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Original Research Article

The Bethesda System of Reporting Thyroid Cytopathology: A Hospital Based Study of Eastern UP

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Abstract

Background: Fine needle aspiration cytology is a well-established first line diagnostic tool for the evaluation of palpable thyroid swellings. It is one of the diagnostic investigations for the Evaluation of solitary thyroid nodule (distinguish neoplastic from non -neoplastic), Evaluation of diffuse thyroid lesions (distinguish inflammatory/ autoimmune from nodular goiter), Confirmation and categorisation of clinically obvious thyroid malignancy. Thyroid FNAC is the most accurate and cost-effective tool for guiding the clinical management of patients with thyroid nodules. The role of cytology in thyroid swellings is important for the pre-operative diagnosis of benign or malignant lesions.

Aims: To assess the thyroid swelling by fine needle aspiration cytology and classify the FNAC findings according to the Bethesda system of reporting thyroid cytopathology 2017 at a tertiary care hospital.

Materials & Methods: It is an observational study done from January 2019 to November 2022. FNAC was performed in 92 cases. Smears stained with Giemsa, Haematoxylin and Eosin and Papanicolaou stain.

Result: In present study commonest indication of FNAC was swelling in neck. Among 92 cases, non-neoplastic category II lesions were the major proportion constituting 78.26%%, category I unsatisfactory smears were 4.34%%, category III 3.26%%, next highest percentage of cases were in category IV with 8.69%, category V 4.34% and category VI had 1.08% of cases. Majority of the patients (78.26%) presented with Category II lesions. Among the benign lesion goiter was the most common lesion (64.12%). Nodular goiter formed maximum cases (57.60%) rest were of (6.52%). Next common lesions was thyroiditis in which lymphocytic thyroiditis was common (8.69%) followed by Hashimoto thyroiditis (3.26%) and Dequervain's thyroiditis (2.17%).

Conclusion: In conclusion the present study shows that TBSRTC helps standardize cytology reports thereby improving the quality of reporting, reducing the diagnostic in accuracies and bringing about an interlaboratory agreement on an objective basis. Furthermore it improves the communication between cytopathologists and clinicians, helping them to triage the patient for the appropriate line of management.

Keywords: FNAC, TBSRTC, Thyroid, Bethesda.

Introduction

Thyroid cytology and its interpretation is not always straight forward but is crucial to the proper management of thyroid lesions. Fine needle aspiration cytology is a well-established first line diagnostic tool for the evaluation of palpable thyroid swellings. It is considered the initial diagnostic test in the evaluation of a thyroid nodule, and other tests like ultrasound should be used in conjunction with FNAC.[1] It reduces the rate of unnecessary thyroid surgery for patients with benign nodules and appropriately triages patients with thyroid cancer to appropriate surgery.[2] Excising all the thyroid lesions is impracticable and associated with risk. As FNAC distinguishes between non neoplastic and neoplastic lesions quite effectively, it is the pre-operative screening method of choice worldwide. Simplicity, diagnostic accuracy and most of all cost effectiveness has given FNAC the status of first line diagnostic test in pre-operative evaluation of thyroid lesions.[3] The main purpose of thyroid FNAC is to identify nodules that require surgery and those with benign nodules that can be followed up clinically and decrease overall the number of thyroidectomies for patients with benign diseases.[4] It is critical that cytopathologists communicate thyroid FNAC interpretations to referring physicians in terms that are succinct, universally accepted diagnostic terminology.

To address terminology and other issues related to thyroid FNAC, the National Cancer Institute (NCI) hosted the "NCI Thyroid Fine Needle Aspiration State of the Science Conference." in the year 2007.[2] A monograph "The Bethesda System for Reporting Thyroid Cytopathology" (TBSRTC) was then formulated which included definitions, diagnostic/ morphologic criteria, explanatory notes, and a brief management plan for each diagnostic category.[5] The present study was undertaken to interpret the spectrum of thyroid lesions undergoing FNAC as per the Bethesda System with cyto - histological correlation wherever possible and the clinicopathological profile was examined.

Aim

Study & classify various FNAC lesions of thyroid according to Bethesda system of reporting thyroid cytopathology 2017.

Material and Methods

The present study was carried out at Heritage Institute of Medical Sciences, Varanasi following due approval from Institute Scientific Research and Ethical Committee. It was an observational study. All patients referred for FNAC in Department of Pathology during the study period from January 2019 - November 2022 were included in this study. Total 92 cases were included in present study, convenient sampling method was done.

Inclusion-criteria:

1. All patients presenting with thyroid nodule or swelling who are referred for thyroid FNAC.
2. Patients of all age group and both sexes will be included.

Exclusion-criteria:

1. Patient having known bleeding disorders.
2. Patient having clinically diagnosed hyperthyroidism.

Statistical Method

The collected data were organized, tabulated. Statistical method Tables, Bar diagrams, Pie diagrams and Percentage used for descriptive purpose.

Methodology

FNAC was done by pathologist, the procedure was explained to patient, and aspiration was done in supine or sitting position with extended neck so make the thyroid swelling more prominent. Material was aspirated by 23-25 gauge needle attached to 5-10 ml disposable syringe. At the time of FNAC, USG finding were recorded. Cytology material was collected and 5 to 6 smears were made. One air dried smear was stained with Giemsa stained & other slides were fixed in 95% ethyl alcohol. After that 1 slide was stained with Haematoxylin and Eosin stain and other slide with a Papanicolaou stain. Slide was interpreted in the light microscope and will be classified according to Bethesda system 2017.

Results

Total FNACs received during study period in Department of Pathology from were 92. Aspirates were satisfactory for evaluation in 88 cases (95.65%), while in four case (4.34%) it was unsatisfactory. In the present study 88.04% were females and 11.96 % were males.

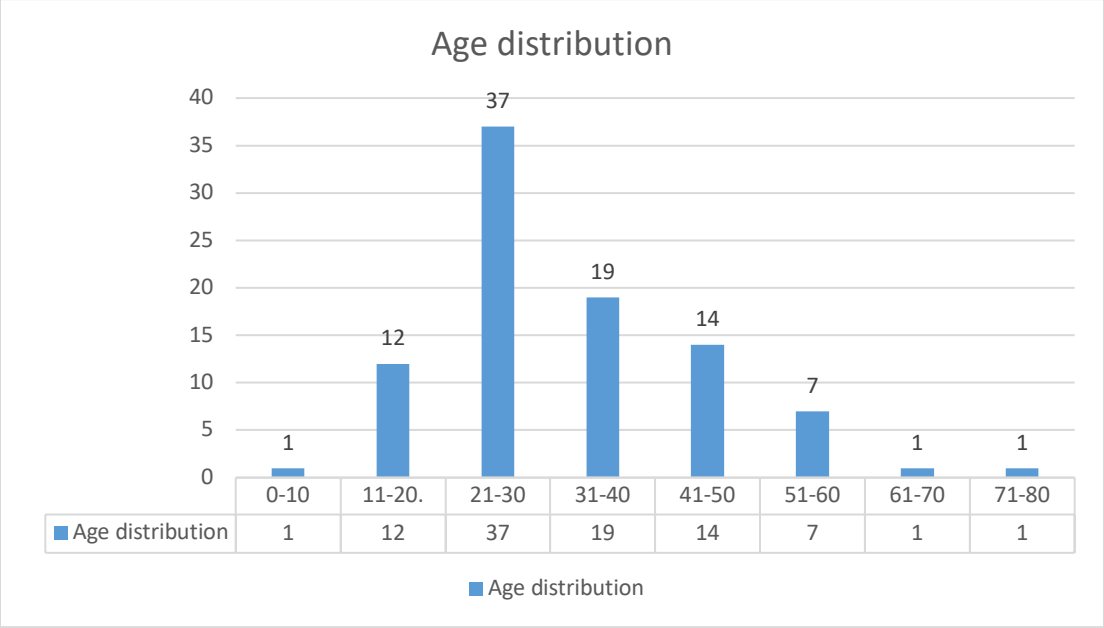

Figure 1: Age wise distribution of thyroid FNAC

Patients with thyroid lesions subjected for FNAC in this study ranged from 10 years to 80 years. Most common age group affected was 21-30 years accounting for 40.21 % (37 cases) followed by 31-40 years 21.73% (20 cases). Thyroid disease were uncommon in first decades and after 61 years of age. Mean age of thyroid cases was 32.87± 1.382 years.

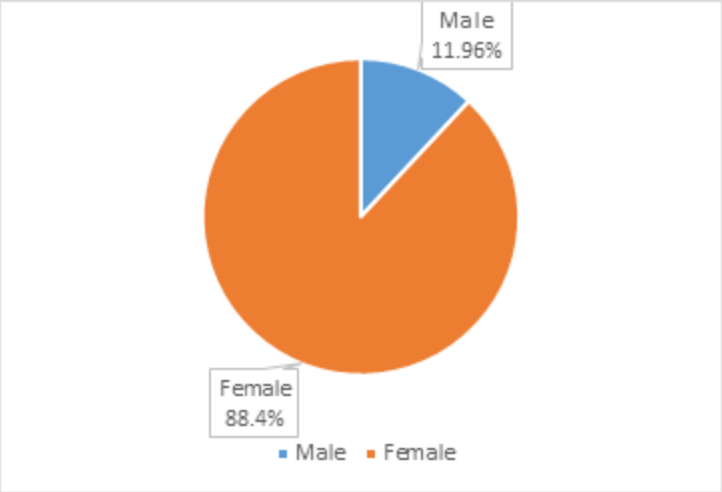

Figure 2: Gender wise distribution of patient

Out of the 92 patients with thyroid lesions, Female preponderance was seen accounting in 88.04% (81 cases) and remaining were males 11.96% (11 cases). Thus male to female ratio was 1:7.3.

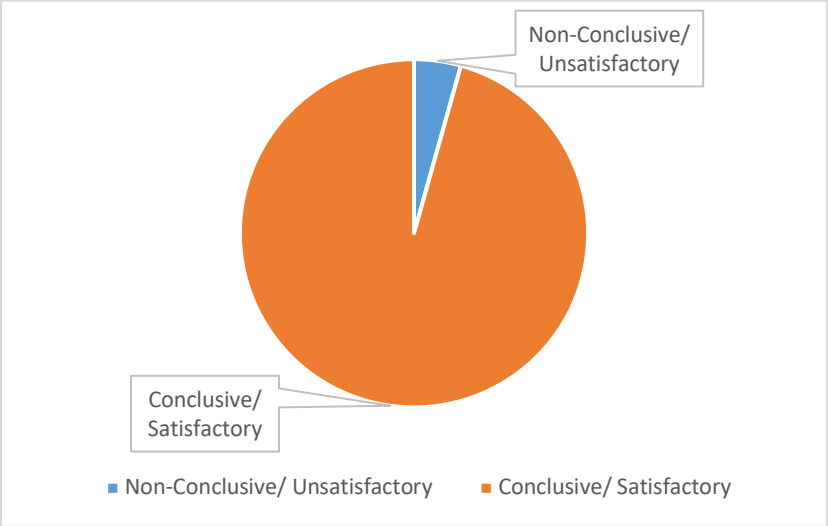

Figure 3: Distribution of patients according to adequacy rates in cytology (N=92)

Out of 92 FNACs, Four aspirates (4.34%) were inadequate for cytological evaluation, hence they were labeled as unsatisfactory smears. They were categorized into category I of The Bethesda system.

The unsatisfactory smears had less than six clusters of follicular cells containing less than ten cells per cluster in a single smear.

The adequacy rate in our institution was (95.65%) (88 cases), the reason behind this high adequacy rate is we repeat FNAs in inadequate aspirates and if necessary FNAC are performed with ultrasound guidance.

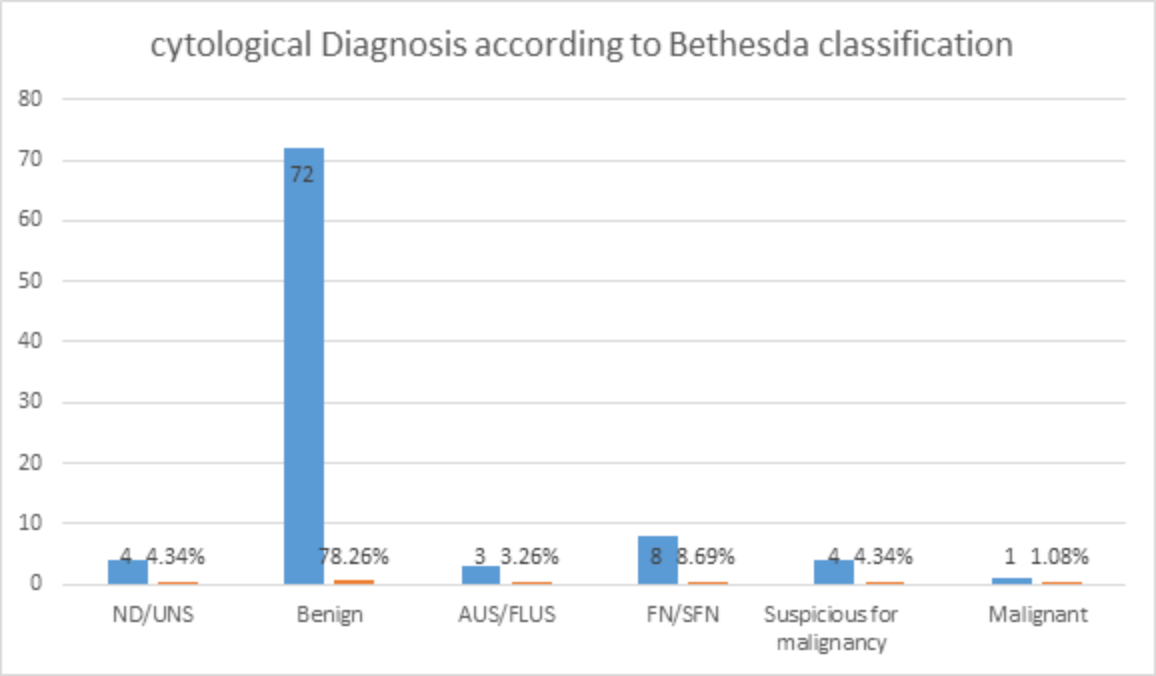

Figure 4: Cytological Diagnosis According to TBSRTC: (N=92)

Among 92 cases, non-neoplastic category II lesions were the major proportion constituting 78.26%%, category I unsatisfactory smears were 4.34%%, category III 3.26%%, next highest percentage of cases were in category IV with 8.69%, category V 4.34% and category VI had 1.08% of cases. Majority of the patients (78.26%) presented with Category II lesions.

Table 1: Distribution of thyroid lesion in cytology

Bethesda category	Diagnosis	No of cases	Percentage
I	Non diagnostic/unsatisfactory	2	2.17%
	Cyst fluid only	2	2.17%
II	Nodular colloid goiter	46	50%
	Diffuse colloid goiter	6	6.52%
	Colloid nodule	6	6.52%
	Multinodular goiter	1	1.08%
	Dequervain's thyroiditis	2	2.17%
	Hashimoto thyroiditis	3	3.26%
	Lymphocytic thyroiditis	8	8.69%
III	Atypia/Follicular lesion of undetermined significance	3	3.26%
IV	Suspicious of follicular neoplasm	7	7.60%
	Hurthle cell neoplasm	1	1.08
V	Suspicious of PTC	3	3.26%
	Suspicious of MTC	1	1.08%
VI	PTC	1	1.08%
	Total	92	100

Table no.1 shows that 4.34% were non-diagnostic/unsatisfactory or had cyst fluid only.

Among the benign lesion goiter was the most common lesion (64.12%). Nodular goiter formed maximum cases (57.60%) rest were of (6.52%).Next common lesions was thyroiditis in which lymphocytic thyroiditis was common (8.69%) followed by Hashimoto thyroiditis (3.26%) and Dequervain's thyroiditis (2.17%). Atypia/Follicular lesion of undetermined significance were seen in 3.26% cases. About 7.60% cases were diagnosed as suspicious for follicular neoplasm.

Hurthle cell neoplasm was diagnosed in one case. Suspicious for papillary carcinoma thyroid was diagnosed in 3 cases.

Discussion

FNAC has an extremely important role in the evaluation of thyroid swellings. The present study was undertaken to categorize Thyroid FNAC case according to the Bethesda system of reporting and Thyroid cytology improves communication between the pathologist and surgeon in deciding the treatment modality for the patients and avoid unnecessary surgeries.

Thyroid aspiration was done in 92 cases who presented with thyroid swelling. In the present study 88.04% were females and 11.96 % were males. Male to female ratio was 1:7.3.Patients with thyroid lesions subjected for FNAC in this study ranged from 10 years to 80 years. Most common age group affected was 21-30 years accounting for 40.21 % (37 cases) followed by 31-40 years 21.73% (20 cases). Thyroid disease were uncommon in first decades and after 61 years of age. Aspirates were satisfactory for evaluation in 88 cases (95.65%), while in four case (4.34%) it was unsatisfactory.

Table 2: Age wise distribution of thyroid lesions in other studies in Comparison to the present study.

S. No	Study	Year of publication	Mean age (Years)
1.	**Tagore *et al* [6]**	2016	33.5 years
2.	**Kartha *et al* [7]**	2017	42.25 years
3.	**Gopal *et al* [8]**	2018	35 years
4.	**Athavale *et al* [9]**	2019	39.48 years
5.	**Anand *et al* [10]**	2020	41.78 years
6.	**Amita and Vandana [11]**	2021	33.2 years
7.	**Present study**	2022	32.87 years

Age wise distribution in present study showed mean age to be 32.87 years. More or less similar to our study Tagore *et al* 2016 from Karnataka, Amita and Vandana 2021 from Gujarat and Gopal *et al* 2018 from Andhra Pradesh reported mean age of thyroid patient from 33.2 to 35 years. Contrary to us Athavale *et al* 2019 from Maharashtra, Anand et al. 2020 from Pondicherry and Kartha & Sadasivan 2017 from Kerala reported it in higher age group between 39.48 to 42.25 years.

Table 3: Gender-wise distribution of thyroid lesions in other studies in Comparison to the present study.

S. No	Study	Year of publication	Male : Female
1.	**Tagore *et al* [6]**	2016	1:10
2.	**Dharrao and Mahajan[12]**	2017	1:9
3.	**Jeelani *et al*[13]**	2018	1:4.4
4.	**Athavale *et al*[9]**	2019	1:7.3
5.	**Anand *et al*[10]**	2020	1:6.3
6.	**Amita and Vandana[11]**	2021	1:3.76
7.	**Present study**	2022	1:7.3

Thyroid lesions were seen mostly in female in our study, male to female ratio was 1:7.3 more. Similar to our study Athavale et al 2019 from Maharashtra, Dharrao &Mahajan reported the same prevalence, Contrary to our study Tagore *et al* 2016 from Karnataka reported higher prevalence in females with male to female ratio of 1:10 whereas Amita and Vandana 2021 from Gujarat and Jeelani *et al* 2018 from Kashmir reported more involvement of females but male to female ratio from 1:3.76 to 1:4.4 only.

Table 4: Comparison of satisfactory to unsatisfactory smears with others study

S. No	STUDY	Years of publication	Total cases	Satisfactory smears	Unsatisfactory smears
1	**Sekhar *et al* [14]**	2015	150	146 (97.33%)	4 (2.67%)
2	**Tagore *et al* [6]**	2016	100	97 (97%)	3 (3%)
3	**Goel and surve [15]**	2018	124	116 (93.54%)	8 (6.45%)
4	**Munavarah *et al* [16]**	2019	54	51 (94.44%)	3 (5.55%)
5	**Anand *et al* [10]**	2020	646	557 (86.22%)	89(13.8%)
6s	**Present study**	2022	92	88 (95.65)	4 (4.34%)

Most of the study found satisfactory smear in FNAC of thyroid varying from 93.54% to 97% which is more or less similar to present study (95.6%).Only one study of Anand *et al* 2020 found unsatisfactory smear in 13.8% & Satisfactory smear only in 86.22% cases.

Table 5: Comparison of the cases and percentage of distribution of fine needle aspiration diagnosis in TBSRTC.

S. No.	Study	Years of Publication	Category						Total no of cases
			I	II	III	IV	V	VI	
1	**Renuka *et al* [17]**	2011	96 (17%)	398 (70.56%)	11 (1.95%)	24 (4.2%)	15 (2.6%)	20 (3.5%)	564
2	**Sekhar *et al* [14]**	2015	4 (2.67%)	115 (76.67%)	1 (0.67%)	19 (12.67%)	4 (2.67%)	7 (4.67%)	150
3	**Tagore *et al*[6]**	2016	3 (3%)	81 (81%)	0 (0%)	9 (9%)	3 (3%)	4 (4%)	100
4	**Laishram *et al*[18]**	2017	30 (5.21%)	518 (89.93%)	0 (0%)	13 (2.26%)	2 (0.35%)	13 (2.26%)	576
5	**Alshaikh *et al*[19]**	2018	69 (10.1%)	469 (68.8%)	85 (12.4%)	20 (2.9%)	18 (2.6%)	28 (4.1%)	681
6	**Goel and surve[15]**	2018	8 (6.45%)	95 (76.61%)	3 (2.41%)	8 (6.45%)	4 (3.22%)	6 (4.83%)	124
7	**Munavarah *et al*[16]**	2019	3 (5.5%)	42 (77.7%)	2 3.70%)	4 (7.40%)	2 (3.70%)	1 (1.85%)	54
8	**Anand *et al*[10]**	2020	89 (13.8%)	490 (75.9%)	8 (1.2%)	24 (3.7%)	17 (2.6%)	18 (2.8%)	646
9.	**Chaitanya and Kurakula[20]**	2021	3 (4%)	65 (83%)	2 (3%)	2 (3%)	2 (3%)	4 (5%)	78
10.	**Present study**	2022	4 (4.34%)	72 (78.26%)	3 (3.26)	8 (8.69%)	4 (4.34%)	1 (1.08%)	92

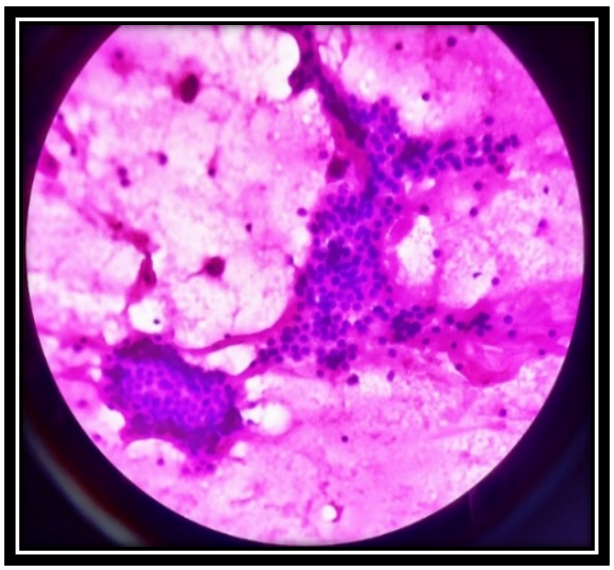

Figure 5: Nodular colloid goiter- Thyroid follicles in a colloid background (H&E x400

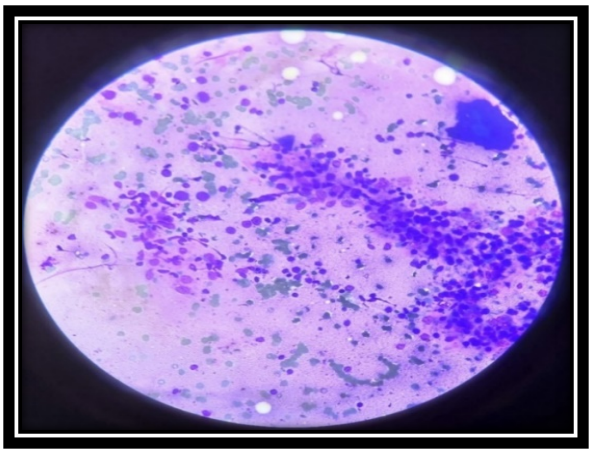

Figure 6: Dequervain's thyroiditis- Clusters of thyroid follicle with epithelioid cells in a hemorrhagic and lymphocytic background. (MGG x400).

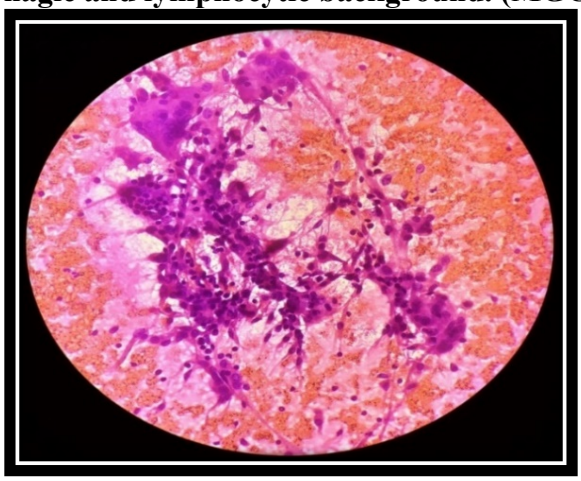

Figure 7: Lymphocytic thyroiditis-Hyperplastic follicular cells with lymphocytic background (H&E x400).

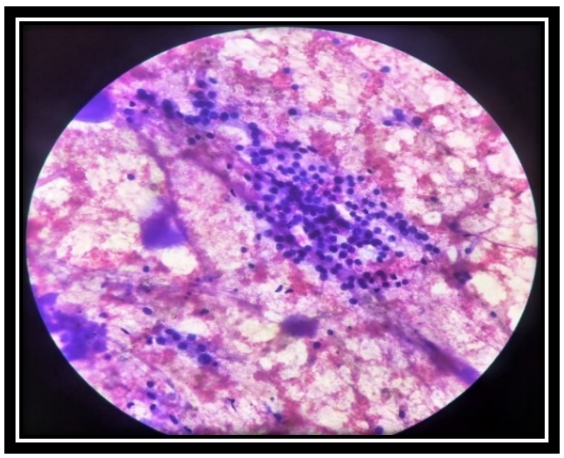

Figure 8: Atypia of undetermined significance- Few scattered atypical cells in a colloid background (H&E x400).

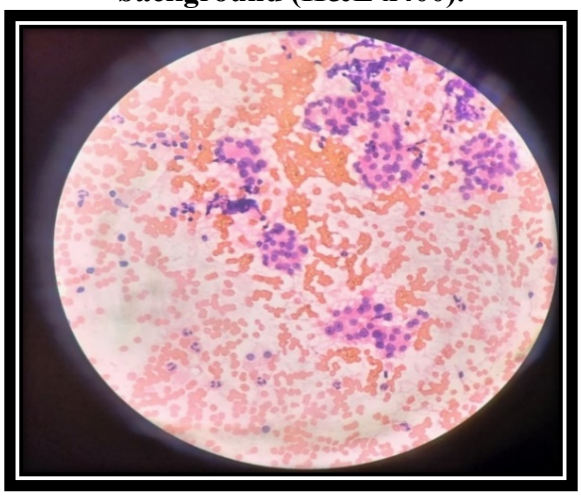

Figure 9: Suspicious for follicular neoplasm-Micro follicles with few atypical cells in a hemorrhagic background (H&E x400).

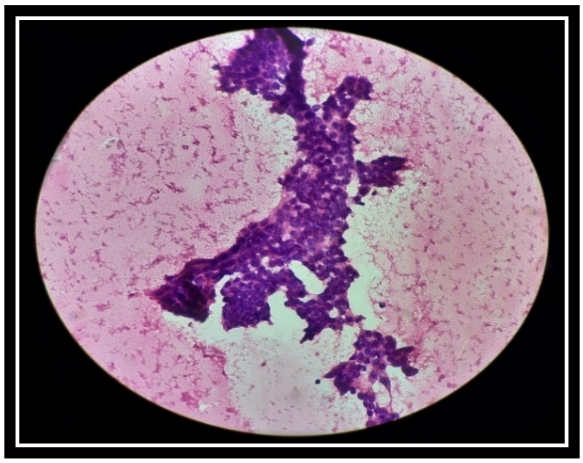

Figure 10: Papillary carcinoma of thyroid-Pleomorphic tumor cells forming papillae in a hemorrhagic background (H&E x400).

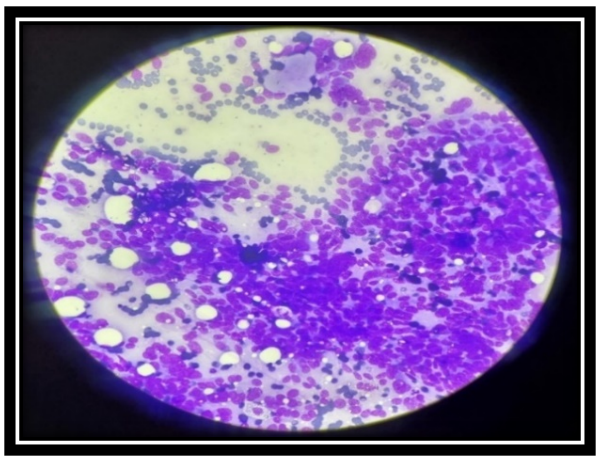

Figure 11: Medullary carcinoma of thyroid-Clusters and sheets of tumor cells in a amyloid mixed colloid free background (MGG x400).

Most of our cases in FNAC when classified according to Bethesda system fall into category of type II. In present study 78.26% cases fall into type II category which was more or less similar to study of sekhar etal 2015, Goel and surve 2018, Munavarah *et al* 2019, Anand *et al* 2020 who also reported highest number of cases between 75 to 77% in category II.

Conclusion

In conclusion the present study shows that TBSRTC helps standardize cytology reports thereby improving the quality of reporting, reducing the diagnostic in accuracies and bringing about an inter laboratory agreement on an objective basis. Furthermore it improves the communication between cytopathologists and clinicians, helping them to triage the patient for the appropriate line of management. Furthermore, the management of such lesions was complicated in the past by the lack of a universal terminology. To cater to these needs, The Bethesda system of reporting thyroid cytology was introduced. This study was undertaken to classify the thyroid lesions based on The Bethesda system of reporting Thyroid Cytology Thereby providing data that would help in planning prognostic and therapeutic approach in patients with thyroid swellings.

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