

Study of Cyto-Histopathological Correlation of Thyroid Lesions at Jhalawar Medical College - A Five Year Study

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Received: 25-08-2024 / Revised: 23-09-2024 / Accepted: 25-10-2024

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Conflict of interest: Nil

Abstract:

Background: Thyroid diseases are fairly frequent among endocrine disorders. In clinical practice, a majority are benign but a substantial number of them are malignant. It is difficult to overall diagnose simply on clinical assessment. Fine needle aspiration cytology (FNAC) has been accepted as the first line investigation, especially for palpable thyroid swellings. But FNAC has its own limitations, therefore for final diagnosis histopathological examination is necessary.

Aim: This study mainly aims to correlate the preoperative FNAC results as per The Bethesda system for Reporting Thyroid Cytopathology with subsequent Histopathological findings as the gold standard.

Objectives: To evaluate the discordant cases, find out causes of discordance and to find out the sensitivity, specificity, positive and negative predictive values of thyroid FNAC.

Methods: This was a five year observational study (3 years retrospective and 2 years prospective) conducted from august 2019 to august 2024 at Department of Pathology, Jhalawar Medical College, Jhalawar, Rajasthan. Total 146 cases were included in this study for which cytopathological and histopathological diagnosis were made.

Results: Out of total 146 cases, 35 cases (23.97%) were neoplastic and 111 cases (76.03%) were non neoplastic lesions. Cytological diagnosis achieved sensitivity of 62.9%, specificity 98.2%, positive predictive value 91.7% and negative predictive value 89.3%. The diagnostic accuracy of cytological diagnosis was 89.72%.

Conclusion: FNAC of thyroid lesions has been shown to be simple, reliable and accurate method for the management of palpable thyroid lesions. It bridges the gap between clinical evaluation and final surgical pathological diagnosis in majority of cases. It enables the clinician to obtain a diagnosis in high percentage of cases with minimal expenditure of time and money and often to prevent unnecessary surgery. As a screening method, it has high sensitivity and specificity, thus helps in planning the future management of patients. The Bethesda system for reporting thyroid cytopathology has standardized the diagnostic approach for reporting of thyroid lesions providing a uniform and clinically pertinent nomenclature.

Keywords: Thyroid, Bethesda, Fine needle aspiration cytology, Benign, Malignant, Neoplastic, Non neoplastic, Histopathology.

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Introduction

The thyroid hormones affect all body organs and are responsible for maintenance of homeostasis and the body integrity. Thyroid diseases are fairly frequent among endocrine disorders. In clinical practice, a majority are benign but a substantial number of them are malignant. [1,2] It is difficult to overall diagnose simply on clinical assessment. Therefore, it is crucial that an accurate diagnosis is obtained as early as possible. [3]

As we know, thyroid lesions relatively common in surgical practice and their wide prevalence is 4-7%. The incidence of malignancy in thyroid goitre is 10%. It is not practical to excise all the thyroid

lesions because of certain risks. To avoid unwanted surgery, an effective screening test is required. [4]

A plethora of diagnostic procedures like ultrasound, thyroid nuclear scan and FNAC are available for the clinician for evaluation of thyroid nodule but, Fine needle aspiration cytology (FNAC) has been accepted as the first line investigation, especially for palpable thyroid swellings. It is a screening tool to assess whether a patient needs surgical intervention or can be managed conservatively. [5]

Thyroid cytology can provide a definite diagnosis of malignancy, with tumor type, permitting

appropriate therapeutic surgery in one stage. It can triage the remaining patients into those who potentially require surgical as opposed to medical/endocrinological management.

Over the time, there has been a variety of terminologies suggested for reporting of thyroid FNAC. The National Cancer Institute developed - The BETHESDA SYSTEM for Reporting Thyroid Cytopathology (TBSRTC) [6], which is widely accepted in clinical practice. It provides a uniform, tiered reporting system for thyroid FNA specimens using which the cytopathologist can communicate thyroid FNA interpretations to the referring physicians in terms that are unambiguous and therapeutically relevant.

However, limitations in FNAC due to scanty sample, vascularity of thyroid swelling, variation in sampling technique, inability to distinguish between follicular lesions and skill of the performing expert as well as the experience of pathologist interpreting the aspirate pose a problem in definitive diagnosis. Hence for final diagnosis "Histopathological examination" is necessary. [7,8]

The goal of this study is to analyse the cytomorphology of palpable thyroid lesion and compare it with histopathology and to evaluate the sensitivity and specificity thereby, its usefulness in pre-operative diagnosis of thyroid diseases and planning of the proper management.

Aim: This study mainly aims to correlate the preoperative FNAC results as per The Bethesda system for Reporting Thyroid Cytopathology with subsequent Histopathological findings as the gold standard.

Objectives:

1. To study the cytomorphology of thyroid cases and categorize them as per The Bethesda reporting system.
2. To evaluate the discordant cases and find out causes of discordance.

3. Find out the sensitivity, specificity, positive and negative predictive values of thyroid FNAC.

Materials and Methods

This was a five year observational study (3 years retrospective and 2 years prospective) conducted from august 2019 to august 2024 at Department of Pathology, Jhalawar Medical College, Jhalawar, Rajasthan. All patients who came with palpable thyroid swelling for FNAC and then underwent surgical procedure like lobectomy or partial or total thyroidectomy from ENT and general surgery department were included in this study. All the patients attending ENT or general surgery OPD with palpable thyroid swelling and put on conservative therapy and known cases of malignancy were excluded from the study. Total 146 cases were included in this study for which cytopathological and histopathological diagnosis were made. FNAC procedure was carried out using a 23-24 gauge needle; the aspirate was smeared on clean dried glass slides and immediately fixed with alcohol, few slides were air dried. Staining was performed using Papanicolaou (Pap) stains. Air dried smears were stained using Field Stain. Cytological diagnosis was done based on TBSRTC. For Histopathological study, excision biopsies of thyroid were fixed in 10% formalin and paraffin blocks were prepared after routine histopathology processing techniques. From each block about 3-4 μm sections were cut and stained with Haematoxylin & Eosin (H&E). The slides were examined under microscope and the findings were recorded. Cytological diagnosis was finally correlated with the histopathology findings and the efficacy of FNAC was estimated. All the statistical calculations were done through SPSS for windows (version 29.0.2.0;SPSS Inc., Chicago, IL, USA). P value is calculated using Chi-Square test. P value of less than 0.05 was considered to be significant.

Results: During the period of the study, a total of 146 cases were diagnosed by FNAC and these findings were finally correlated with histopathological diagnosis

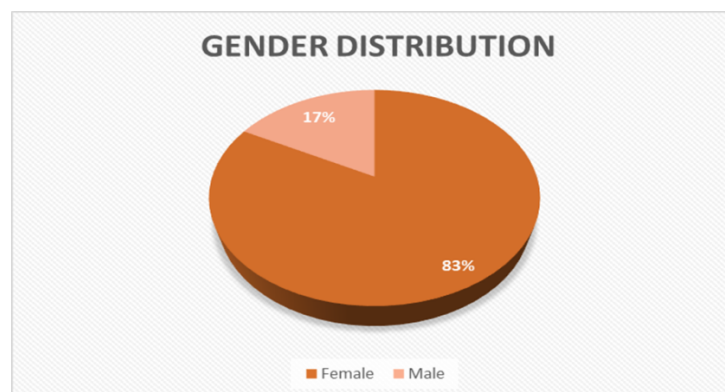


Figure 1: Gender distribution of the study population (n=146)

Our study showed the female preponderance. Females accounted for 121 cases (n=121, 82.9%) and males accounted for 25 cases (n=28, 17.1%) with Male: Female Ratio of 1: 4.84.

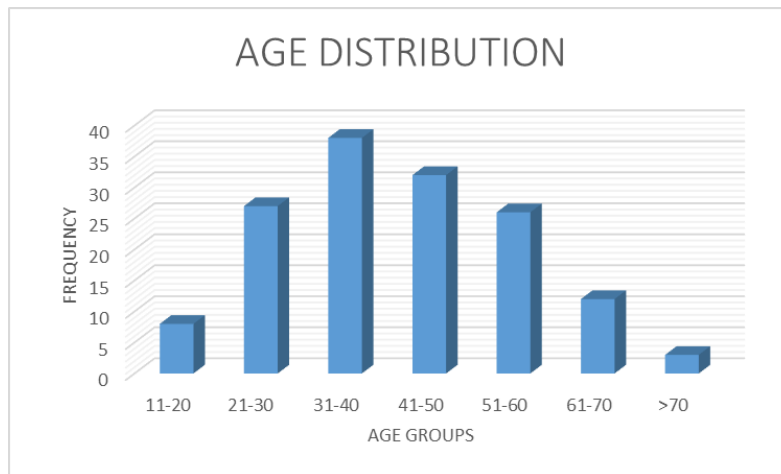


Figure 2: Age distribution of the study population (n=146)

In our study, the age of the patients ranged from 17 years to 75 years with the mean age of 41.68 years with Standard deviation of 13.77 years. Majority of the patients belong to age group of 31-40 years (n=38, 26.00%) followed by 41-50 years (n=32, 21.9%). Only 3 patients were in the age group of >70 years (n=3, 2.1%).

Table 1: Distribution of cases according to the Bethesda Category on FNAC (n=146)

Bethesda Category	Frequency	Percentage
I (ND/UNS)	0	0%
II (Benign)	122	83.56%
III (AUS)	0	0%
IV (FN/SFN)	14	9.59%
V (SFM)	3	2.06%
VI (Malignant)	7	4.79%
Total	146	100.00%

In our study, category II (Benign) was the largest with 122 cases, (83.56%) followed by category IV (FN/SN) and category VI (Malignant), which constituted 14 (9.59%) and 7 (4.79%) cases respectively

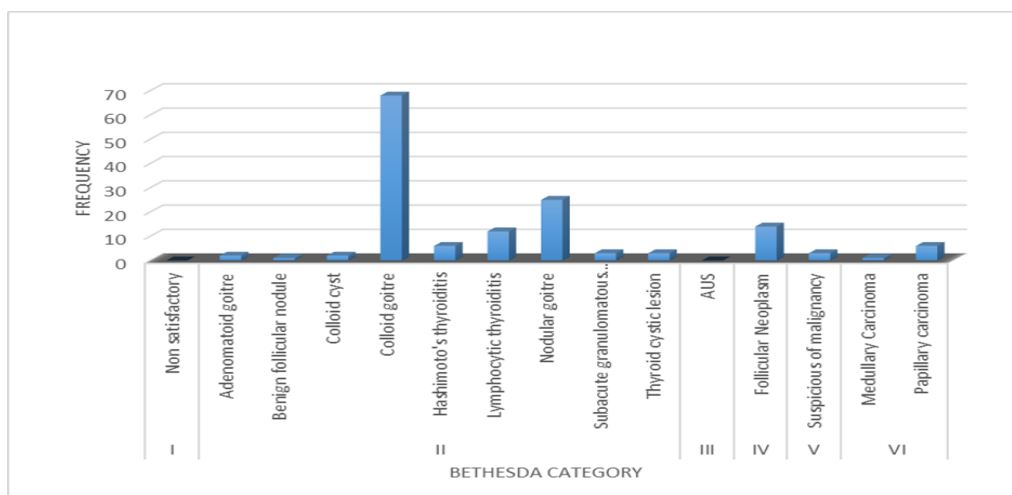


Figure 3: Distribution of individual thyroid lesion according to The Bethesda category on FNAC

In our study of 146 cases, all the cases were satisfactory for evaluation, therefore no case was in the Bethesda category I (Non satisfactory). Category II (Benign) had 122 cases, (83.56%). In this category

colloid goitre was the commonest lesion (n=68, 46.59%) followed by Nodular goitre (n=25, 17.12%). Category III (AUS) were not diagnosed in our study. Category IV (FN/SFN) had 14 cases

(9.58%) in our study and all of them were reported as Follicular Neoplasm. Category V (SFM) had only 3 cases (2.05%). Category VI (Malignant) had

7 cases (4.79%), of which 6 cases were reported as Papillary carcinoma (4.11%) and one case as Medullary thyroid carcinoma (0.68%).

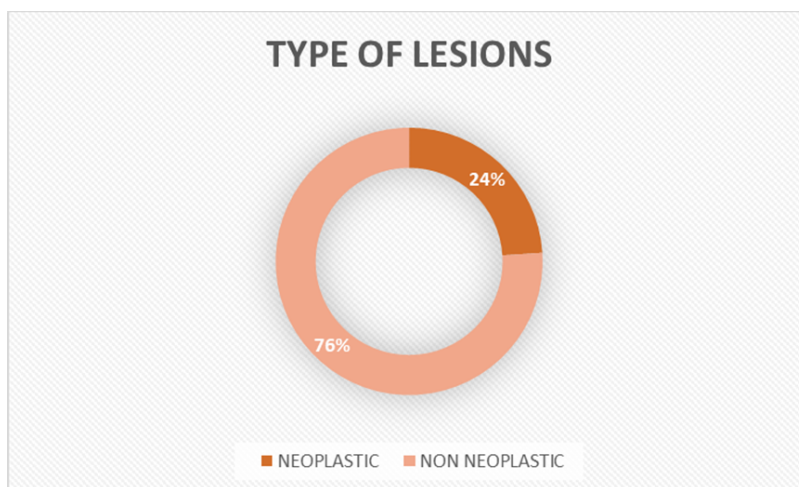


Figure 4: Distribution of Neoplastic and Non Neoplastic thyroid lesion on Histopathology

After histopathological examination of thyroid specimens, Neoplastic lesions accounted for 35 cases (23.97%) and Non neoplastic lesions accounted for 111 cases (76.03%) in our study.

Table 2: Category wise distribution of thyroid lesions and their Cyto-histopathological correlation with concordant and discordant cases

Bethesda category	Histopathological diagnosis	No. of cases	Percentage	Concordant/ Discordant
I	-	-	-	-
II	Colloid goitre	73	50.00%	Concordant
	Diffuse toxic goitre	1	0.68%	Concordant
	Follicular adenoma	9	6.16%	Discordant
	Follicular carcinoma	1	0.68%	Discordant
	Hashimoto's thyroiditis	8	5.48%	Concordant
	lymphocytic thyroiditis	8	5.48%	Concordant
	Multinodular goitre	9	6.16%	Discordant
	NIFTP	1	0.68%	Concordant
	Nodular goitre	10	6.85%	Discordant
	Papillary carcinoma	2	1.37%	Discordant
III	-	-	-	-
IV	Adenomatoid goitre	1	0.68%	Discordant
	Follicular adenoma	9	6.16%	Concordant
	Follicular carcinoma	4	2.74%	Concordant
V	Medullary carcinoma	1	0.68%	Concordant
	MNG with foci of hyperplasia	1	6.16%	Discordant
	Papillary carcinoma	1	2.74%	Concordant
VI	Medullary carcinoma	1	0.68%	Concordant
	Papillary carcinoma	6	4.11%	Concordant
Total		146	100.00%	

Out of 122 cases in category II, 109 cases were concordant and 13 cases were discordant. Out of these 13 cases, 9 were diagnosed as follicular adenoma on histopathology, 2 were diagnosed as pa-

pillary carcinoma, 1 as follicular carcinoma and 1 as NIFTP. Out of 14 cases in category IV, 13 cases were concordant and 1 case was discordant which was diagnosed as adenomatoid goitre on histo-

pathology. Out of 3 cases in category V, 2 cases were concordant and 1 case was discordant which was diagnosed as multinodular goitre with foci of

hyperplasia on histopathology. In category VI, all 7 cases were concordant with histopathology.

Table 3: Statistical Indicators

Statistical Indicators	
Sensitivity	62.9%
Specificity	98.2%
Positive Predictive Value	91.7%
Negative Predictive Value	89.3%
Diagnostic Accuracy	89.72%
P value	<0.001

On applying the relevant formulas, the sensitivity of FNAC was calculated to be 62.9%, specificity to be 98.2%, Positive predictive value was 91.7% and Negative predictive value was 89.3%. The diagnostic accuracy was calculated to be 89.72%. This result was statistically significant (p value<0.001).

Discussion

In the present study, out of 146 cases, females were in majority with 121 cases, while males accounted for only 25 cases and male to female ratio of 1:4.84 which is well comparable with study of Khan et al⁹. Other studies, Garg et al [10] and Kasliwal et al [11] also showed similar results but with higher female predominance.

The present study showed an age range of 17-75 years which is comparable with study done by Mahar AS et al [12] and Afroze N et al [13] studies. The median age was found to be 40.5years. The age range of our study is slightly higher than the study conducted by Gupta M et al [14] study.

The incidence of thyroid lesion in present study on FNAC was comparable with the study conducted by Lohiya et al [15]. Their study showed higher incidence of cases in Category I, while our study showed no cases in category I of Bethesda. In

category II- Our study showed maximum cases of Colloid Goitre (46.59%) followed by Nodular Goitre (17.12%), whereas study of Lohiya et al¹⁵ had majority of cases as Colloid Goitre (35.6%) followed by Thyroid cystic lesion (16.4%). Our study showed higher incidence of thyroid lesion in category IV (9.59%) as compared with the study done by Lohiya et al¹⁵ (1.6%). Our study showed slightly higher incidence of thyroid lesion in category V (2.05%) as compared with the study done by Lohiya et al¹⁵ (0.8%). Our study showed comparable incidence of thyroid lesion in category VI (4.79%) with the study done by Lohiya et al [15] (3.6%).

In our study, non neoplastic lesions accounted for 76.03% and neoplastic lesions accounted for 23.97% which was comparable with the study done by Lohiya et al [15]. Whereas Siddegowda et al [16] reported higher incidence of neoplastic lesions (42.8%) as compared to the present study.

In our study, the concordance rate was 90.41% which was higher than the studies done by Pandey et al [17] and Borgohain et al [18]. In our study, the discordance rate was 9.59% which was lower than the studies done by Pandey et al [17] and Borgohain et al [18].

Table 4: Comparison of statistical indicators.

Statistical indicators	Bouvet et al (1992) ¹⁹	Afroze et al (2002) ¹³	Sheikh et al (2016) ²⁰	Present study
Sensitivity	93.5%	61.9%	83.2%	62.9%
Specificity	75%	99.31%	63.3%	98.2%
Positive Predictive Value	85.3%	92.86%	74.3%	91.7%
Negative Predictive Value	88.2%	94.74%	74.6%	89.3%
Diagnostic Accuracy	79.6%	94.58%	74.4%	89.72%

The sensitivity of the present study was 62.9% which was comparable with the study by Afroze et al [13] (61.9%) but lower than the studies by Bouvet et al [19] (93.5%) and Sheikh et al [20] (83.2%). The specificity of the present study was 98.2% which was comparable with the study by Afroze et al (99.31%) but higher than the studies by Bouvet et al [19] (75%) and Sheikh et al [20]

(63.3%). The PPV of the present study was 91.7% which was comparable with the study by Afroze et al (92.86%) but higher than the studies by Bouvet et al [19] (85.3%) and Sheikh et al [20] (74.3%). The NPV of the present study was 89.3% which was comparable with the study by Bouvet et al (88.2%) but lower than the study by Afroze et al [13] (94.74%) and higher than the study by Sheikh

et al [20] (74.6%). The diagnostic accuracy of present study was 89.72% which was lower than the study by Afroze et al [13] (94.58%) but higher than the study by Bouvet et al [19] (79.6%) and Sheikh et al [20] (74.4%).

Conclusion

FNAC of thyroid lesions has been shown to be simple, reliable, safe, cost effective, minimally invasive and accurate method for the management of palpable thyroid lesions. It helps to categorize Non neoplastic from Neoplastic thyroid lesions.

It permits us to decide for or against radical surgery with higher accuracy than any other method. It bridges the gap between clinical evaluation and final surgical pathological diagnosis in majority of cases. It enables the clinician to obtain a diagnosis in high percentage of cases with minimal expenditure of time and money and often to prevent unnecessary surgery.

As a screening method, it has high sensitivity and specificity, thus helpful in planning the future management of patients.

The Bethesda system for reporting thyroid cytopathology has standardized the diagnostic approach for reporting of thyroid lesions providing a uniform and clinically pertinent nomenclature. In Bethesda system, each category is attributed to a particular risk for malignancy which makes it a valuable aid in choosing the proper treatment option for the patient.

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