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Classification of Thyroid Fine Needle Aspiration Cytology into Bethesda Categories - An Institutional Experience

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Abstract: ***Background*:** In the recent years, FNAC Thyroid has been increasingly utilised for the investigation of thyroid lesions. Preoperative diagnosis of benign thyroid lesions is of paramount importance to avoid unnecessary surgery. Hence FNAC thyroid being simple, safe, cost effective retains the status of first line diagnostic test in preoperative evaluation of thyroid lesions. According to Orell and Sterrett's, FNAC thyroid has a sensitivity of 93.4%, specificity of 74.9% and positive predictive value of malignancy is 98.6%. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) established a standardized, category based reporting system for thyroid fine-needle aspiration (FNA) specimens. The 2017 revision reaffirms that every thyroid FNA report should begin with one of six diagnostic categories, the names of which remain unchanged since they were first introduced: (i) Non-diagnostic or unsatisfactory; (ii) benign; (iii) Atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS); (iv) follicular neoplasm or suspicious for a follicular neoplasm; (v) suspicious for malignancy; and (vi) malignant. Each category has an implied cancer risk that ranges from 0% to 3% for the ''benign'' category to virtually 100% for the ''malignant'' category. As a function of their risk associations, each category is linked to updated, evidence-based clinical management recommendations also. ***Materials and Methods:*** This is a retrospective study, FNAC thyroid 344 cases were collected from January 2022 to October 2023, categorized according to Bethesda categories, assessment of malignancy risk in each category is done and histopathological correlation done in 82 cases. Accuracy, Sensitivity, Specificity and predictive values are calculated and analysed statistically. ***Results:*** A Total of 344 cases of thyroid FNAC, out of which majority 294 cases belongs to category II benign, 2 cases belongs to category I, 1 case belongs to category III, 30 cases belongs to category IV, 3 cases belongs to category V, 14 cases belongs to category VI. Accuracy, Sensitivity and Specificity are 95%, 84.61%, 98.14% respectively. ***Conclusions:*** Since our study results correlate well with other studies, applying TBSRTC to thyroid FNAC reporting allows more standardization, also provides clear guidelines to clinicians regarding treatment protocols.

Keywords: FNAC, The Bethesda system, thyroid.

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INTRODUCTION

FNAC Thyroid has been increasingly utilised for the investigation of thyroid nodules or lesion nowadays. Preoperative diagnosis of benign thyroid lesions is of paramount importance to avoid unnecessary surgery. When thyroid FNAC combined with TFT, USG thyroid it has high degree of accuracy in diagnosing the lesion. Hence FNAC thyroid being simple, safe, cost effective retains the status of first line diagnostic test in preoperative evaluation of thyroid lesions. According to Orell and Sterrett's, FNAC thyroid has a sensitivity of 93.4%, specificity of 74.9% and positive predictive value of malignancy is 98.6%.

The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) established a standardized; category based reporting system for thyroid fine-needle aspiration (FNA) specimens. The 2017 revision reaffirms that every thyroid

FNA report should begin with one of six diagnostic categories, the names of which remain unchanged since they were first introduced: (i) Non-diagnostic or unsatisfactory; (ii) benign; (iii) Atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS); (iv) follicular neoplasm or suspicious for a follicular neoplasm; (v) suspicious for malignancy; and (vi) malignant. Each category has an implied cancer risk that ranges from 0% to 3% for the ‘‘benign’’ category to virtually 100% for the ‘‘malignant’’ category. As a function of their risk associations, each category is linked to updated, evidence-based clinical management recommendations.

AIMS AND OBJECTIVES

1. To stratify the thyroid FNAC reports given into Bethesda categories.
2. Histopathological correlation and to assess malignancy risk.

MATERIAL AND METHODS:

This is a retrospective study done in Department of pathology, Government Erode Medical college and Hospital, Perundurai after getting Ethical committee approval, FNAC thyroid reports of 344 cases were collected from January 2022 to October 2023, categorized according to Bethesda categories, Detailed reviewing of clinical history, hormonal status, available radiological reports, clinical examination details were done. FNAC smears are prepared by conventional methods and are stained with H&E Stain and Leishmann stain. Assessment of malignancy risk in each category is done and histopathological correlation done in 82 cases. Histopathological specimen grossing done and were processed according to standard protocols. Statistical analysis done. Accuracy, Sensitivity, Specificity and predictive values are calculated and analysed statistically.

RESULTS:

Out of 344 cases studied, The Bethesda Categorization were done as follows-2 cases Non Diagnostic (0.5%), 294 cases (85.46%) Benign category, 1 case (0.29%) AUS / FLUS, 30 cases (8.72%) FN / SFN, 3 cases (0.87%) SFM, 14 cases (4.06%) malignant category. Out of 344 cases only 82 cases were histopathologically available for correlation. Hence we compared histopath- diagnosis and cytology diagnosis of these 82 cases and calculated malignancy risk in each category. Among these 82 cases, one were non diagnostic (category - I), fifty five benign (category - II), twelve suspicious of follicular neoplasm (category - IV), two suspicious for malignancy (category V), twelve cases were malignant (category - VI).

Sixty seven cases of Category II and Category VI were assessed statistically. Out of 67 cases,53 were true negatives (both cytologically and histopathologically negative for malignancy / benign), 11 were true positives (both cytologically and histologically malignant), 2 were false negatives and one case was false positive. After statistical analysis Accuracy was 95%, Sensitivity 84.61%, Specificity 98.14%, positive predictive value 91.66%, negative predictive value 96.36%.

Table 1: Distribution of thyroid cytology categorized according to The Bethesda system.

BETHESDA CATEGORIES	NUMBER OF CASES	PERCENTAGE OF CASES (%)
ND/UND	2	0.5 %
BENIGN	294	85.46 %
AUS/FLUS	1	0.29 %
FN/SFN	30	8.72 %
SFM	3	0.87 %
MALIGNANCY	14	4.06 %
TOTAL CASES	344	100 %

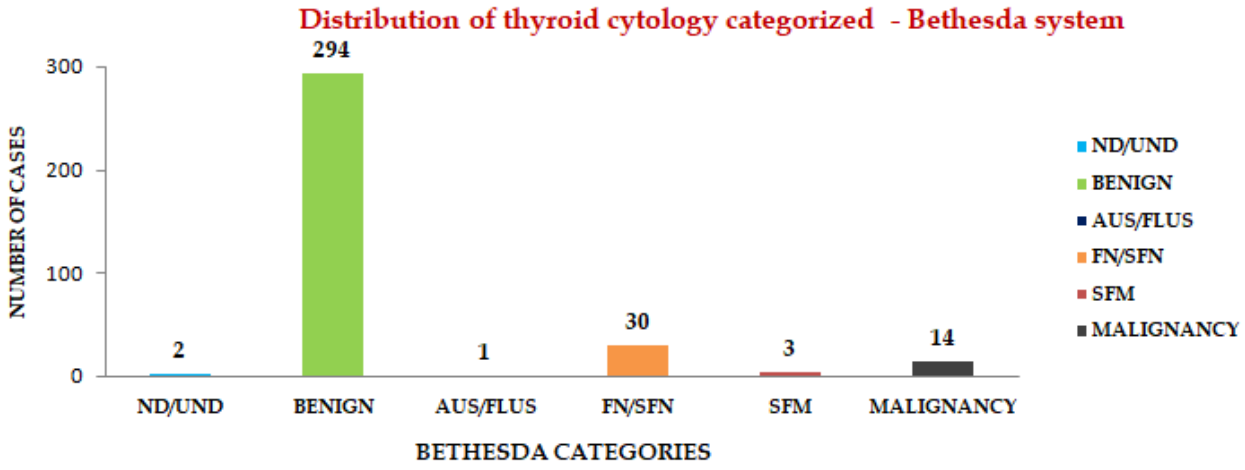

Table 2: Malignancy risk in different categories after histopathology correlation.

FNAC	HISTOPATHOLOGY		TOTAL NUMBER OF CASES	MALIGNANCY RISK (%)
	BENIGN	MALIGNANT		
Non diagnostic	1	0	1	0
Benign	53	2	55	3.63
SFN	12	0	12	0
SFM	1	1	2	50
Malignant	1	11	12	91.66
Total cases	68	14	82	-

Table3: Statistical parameters in our study in detecting malignancy.

STATISTICAL PARAMETERS	PERCENTAGE (%)
SENSITIVITY	84.61 %
SPECIFICITY	98.14 %
POSITIVE PREDICTIVE VALUE	91.66 %
NEGATIVE PREDICTIVE VALUE	96.36 %
ACCURACY	95.52 %

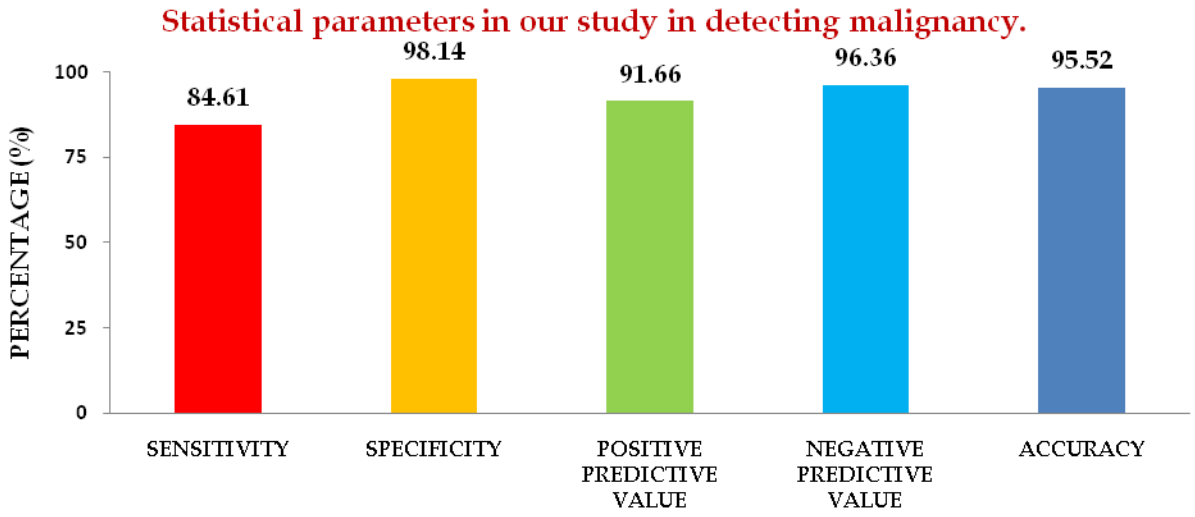

Table 4: Comparison of percentage of distribution of FNAC diagnosis with other studies

Diagnostic Category	Present Study	Shanmuga Priya shankar et al	Yassa et al	Nayar and ivonic et al
ND / UNS	0.5	10.7	7	5
BENIGN	85.46	81.6	66	64
AUS / FLUS	0.29	1.24	4	18
SFN	8.72	1.74	9	6
SFM	0.87	2	9	2
MALIGNANT	4.06	2.7	5	5

Table 5: Comparison of risk of malignancy with other studies

Diagnostic Category	Present Study	Implied risk of TBSRTC	Yassa et al	Shanmuga Priya Shankar et al
ND / UNS	0	1-4	10	0
BENIGN	3.63	0-3	0.3	0
SFN	0	15-30	28	28.6
SFM	50	60-75	60	71.4
MALIGNANT	91.66	97-99	97	80
ND/UNS	0	1-4	10	0

Table 6: Comparison of Statistical analysis of our study with other study

Statistical Analysis	Present Study	Sampa Choudary et al	Naz et al	Sharma C et al	Shanmuga Priya Shankar et al
Sensitivity	84.61%	55.6%	64.3%	89.5%	80%
Specificity	98.14%	100%	85%	98%	98.53%
Positive Predictive Value	91.66%	100%	56.3%	84.6%	80%
Negative Predictive Value	96.36%	93.1%	88.9%	98.6%	98.53%
Accuracy	95.52%	93.7%	80.3%	97%	97.26%

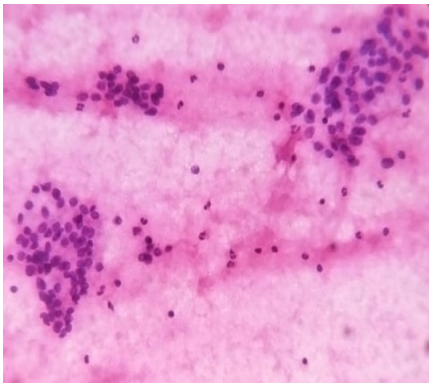

Fig 1:FNAC picture of Follicular neoplasm (H&E 10x)

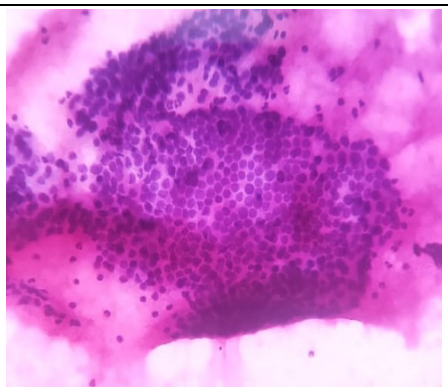

Fig 2: FNAC picture of Suspicious of Follicular neoplasm (H&E 10x)

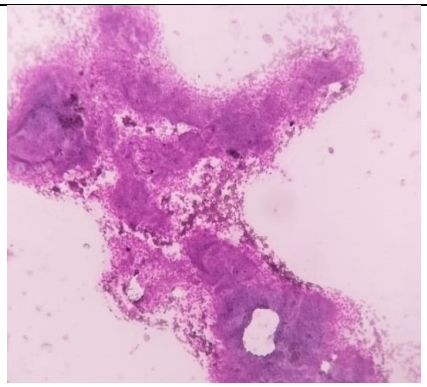

Fig 3:FNAC picture of Papillary carcinoma (H&E 10x)

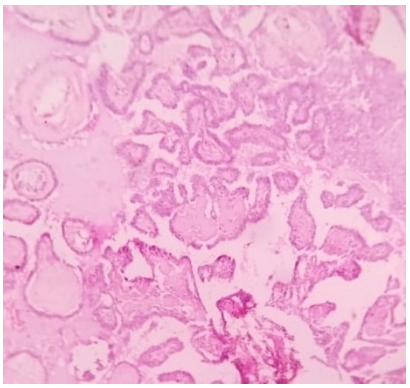

Fig 4: Histopathology picture of Papillary carcinoma (H&E 10 x)

DISCUSSION:

Our study is a retrospective study done in Department of pathology, Government Erode Medical college and Hospital, Perundurai after getting Ethical committee approval, FNAC thyroid reports of 344 cases were collected from January 2022 to October 2023,categorized according to Bethesda categories, histopathological correlation done, malignancy risk were assessed and analysed statistically. The more common age group involved is 31-40 years of age, female gender predominance noted. These findings were similar to study conducted by Renuka IV et al[8], Deshpande et al[7], Sampa

chaudary et al[2].Among Bethesda classification most cases fall into category II (85.46%) followed by 8.72% cases in category IV, 4.06% cases in category VI, These large proportion of benign cases findings in our study correlated with Mondal SK et al[12] and Sampa chaudary et al[2]. Further percentage of Non diagnostic category is 0.5% which is closer to study by Yassa et al[9] and Nayar and Ivonic et al[11]. Implied risk of malignancy in our study correlated with study done by Yassa et al[9].In our study the most common malignancy is Papillary carcinoma of thyroid,irrespective of age,this finding was similar to study by Cibas[4] who told that Papillary thyroid carcinoma represents more than 90% of the differentiated thyroid cancers and 80% of all thyroid malignancies.

On Statistical analysis, our sensitivity and specificity correlates well with study done by Sharma C et al[6]. Sometimes high cellular yield, papillaroid clusters, repetitive micro-follicular pattern, nuclear inclusions may mimic malignancy, thus giving rise to false positive reports in our study. False negative cases in our study might be due to inadequate aspiration, or not aspirated from representative area because all were non guided aspirations done.
Major limitation of our study is lesser number of cases was available for cyto-histo correlation.

CONCLUSION:

FNAC thyroid being simple, safe, cost effective retains the status of first line diagnostic test in preoperative evaluation of thyroid lesions, hence standardisation of thyroid cytology report by applying TBSRTC-6 tier diagnostic categories, provides a valuable tool for surgeons for treatment decisions. In our study sensitivity was 84.61%, specificity was 98.14%, Accuracy 95% validating the Bethesda system of reporting.

CONFLICTS OF INTEREST : Nil
ETHICAL COMMITTEE APPROVAL : Approved
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AUTHORS' CONTRIBUTIONS

Dr. G.Sharmila : Data Collection, Interpretation, Data's Integrity and Discussion
Dr. E.Krithiga : Data Collection, Proof Reading.
Dr. P.Rajeswari : Literature Review.
Dr.S.Karthick : Manuscript draft editing and statistical analysis.
All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript.

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