy rates (17.3% in Category VI) were observed.

Discussion:

The Bethesda System for Reporting Thyroid Cytopathology provides a standardized approach to categorizing thyroid lesions based on FNAC findings. In our study, the majority of cases (64%) were classified as benign (Category II), consistent with other studies such as those by Khatib et al. and Bhat et al.[9-10] This highlights the importance of FNAC in reducing unnecessary surgeries in patients with benign thyroid lesions.

The high percentage of Category I cases (23%) indicates a need for improved sample collection techniques or repeat FNACs to ensure diagnostic adequacy. The distribution of Category III (AUS/FLUS) and Category IV (FN/SFN) cases was relatively low, aligning with the expected lower frequency of indeterminate lesions.[7,8]

Comparing our findings with other studies, we observed that the malignancy rate (Category V and VI) in our study was lower, reflecting the effectiveness of FNAC in identifying benign conditions. However, the single case in Category VI underscores the importance of prompt surgical intervention in cases where malignancy is suspected.[5]

The female predominance in thyroid lesions, as observed in our study, is consistent with the global trend, as reported in studies by Naz et al., Bhat et al., and Park et al.[5,6,8,9]The mean age

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of 43 years in our study also aligns with findings from similar research, suggesting that middle-aged women are the most affected demographic group.[10]

Implications for Clinical Practice:
The use of TBSRTC in thyroid FNAC has been shown to improve diagnostic accuracy and guide clinical decision-making. Our study reinforces the value of TBSRTC in a tertiary care setting, where it aids in stratifying patients based on malignancy risk and determining the need for further intervention.

Limitations:
This study is limited by its retrospective design and the potential for selection bias, as only patients referred for FNAC were included. Additionally, the relatively small sample size may limit the generalizability of the findings.

Conclusion:
The Bethesda System enhances the consistency and accuracy of thyroid FNAC interpretations, facilitating appropriate clinical management. Our study underscores the importance of standardized cytological reporting in the management of thyroid lesions, with significant implications for patient outcomes. Future research should focus on larger, multi-centre studies to validate these findings and explore the long-term impact of TBSRTC on patient care.

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