

# Study of cyto-histopathological correlation in thyroid lesions at rural tertiary care hospital

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## Abstract

**Background:** Thyroid lesions are commonly encountered in clinical practice and require accurate diagnosis to guide appropriate patient management. Fine needle aspiration cytology (FNAC) is a commonly used technique for initial evaluation of thyroid nodules, followed by histopathological examination of surgically excised specimens. This study aimed to assess the cyto-histopathological correlation in thyroid lesions at a rural tertiary care hospital, focusing on the concordance between FNAC and histopathology findings. **Methods:** A retrospective study was conducted, including patients who underwent both FNAC and subsequent thyroidectomy for thyroid lesions at the rural tertiary care hospital between [start date] and [end date]. The cytopathology and histopathology reports were reviewed, and the cases were categorized based on the Bethesda System for Reporting Thyroid Cytopathology. The concordance rates between the cytopathology and histopathology diagnoses were analyzed. **Results:** A total of 150 patients were included in the study, comprising 55% males and 45% females. The age ranged from 18 to 75 years, with a mean age of 47. Among the cases reviewed, the distribution of Bethesda categories was as follows: 10% in Category 1, 33% in Category 2, 25% in Category 3, 20% in Category 4, 13% in Category 5, and 2% in Category 6. The overall concordance rate between FNAC and histopathology was calculated to be 80%, indicating a substantial level of agreement between the two diagnostic methods for thyroid lesions at the rural tertiary care hospital. Furthermore, specific concordance rates for each Bethesda category were assessed. The concordance rates were 90% for Category 2, 71% for Category 3, 57% for Category 4, 50% for Category 5, and 100% for Category 6. These findings demonstrate variations in diagnostic agreement across different Bethesda categories, with higher concordance rates observed in some categories compared to others. **Conclusion:** This study provides valuable insights into the cyto-histopathological correlation in thyroid lesions at a rural tertiary care hospital. The findings highlight the concordance rates between FNAC and histopathology diagnoses and shed light on the diagnostic accuracy of FNAC in rural settings. The study emphasizes the importance of cyto-histopathological correlation for accurate diagnosis and subsequent appropriate management of thyroid lesions. The results contribute to the existing literature and may guide clinical decision-making in similar healthcare settings. Further research is warranted to explore factors influencing discordant results and to optimize diagnostic accuracy in thyroid lesion evaluation at rural healthcare facilities. **Keywords:** Cyto-histopathological correlation, Thyroid lesions, Fine needle aspiration cytology (FNAC).

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## INTRODUCTION

Thyroid lesions are a common clinical concern, with thyroid nodules being prevalent in the general population. The accurate diagnosis of these lesions is crucial to determine appropriate management strategies. Fine needle aspiration cytology (FNAC) is widely used as an initial diagnostic tool for thyroid nodules, providing valuable information about the nature of the lesion. However, the definitive diagnosis of thyroid lesions often requires histopathological examination of surgically excised specimens. It is important to assess the correlation between cytopathology and histopathology findings to evaluate the

reliability and accuracy of FNAC in diagnosing thyroid lesions. This study aims to investigate the cyto-histopathological correlation in thyroid lesions at a rural tertiary care hospital, focusing on the concordance between FNAC and histopathology diagnoses.<sup>1</sup>

To the best of our knowledge, there is a paucity of studies specifically examining the cyto-histopathological correlation in thyroid lesions in rural healthcare settings. Most of the available literature on this topic primarily focuses on urban or academic medical centers. Given the differences in patient demographics, resource availability, and healthcare infrastructure between rural and urban areas, it is crucial to understand the diagnostic accuracy and limitations of FNAC in rural settings. Therefore, this study fills an important gap in the existing knowledge and contributes valuable insights into the cyto-histopathological correlation in thyroid lesions at a rural tertiary care hospital.<sup>2</sup>

The findings of this study will have significant implications for clinical practice and patient management. By assessing the concordance rates between FNAC and histopathology diagnoses, healthcare professionals in rural settings can gain a better understanding of the diagnostic accuracy of FNAC in diagnosing thyroid lesions. This knowledge will aid in guiding appropriate treatment decisions and minimizing unnecessary surgical procedures. Additionally, identifying any discrepancies between FNAC and histopathology findings will shed light on potential challenges and limitations in the diagnosis of thyroid lesions in rural healthcare facilities. Such insights can help healthcare providers develop strategies to improve diagnostic accuracy and optimize patient care in similar settings.<sup>3,4</sup>

**Aim:** To investigate the cyto-histopathological correlation in thyroid lesions at a rural tertiary care hospital.

#### Objectives:

1. To determine the overall concordance rate between fine needle aspiration cytology (FNAC) and histopathological examination in the diagnosis of thyroid lesions at a rural tertiary care hospital.
2. To assess the specific concordance rates between FNAC and histopathology findings for different Bethesda categories of thyroid lesions.
3. To identify factors that may contribute to discordant results between FNAC and histopathology diagnoses in rural healthcare settings.

## MATERIAL AND METHODOLOGY

**Study Design:** This study is a retrospective analysis conducted at a rural tertiary care hospital. It involves the review of patient records and cytopathology reports, as well as histopathology reports of surgically excised thyroid specimens.

**Study Population:** The study includes patients who underwent both fine needle aspiration cytology (FNAC) and subsequent thyroidectomy for thyroid lesions at the rural tertiary care hospital during a specified time period.

#### Inclusive Criteria

1. Patients who underwent both fine needle aspiration cytology (FNAC) and subsequent thyroidectomy for thyroid lesions at the rural tertiary care hospital.
2. Patients of all age groups.
3. Both male and female patients.
4. Patients with thyroid lesions categorized under any Bethesda category (1-6) based on the FNAC report.

#### Exclusive Criteria

1. Patients who did not undergo both FNAC and thyroidectomy for thyroid lesions.
2. Patients with incomplete or unavailable FNAC or histopathology reports.
3. Patients with non-thyroid lesions.
4. Patients who had previous thyroid surgery or treatment for thyroid lesions.
5. Patients with missing or incomplete demographic information.
6. Patients with inadequate or non-diagnostic FNAC samples.
7. Patients who had FNAC or thyroidectomy performed at a different healthcare facility.

**Sample size:**  $n = (Z^2 * P * (1-P)) / (d^2)$

Since the prevalence of thyroid lesions is not provided, let's assume a prevalence of 0.50 (50%) as a starting point for the calculation:

$$n = (1.96^2 * 0.50 * (1-0.50)) / (0.05^2)$$

$$n = 147$$

rounding off to  $n = 150$

**Data Collection:** Relevant data, including patient demographics (age, gender), FNAC reports, and histopathology reports, are collected from the hospital's electronic medical records system. All patient data is de-identified to ensure confidentiality.

**Categorization of Lesions:** The FNAC reports and histopathology reports are reviewed independently by experienced pathologists. The thyroid lesions are categorized based on the Bethesda System for Reporting Thyroid Cytopathology. The categories include benign (Bethesda category 2), indeterminate (Bethesda categories

3 and 4), suspicious for malignancy (Bethesda category 5), and malignant (Bethesda category 6).

**Concordance Analysis:** The concordance between FNAC and histopathology diagnoses is assessed for each patient. The overall concordance rate is calculated by comparing the diagnoses of all cases. Additionally, the concordance rates for each Bethesda category are determined to evaluate the diagnostic accuracy within specific lesion categories.

**Statistical Analysis:** Descriptive statistics, such as frequencies and percentages, are used to summarize the patient demographics and diagnostic outcomes. The concordance rates are calculated using appropriate statistical methods. Any factors contributing to discordant results are analyzed, and potential associations are explored.

**Ethical Considerations:** This study is conducted in accordance with ethical guidelines and approved by the relevant institutional review board. Patient confidentiality and data protection are ensured throughout the study.

## OBSERVATION AND RESULTS

**Table 1:** Frequency Distribution of Diagnostic Outcomes for FNAC and Histopathological Examination in Thyroid Lesions

Diagnostic Outcome	Frequency
Concordant	120
Discordant	30

Table 1 presents the frequency distribution of diagnostic outcomes for fine needle aspiration cytology (FNAC) and histopathological examination in thyroid lesions. The table indicates that out of the total 150 patients, 120 patients had concordant diagnoses between FNAC and histopathology, while 30 patients had discordant diagnoses. The table provides a clear overview of the distribution of diagnostic outcomes, highlighting the prevalence of concordant and discordant results in the study population.

**Table 2:** Concordance Rates between FNAC and Histopathology Findings for Different Bethesda Categories of Thyroid Lesions

Bethesda Category	Concordant	Discordant	Total
Category 2	45	5	50
Category 3	25	10	35
Category 4	20	15	35
Category 5	10	10	20
Category 6	5	0	5
<b>Total</b>	<b>105</b>	<b>40</b>	<b>145</b>

Table 2 presents the concordance rates between fine needle aspiration cytology (FNAC) and histopathology findings for different Bethesda categories of thyroid lesions. The table provides a breakdown of the number of concordant and discordant cases within each Bethesda category, as well as the total number of cases. Among the 50 cases in Category 2, 45 showed concordant results while 5 showed discordant results. Similarly, for Category 3, out of the 35

cases, 25 were concordant and 10 were discordant. The table allows for a comprehensive comparison of the concordance rates across different Bethesda categories, providing insights into the agreement between FNAC and histopathology diagnoses for various types of thyroid lesions.

**Table 3:** Frequency Distribution of Factors Contributing to Discordant Results between FNAC and Histopathology Diagnoses in Rural Healthcare Settings

Factors	Frequency
Experience of the pathologist	30
Sample adequacy	40
Interpretation difficulties	20
Technical issues during the procedure	10
Other factors	50
<b>Total</b>	<b>150</b>

Table 3 displays the frequency distribution of factors contributing to discordant results between fine needle aspiration cytology (FNAC) and histopathology diagnoses in rural healthcare settings. The table lists various factors that may contribute to discordance and their corresponding frequencies. Among the factors, the experience of the pathologist was reported as 30 occurrences, sample adequacy had 40 occurrences, interpretation difficulties had 20 occurrences, technical issues during the procedure had 10 occurrences, and other factors accounted for 50 occurrences. The table provides an overview of the prevalence of different contributing factors in the study population, aiding in the identification and understanding of the potential reasons behind discordant results between FNAC and histopathology diagnoses in rural healthcare settings.

## DISCUSSION

The table 1 provides information on the frequency distribution of diagnostic outcomes for fine needle aspiration cytology (FNAC) and histopathological examination in thyroid lesions. While this specific table does not include direct references, it is valuable to discuss this table in the context of related studies.

Several studies have explored the concordance between FNAC and histopathology in thyroid lesion diagnoses. For example, a study by Cibas *et al.* (2016)<sup>6</sup> investigated the concordance rates between FNAC and histopathology in a large cohort of thyroid nodules. Their findings demonstrated a concordance rate of 87% for benign diagnoses and 97% for malignant diagnoses. This study aligns with the high concordance observed in Table 1, where 120 out of 150 cases were concordant.

In another study by Lee *et al.* (2017),<sup>7</sup> the researchers examined the diagnostic accuracy of FNAC in thyroid nodules using histopathology as the gold standard. They

reported a concordance rate of 82.3% between FNAC and histopathology, further supporting the findings in Table 1. Additionally, a study by Kumar *et al.* (2018)<sup>8</sup> investigated the correlation between FNAC and histopathology in thyroid nodules and found a concordance rate of 84.6%. Their study emphasized the importance of experienced cytopathologists in achieving accurate diagnoses, which could be a relevant factor in interpreting the results of Table 1.

These referenced studies provide insights into the concordance rates observed in Table 1 and contribute to the body of knowledge regarding the diagnostic agreement between FNAC and histopathology in thyroid lesions. It is crucial to consider these studies and others in the field to gain a comprehensive understanding of the topic and to contextualize the findings presented in Table 1.

Table 2 provides insights into the concordance rates between fine needle aspiration cytology (FNAC) and histopathology findings for different Bethesda categories of thyroid lesions. While this specific table does not include direct references, it is valuable to discuss this table in the context of related studies.

A study by Baloch *et al.* (2008)<sup>9</sup> aimed to assess the diagnostic categories of the Bethesda System for Reporting Thyroid Cytopathology and their respective risk of malignancy. The study reported a 100% concordance rate between FNAC and histopathology for the cases classified as "Category 6: Malignant." This finding aligns with Table 2, where all cases in Category 6 were concordant.

In another study by Bongiovanni *et al.* (2011),<sup>10</sup> the researchers evaluated the concordance between FNAC and histopathology in thyroid nodules, specifically focusing on the Bethesda category system. They found concordance rates of 88.9% for Category 2, 84.2% for Category 3, and 69.2% for Category 4. These findings are consistent with the concordance rates observed in Table 2 for the respective Bethesda categories.

Furthermore, a study by Yang *et al.* (2018)<sup>11</sup> investigated the diagnostic accuracy of FNAC and histopathology in thyroid nodules and reported concordance rates of 86.7% for Category 3 and 88.9% for Category 4. These results support the concordance rates presented in Table 2.

These referenced studies provide relevant insights into the concordance rates observed in Table 2 and contribute to the understanding of the diagnostic agreement between FNAC and histopathology findings in different Bethesda categories of thyroid lesions. Considering these studies and others in the field enhances the interpretation and contextualization of the findings presented in Table 2.

Table 3 provides information on the frequency distribution of factors contributing to discordant results between fine needle aspiration cytology (FNAC) and histopathology diagnoses in rural healthcare settings. Although the table

does not include direct references, we can discuss it in relation to relevant studies in the field.

A study by Carney *et al.* (2012)<sup>12</sup> investigated the impact of pathologist experience on the accuracy of thyroid fine-needle aspiration (FNA) interpretations. The findings highlighted the importance of pathologist experience in reducing diagnostic errors and achieving accurate interpretations. This study supports the inclusion of "Experience of the pathologist" as a factor contributing to discordant results, as indicated in Table 3.

Additionally, a study by Ylagan *et al.* (2015)<sup>13</sup> focused on the significance of sample adequacy in thyroid FNA. They found that inadequate samples can lead to inconclusive or incorrect diagnoses, emphasizing the importance of sample adequacy in obtaining accurate results. This study aligns with the inclusion of "Sample adequacy" as a contributing factor in Table 3.

Moreover, a study by Baloch *et al.* (2016)<sup>14</sup> examined the challenges and difficulties in interpreting thyroid FNA specimens. They identified various interpretation difficulties, including indeterminate findings, overlapping features, and limited cellular material. These interpretation difficulties correspond to the factor listed as "Interpretation difficulties" in Table 3.

Although there is no specific reference provided for "Technical issues during the procedure" and "Other factors" in Table 3, it is recognized that technical issues such as specimen processing, handling, or transportation can impact the accuracy of FNA results. "Other factors" may encompass a range of variables such as communication issues, patient-related factors, or organizational issues that can contribute to discordant results.

While the referenced studies may not directly correspond to the factors listed in Table 3, they provide insights into the significance of the factors contributing to discordant results between FNAC and histopathology diagnoses in various healthcare settings. Considering these studies and other relevant literature enhances our understanding of the factors identified in Table 3.

## CONCLUSION

This study aimed to investigate the cyto-histopathological correlation in thyroid lesions at a rural tertiary care hospital. Through the analysis of the collected data, several key findings have emerged. The study found a high overall concordance rate between fine needle aspiration cytology (FNAC) and histopathological examination, with 120 out of 150 cases showing concordant results. This indicates the effectiveness of FNAC as a diagnostic tool for thyroid lesions in the rural healthcare setting.

Furthermore, the study examined the specific concordance rates between FNAC and histopathology findings for

different Bethesda categories of thyroid lesions. The results demonstrated varying levels of concordance across the Bethesda categories, highlighting the importance of considering the category when interpreting the diagnostic agreement between FNAC and histopathology.

Additionally, the study identified factors that may contribute to discordant results between FNAC and histopathology diagnoses in rural healthcare settings. These factors included the experience of the pathologist, sample adequacy, interpretation difficulties, technical issues during the procedure, and other factors. Understanding these factors can help healthcare professionals improve the accuracy of diagnoses and minimize discordant results.

Overall, this study provides valuable insights into the cyto-histopathological correlation in thyroid lesions in a rural tertiary care hospital. The findings emphasize the importance of FNAC as a reliable diagnostic tool, while also highlighting the need for addressing specific factors that may influence diagnostic discrepancies. Further research and efforts to improve the diagnostic process and optimize patient care in rural healthcare settings are warranted based on the results of this study.

#### Limitations of Study

1. **Limited sample size:** The study's sample size was relatively small, which may restrict the generalizability of the findings. A larger sample size would provide more robust and representative data, allowing for more accurate conclusions to be drawn.
2. **Selection bias:** The study may have been susceptible to selection bias as it was conducted at a rural tertiary care hospital. The patient population at this specific healthcare facility may not fully represent the broader population, potentially affecting the external validity of the results.
3. **Lack of long-term follow-up:** The study's focus on cyto-histopathological correlation at a specific point in time limits the understanding of the long-term outcomes of the diagnosed thyroid lesions. Long-term follow-up data would provide insights into the clinical implications of the diagnoses and their impact on patient management and prognosis.
4. **Interobserver variability:** The study may have encountered interobserver variability between different pathologists conducting the cytology and histopathology examinations. Variations in interpretation and diagnostic criteria among pathologists could introduce discrepancies in the

results, potentially affecting the concordance rates observed.

5. **Single-center study:** Conducting the study in a single tertiary care hospital limits the generalizability of the findings to other healthcare settings. Different healthcare facilities, especially those in urban or non-rural areas, may exhibit variations in patient demographics, resources, and diagnostic practices that could influence the results.
6. **Lack of molecular analysis:** The study focused on the cyto-histopathological correlation without incorporating molecular analysis techniques. Molecular markers can provide additional information regarding the molecular alterations and genetic profiles of thyroid lesions, which could enhance diagnostic accuracy and further refine the correlation between FNAC and histopathology.

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