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Profile of Fine Needle Aspiration Cytology of Thyroid Lesions Based on the 2023 Bethesda System of Reporting: A Retrospective Record Based Study in a Tertiary Care Centre in Mandya

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ABSTRACT
Thyroid lesions are one of the common conditions encountered in clinical practice. Diseases of the thyroid gland include benign and malignant conditions. Clinical features alone cannot distinguish between benign and malignant nodules. Fine-needle aspiration cytology (FNAC) plays a vital role in evaluating patients with thyroid nodules and guides the management of patients by identifying patients who require surgical resection and who require no further interventions. The 2023 Bethesda system for reporting thyroid cytopathology (TBSRTC) recommends that every thyroid FNAC report should be one of the 6 diagnostic categories. The study is aimed to classify the cytomorphology of palpable thyroid lesions by FNAC as per the 2023 Bethesda System for Reporting of Thyroid Cytopathology (TBSRTC). Present study is a Record based Retrospective study in a tertiary care hospital. 448 cases of the thyroid lesion were included in the study from January 2023 to December 2023. FNAC slides, clinical and demographic data of all thyroid cases are reviewed and was classified according to the 2023 Bethesda System for Reporting of Thyroid Cytopathology (TBSRTC). Out of total 448 cases studied, 406(90.6%) were benign, 12(2.7%) were neoplastic, 7(1.6%) were suspicious for malignancy, 6(1.3%) were suspicious for a follicular neoplasm, 8(1.8%) were Atypia of undetermined significance and 9(2.0%) were inadequate. FNAC is the first line screening test which gives direction to the clinician for further management of the patients as it is a safe, simple, rapid, economical, highly accurate and universally accepted modality for evaluation of thyroid lesions. Hence the Bethesda system is a useful standardised system for reporting thyroid lesions which serves as an effective guide for clinical management of thyroid lesions.

INTRODUCTION

Thyroid lesions are one of the common conditions encountered in clinical practice[1]. Fine-needle aspiration cytology (FNAC) plays a vital role in evaluating patients with thyroid nodules[2]. Diseases of the thyroid gland include benign and malignant conditions. Benign conditions include goitre, thyroiditis and follicular adenoma. Malignant conditions include follicular, papillary, medullary and anaplastic carcinoma[3]. Clinical features alone cannot distinguish between benign and malignant nodules[2]. Thyroid lesions exhibit a distinct characteristic both non-neoplastic and neoplastic conditions can cause diffuse or nodular enlargement, affecting the gland's morphology[4]. 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[5]. Due to its simplicity, low cost and absence of major complications, this procedure is being performed on an increasing number of patients, which has led to the detection of thyroid cancers at earlier stages, resulting in better outcome of patient[6]. To achieve standardization of diagnostic terminology, morphologic criteria and risk of malignancy for reporting of thyroid FNA, in 2007, the National Cancer Institute (NCI) organized the NCI Thyroid Fine Needle Aspiration State of the Science Conference which proposed a 6-tier system and named it The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)[7]. Using the terminology of TBSRTC, cytopathologists can effectively communicate thyroid FNA interpretations to the referring physician in succinct, unambiguous and clinically useful terms[8]. TBSRTC 2023 recommends the following as the 6 reporting category names: (i) nondiagnostic., (ii) benign., (iii) atypia of undetermined significance (AUS)., (iv) follicular neoplasm., (v) suspicious for malignancy (SFM) and (vi) malignant[8]. TBSRTC 2023 continues to recommend that the names of the categories (and not just their numerical designations) should be used for reporting results and publishing scientific investigations to avoid confusion with the Thyroid Imaging and Reporting System (TIRADS) and other reporting systems that are primarily numeral-based[8]. TBSRTC 2023 has discontinued the option of using the term unsatisfactory for the first category., henceforth, the sole term nondiagnostic is recommended[8]. The study is aimed to evaluate the diagnostic utility and classify the thyroid lesions based on the Bethesda System for Reporting thyroid Cytopathology. The findings of this study will help the patients in rapid diagnosis by categorizing the lesions into 6 categories there by help in choosing the best possible appropriate management and providing the required treatment.

Objectives:

- To classify the cytomorphology of palpable thyroid lesions by FNAC as per the 2023 Bethesda System for Reporting of Thyroid Cytopathology (TBSRTC).

MATERIALS AND METHODS

This was a Record based Retrospective study was conducted at the Department of Pathology, Mandya Institute of Medical Sciences, Mandya, after ethical clearance was obtained with Institutional Ethics Committee (IEC) number-MIMS/ IEC/2024/921. In the last one-year out of 2956 FNACs performed, 448 FNACs on patients of thyroid swellings are sampled from the records after applying inclusion and exclusion criteria. Records from January 2023 to December 2023 were reviewed during the period of February 2024 to March 2024.

Inclusion Criteria:

- All the thyroid FNAC cases done in our hospital.
- Both solid and cystic lesions of thyroid.
- All ages and both genders.
- All cases of USG guided thyroid FNAC entered in the USG guided FNAC record book in the study period.

Exclusion Criteria:

- Cases with inadequate data.
- Other neck swelling FNACs.

As per the proforma, clinical and demographic data of all the thyroid FNAC cases entered in the FNAC register in the department of Pathology was collected. FNAC smears of the same data was reviewed and cytological interpretation was done based on the 2023 Bethesda system for reporting Thyroid Cytopathology for a study period of 2 months after the ethical committee approval.

Statistical Analysis: The collected data was entered in Microsoft excel sheet and analysed using Statistical Package for the Social Sciences trail version 20 statistical software. The descriptive statistics like mean, percentage etc., are used for inferential statistics.

RESULTS AND DISCUSSIONS

The present study included a total of 448 cases of thyroid lesions. Data were analyzed with their history and FNAC smears. The age ranged from 6 years to 90 years with a mean age of 41.71 years. Female population was predominant 396 and males were 52(Table 1).

Table 1: Sex Distribution and Mean Age of Thyroid Lesions

Sex	Number	Mean Age
Males	52	44.54
Females	396	41.37
Total	448	41.71

The highest number of cases were 210(46.9%) seen in the age group of 21-40 years. There was a female predominance with female to male ratio of 7.6:1(F:M) in the study.

Table 2: Age and Sex Distribution of Thyroid Lesions

Age	Males (%)	Females (%)	Total (%)
1-20	2(0.4%)	24(5.4%)	26(5.8%)
21-40	20(4.5%)	190(42.4%)	210(46.9%)
41-60	23(5.1%)	143(31.9%)	166(37.0%)
61-80	6(1.3%)	35(7.8%)	41(9.1%)
>81	1(0.2%)	4(0.9%)	5(1.1%)
Total	52(11.6%)	396(88.4%)	448

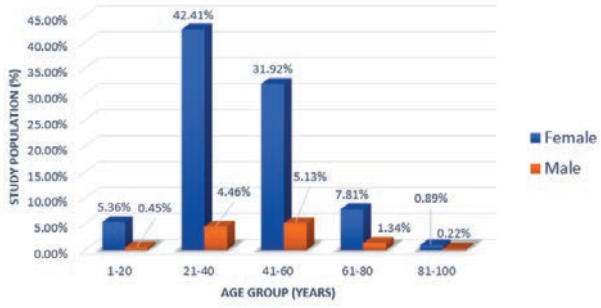

Fig 1: Age and Sex Distribution of Thyroid Lesions

The results were categorized as per the recent 2023 Bethesda system for reporting thyroid cytopathology into: I-Non-diagnostic., II-Benign., III-Atypia of undetermined significance (AUS)., IV-Follicular neoplasm., V-Suspicious for malignancy and V-Malignant.

According to TBSRTC, in this study, 9(2%) lesions fall in category I, 406(90.6%) in category II, 8(1.8%) in category III, 6(1.3%) in category IV, 7(1.6%) in category V and 12(2.7%) in category VI (Table 3).

Table 3: Showing Age and Sex Distribution of Cases in Different Categories of the 2023 Bethesda Classification

Age Groups (yrs)	Cytological Diagnostic Category												
	I		II		III		IV		V		VI		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
1-20	-	-	2	24	-	-	-	-	-	-	-	-	26
21-40	1	4	17	174	1	4	-	1	1	2	-	5	210
41-60	-	3	20	132	-	2	-	2	2	2	1	2	166
61-80	-	1	5	30	-	-	-	2	-	-	1	2	41
>80	-	-	1	1	-	1	-	1	-	-	-	1	5
Total	1	8	45	361	1	7	-	6	3	4	2	10	448
	9 (2.0%)		406 (90.6%)		8 (1.8%)		6 (1.3%)		7(1.6%)		12(2.7%)		

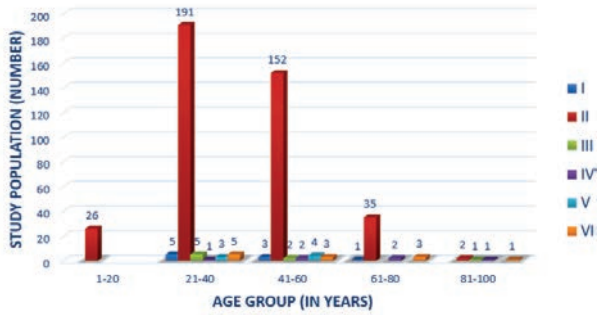

Fig. 3: Cytological Diagnostic Category Based on the 2023 Bethesda System

Cytological diagnosis of Benign and malignant lesions accounts for 412(91.9%) and 12(2.7%) respectively (Table 5). Benign lesions included Thyroglossal Cyst, Colloid Nodule, Colloid cyst, Adenomatous goiter, Hashimoto's Thyroiditis, Lymphocytic thyroiditis, Granulomatous Thyroiditis and Multinodular goiter, whereas malignant lesions included papillary thyroid carcinoma and anaplastic carcinoma. Out of a total 90.6% benign cases, colloid goiter was the most common lesion. Out of a total of 2.7% malignant cases, Papillary carcinoma of thyroid was the most common followed by anaplastic carcinoma of thyroid.

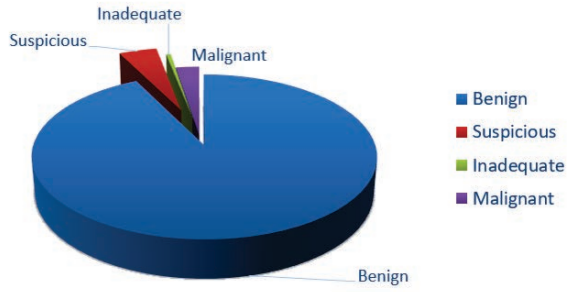

Fig. 4: Distribution of Benign and Malignant Thyroid Lesions

Table 4: Percentage Distribution of Spectrum Lesions on Cytopathology

Cytological Diagnosis	Males	Females	Total
Non-Diagnostic	1	8	9
Thyroglossal Cyst	4	5	9
Colloid Goiter (Colloid nodule)	22	137	159
Colloid cyst	6	43	49
Adenomatous Goiter	-	11	11
Multinodular Goiter	-	6	6
Hashimoto's Thyroiditis	10	138	148
Lymphocytic thyroiditis	3	18	21
Granulomatous Thyroiditis	-	1	1
Atypia of undetermined significance	1	9	10
Suspicious of Malignancy	3	4	7
Follicular Neoplasm	-	5	5
Hurthle Cell Neoplasm	-	1	1
Papillary Thyroid Carcinoma	2	9	11
Anaplastic Thyroid Carcinoma	-	1	1
Total	52	396	448

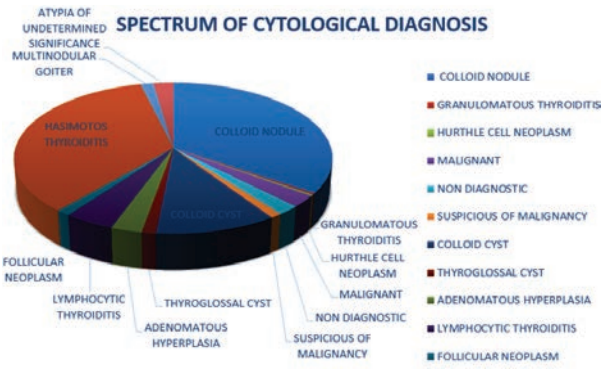

Fig 5: Percentage Distribution of Spectrum Lesions on Cytopathology

Ranjan *et al.* study showed out of total 281 cases studied, 247(87.90%) were benign, 4(1.42%) were

neoplastic, 5(1.78%) were suspicious for malignancy, 7(2.49%) were suspicious for a follicular neoplasm, 11(3.91%) were Atypia of undetermined significance and 7(2.49%) were inadequate[2]. The study undertaken by Gupta *et al.* on 60 patients with clinically palpable thyroid lesions showed most thyroid lesions as benign (62%)[3]. Akshatha *et al.* showed that out of 101 cases studied, 47 (46.5%) were Benign, 33 (32.6%) were Inflammatory, 09 (8.9%) cases were Follicular Neoplasm and 04 (3.9%) cases were Malignant while 09 (8.9%) cases were inadequate[4]. Muppidi *et al.* showed that on FNAC 33 (70.2%) cases were diagnosed as colloid nodular goitre, 04 (8.5%) as autoimmune thyroiditis, 08 (17.0%) as follicular neoplasm, 01 (2.1%) as suspicious of malignancy, 01 (2.1%) as papillary carcinoma[9].

Table 5: Distribution of Benign and Malignant Thyroid Lesions

Studies	Benign	Malignant	Total
Present study	412	12	448
Afroze *et al.*	115	13	170
Gupta *et al.*	63	12	75
Bhojani *et al.*	94	6	100

Anand *et al.* distributed the cases in various TBSRTC categories as follows: I-nondiagnostic 13.8%, II-benign 75.9%, III-atypia of undetermined significance (AUS)/follicular lesion of undetermined significance (FLUS) 1.2%, IV-follicular neoplasm (FN)/suspicious for follicular neoplasm (SFN) 3.7%, V-suspicious for malignancy (SM) 2.6% and VI-malignant 2.8%[7]. Purushotham *et al.* study shows out of 484 cases, 432 (89.2%) were benign lesions, 20 (4.1%) were malignant, 18 (3.7%) was Unsatisfactory/Nondiagnostic, 10 (2%) were Follicular neoplasm/Suspicious for neoplasm, 3 (0.6%) were suspicious for malignancy and 01 (0.002%) case was reported as Atypia of undetermined significance[5].

Table 6: Showing Age and Sex Distribution of Cases in Different Categories of the 2023 Bethesda Classification

Category	Ranjan *et al.*	Purushotham *et al.*	Akshatha *et al.*	Anand *et al.*	Our study
I	7 (2.49%)	18 (3.7%)	09 (8.9%)	13.8%	9 (2.0%)
II	247(87.90%)	432 (89.2%)	70 (79.1%)	75.9%	406 (90.6%)
III	11 (3.91%)	01 (0.002%)	-	1.2%	8 (1.8%)
IV	7 (2.49%)	10 (2%)	09 (8.9%)	3.7%	6 (1.3%)
V	5 (1.78%)	3 (0.6%)	09 (8.9%)	2.6%	7(1.6%)
VI	4 (1.42%)	20 (4.1%)	04 (3.9%)	2.6%	12(2.7%)
Total	281	484	101		448

Padmavathi *et al.* study showed of 179 cases maximum number of patients were noticed between 21-40 years of age (96 cases). Majority of the patients referred for FNAC thyroid were females accounted for 161 (90%) with male to female ratio of 1:9(6). Obaid *et al.* showed out of 111 patients studied 1 sample was inadequate. Among remaining 110 cases 99 were benign thyroid lesions, 6 were malignant and 5 were highly suspicious of malignancy[10].

CONCLUSION

Fine-Needle Aspiration Cytology (FNAC) is the primary screening test for thyroid lesions, providing clinicians with crucial guidance for patient management. FNAC's safety, simplicity, rapidity, affordability and high accuracy make it a universally accepted diagnostic modality. The Bethesda System, a standardized reporting framework, complements FNAC by categorizing thyroid lesions into six distinct categories. This classification enables effective clinical management, facilitating informed treatment decisions. Thus this study's findings will aid in categorizing thyroid lesions, ensuring patients receive tailored management and optimal treatment without any delay.

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