IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 10 Ver. 6 (October. 2018), PP 01-14
www.iosrjournals.org

Cytological Evaluation of Thyroid Lesions and its Correlation with Histopathology: A Study in a Rural Tertiary Care Hospital, Konkan belt of Maharashtra, India.

Dr. Neha Mukesh Goel[1], Miss. Madhura Nitin Surve [2]
[1] *(Assistant Professor, Department of Pathology, B.K.L. Walawalkar Rural Medical College and Hospital, Sawarde, District-Ratnagiri, Maharashtra, India)*
[2]*(Technician, Department of Pathology, B.K.L. Walawalkar Rural Medical College and Hospital, Sawarde, District-Ratnagiri, Maharashtra, India.)*
Corresponding Author: Dr. Neha Mukesh Goel

Abstract:
Background*: Thyroid diseases are common problem of enormous magnitude now a day all over the world. And it is necessary in the clinical practice is to distinguish reliably the few malignant thyroid tumors from the harmless thyroid lesions, so that a definitive preoperative tissue diagnosis of the malignancy allows planning of appropriate surgery and relevant patient counseling. Fine needle aspiration cytology (FNAC) is simple, readily available, reliable, time saving, and minimally invasive procedure.*
Aims & objectives:*The objective of the study was to understand the usefulness of FNAC as a diagnostic tool in the evaluation of various thyroid lesions, classify the thyroid fine needle aspirations based on the Bethesda system and compare the result of FNAC with histopathological examination, wherever available.*
Material & methods: *A study was carried out from 1st January 2015 to 15th August 2018 in 124 patients. Data collected were detailed clinical history, general physical examination, and local examination. Specimens were obtained for cytological study by fine needle aspiration & non-aspiration technique. Staining of these smears was done with different stains like H&E, PAP and MGG routinely as per the standard staining procedures. Special stains like Ziehl-Neelsen(ZN) stain were also done wherever required. All these smears were screened and reported by routine reporting method as well as by Bethesda system. 65 cases underwent surgery and histopathologic correlation.*
Results: *Out of total 124 patients, 110 were female. Common age group of presentation was 41–50 years of age. Adequacy rate was 93.54%. Non-neoplastic non-inflammatory lesions were common (76.67%) with commonest lesion being nodular colloid goitre (47.58% cases) on routine reporting. Based on Bethesda system, 6.45% were Category I (nondiagnostic), 76.61% Category II (benign), 2.41% were Category III (atypia of undetermined significance), 6.45% were Category IV (suspicious for follicular neoplasm), 3.22% were Category V (suspicious for malignancy), and 4.83% were Category VI (malignant) In 65 cases, which underwent surgery, FNAC reports were compared with histopathologic results and statistical indices were calculated. Overall malignancy rate was 18.46%. There was a single false negative case. Diagnostic accuracy rate was 97.95% with a sensitivity of 75%, and specificity of 100%. While positive predictive value (PPV) was 100% and negative predictive value was 97.82%.* ***Conclusion:*** *The results of our study are comparable with the current published data and demonstrate that FNA cytology is safe, simple, economical and cost effective procedure. It gives a reliable pre-operative cytological diagnosis based on which surgical procedures can be confidently executed. The clinicians should be encouraged to embrace this procedure in the initial management of such patients.*

Keywords*: Fine needle aspiration cytology, histopathology, thyroid swelling, Bethesda*

Date of Submission: 01-10-2018 Date of acceptance: 15-10-2018

I. Introduction

Thyroid nodule is a common clinical problem and comprise a spectrum of entities causing systemic disease (Grave's disease) or a localised abnormality in the thyroid gland such as nodular enlargement (goitre) or a tumour mass. So it is necessary in the clinical practice is to distinguish reliably the few malignant thyroid tumors from the harmless thyroid lesions, so that a definitive preoperative tissue diagnosis of the malignancy allows planning of appropriate surgery and relevant patient counseling.

Thyroid Fine Needle Aspiration Cytology (FNAC) has proven to be a first line tool to evaluate the thyroid lesions because of its cost effectiveness and high patient acceptance. FNAC particularly, guided is

highly successful in triaging patients with thyroid nodules into operative and non-operative groups. This enables surgeons to take an early decision regarding mode of treatment to be applied. However, cytopathological reporting of thyroid FNAC has been a source of considerable confusion. A recent survey on the perception of diagnostic terminology and cytopathology reporting categories for thyroid FNAC demonstrated discordance between clinicians and pathologists. Historically, terminology for thyroid FNAC has varied significantly from one laboratory to another, creating confusion in some cases. To address terminology and other issues related to thyroid FNAC, THE NATIONAL CANCER INSTITUTE (NCI) proposed the six tiered "The Bethesda System for Reporting Thyroid Cytopathology" (TBSRTC). It helps to communicate thyroid fine needle aspiration interpretations to referring physicians in terms that are succinct, unambiguous and clinically helpful and it will be source of information for pathologists as well[1].

The present study has been taken up to study the FNAC of various thyroid lesions and to study the different cytomorphological patterns based on the Bethesda system. The diagnoses were compared with available histopathology, thus verifying the accuracy of FNAC in detecting thyroid lesions.

II. Material And Methods

This study was carried out on patients of Department of Pathology at B.K.L. Walawalkar Rural Medical College and Hosptal, Maharashtra 1st January 2015 to 15th August 2018 in 124 patients.

Inclusion criteria:

All those patients having thyroid lesions, irrespective of their age and sex, referred for cytological study from ENT and Surgery OPD and admitted to ward were selected. In each patient detailed clinical history was obtained and through clinical examination was done prior to procuring sample for cytological study using following proforma.

Exclusion criteria:

Patients not willing for USG-guided / unguided fine needle aspiration cytology of their thyroid lesions even after explaining the purpose, utility and consequence of the procedure were excluded from the study.

Procedure methodology

Specimens were obtained for cytological study by one of the following techniques- Orell SR and Vielh P (2012)[2]; Sanchez MA and Stahl RE (2006)[3].

A. Fine Needle Aspiration Technique (FNAC)

B. Non-aspiration technique (FNC/FNCB)

C. Cyst fluid.

The sample contained in the needle is expelled on to a clean and dry microscopy slide using air in a syringe and also avoid splashing. A 'dry' aspirate is best smeared with the flat of a standard glass slide or with a 0.4 mm coverslip, moving the slide steadily and evenly over the specimen slide while exerting a light pressure to achieve a thin, even spread. A 'wet' aspirate should be treated differently in order to concentrate the cells and separate them from the fluid. In two-step technique the smearing slide is held against the specimen slide at a blunt angle near one end of the slide, allowing the specimen to accumulate in the angle. The smearing slide is then rapidly moved to the middle or the opposite end of the specimen slide, depending on the volume of the specimen. This operation leaves most of the fluid behind while the cells follow the smearing slide like a '(buffy)' coat. The concentrated cells can then be smeared with the flat of the slide as for a dry aspirate, on the same slide (middle), or moved to another slide (bottom). For each case H&E, PAP and MGG staining of smeared slides done[4].

For routine cytological reporting, diagnostic criteria by Jayaram G and Orell SR (2012)[5] were followed. Diagnostic terminology and morphologic criteria for cytologic diagnosis of Thyroid lesions put forth by **Cibas ES et al (2009 & 2017)** [1, 6] were also used.

III. Result

As per the proforma mentioned in Materials and Methods, detail clinical history was procured before obtaining a sample for cytological study. Based on clinical histories, the following observations were made:

Age

Table no 1: Distribution of patients according to age (N=124).

Age	Number	Percent (%)
1-10	0	0
11-20	1	0.80
21-30	10	8.06
31-40	27	21.77
41-50	42	33.87
51-60	23	18.54

61-70	14	11.29
71-80	6	4.83
81-90	1	0.80
Total	124	100

Chart no 1: Bar diagram showing age-wise distribution of the 124 thyroid.

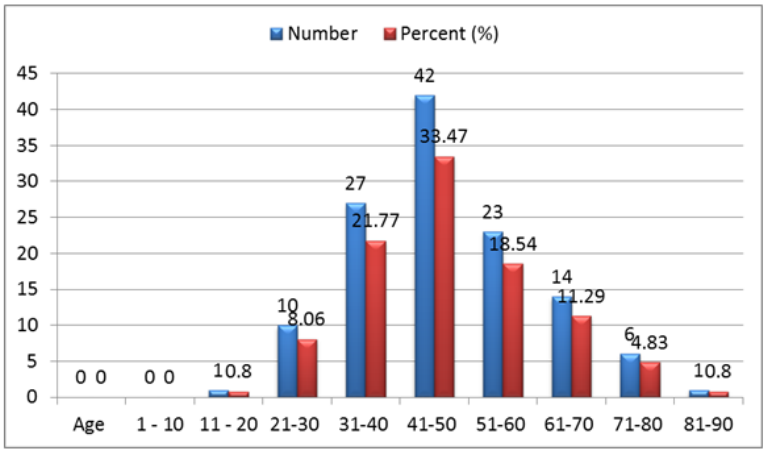
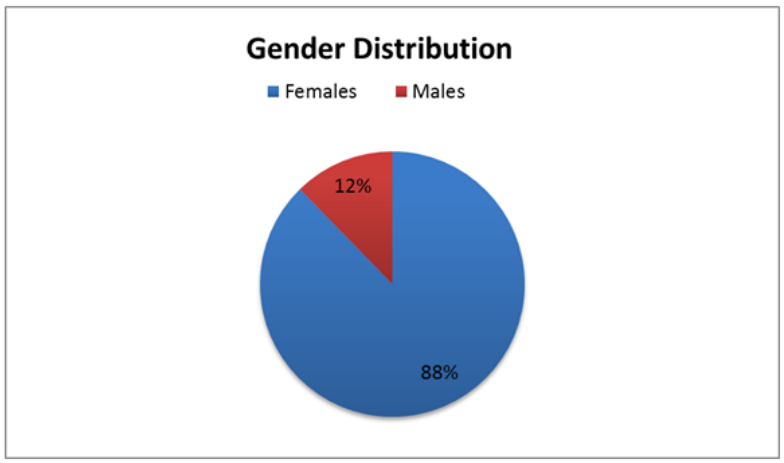


Table No.1 and Chart 1 indicates the overall age of incidence of thyroid lesions in 124 cases. Maximum thyroid lesions were noted in age group of 41 to 50 yrs. (33.87%), followed by 31 to 40 yrs. (21.77%). The youngest patient was 18 years old and the eldest was 85 year old. Mean age was 51.5.

Sex

Chart no 2: Percentage distribution of the sample according to gender.



Out of the 124 patients with thyroid lesions, 110 were females and 14 were males. Female to male ratio is 7:1 (Chart 2).

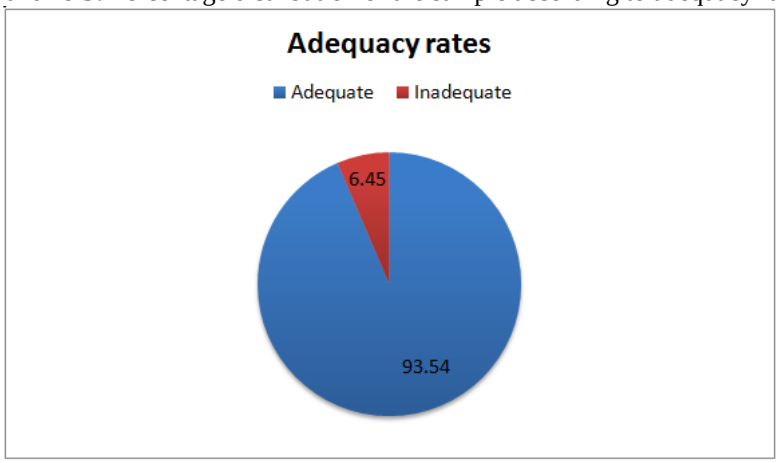
Adequacy rate

Out of 124 FNACs, eight aspirates were inadequate for cytological evaluation; hence they were labeled as unsatisfactory smears (Chart 3). 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 93.54%; the reason behind this high adequacy rate is we repeat FNAs in inadequate aspirates and if necessary FNAs are performed with ultrasound guidance.

Chart no 3: Percentage distribution of the sample according to adequacy rate.



Clinical symptoms

Table no 2: Clinical symptoms in patients with thyroid lesions.

S. No.	Presenting Complaints	No. of Patients
1.	Swelling in front of lower neck	122
2.	Difficulty in breathing	2
3.	History of change in voice	3
4.	Headache	1
5.	Fever and cough	1
6.	Weight gain	1
7.	Loss of weight / Hyperthyroidism	2
8.	Intolerance to cold / Hypothyroidism	2

Table No.2 shows that in the present study, the most common clinical symptom in patients with thyroid lesions was swelling in the neck which was present in total 122 cases i.e., 98.38%.

Duration of complaints

Table no 3: Duration of symptoms.

Duration of Symptoms	No. of cases	Percentage
≤ 1 month	6	4.83
1 to 6 months	86	69.35
6 to 12 months	7	5.64
>1 year	25	20.16
Total	124	100

Table No.3 shows that out of 124 cases, the maximum number of patients (69.35%) presented with duration of symptoms between 1 to 6 months. Minimum number of cases (4.83%) had the duration of symptoms being less than 1 month.

Size of thyroid swelling

Table no 4: Size of thyroid swelling in 124 cases on palpation

Size of thyroid swelling- largest diameter in cms	No. of cases	Percentage (%)
≤ 1cms	7	5.64
≤ 2cms	33	26.61
≤ 3 cms	37	29.83
≤ 4 cms	10	8.06
≤ 5 cms	12	9.67
≤ 6 cms	7	5.64
≤ 7 cms	8	6.45
≤ 8 cms	10	8.06
Total	124	100

Chart no 4 : Bar diagram showing size of thyroid swelling in 124 cases**.**

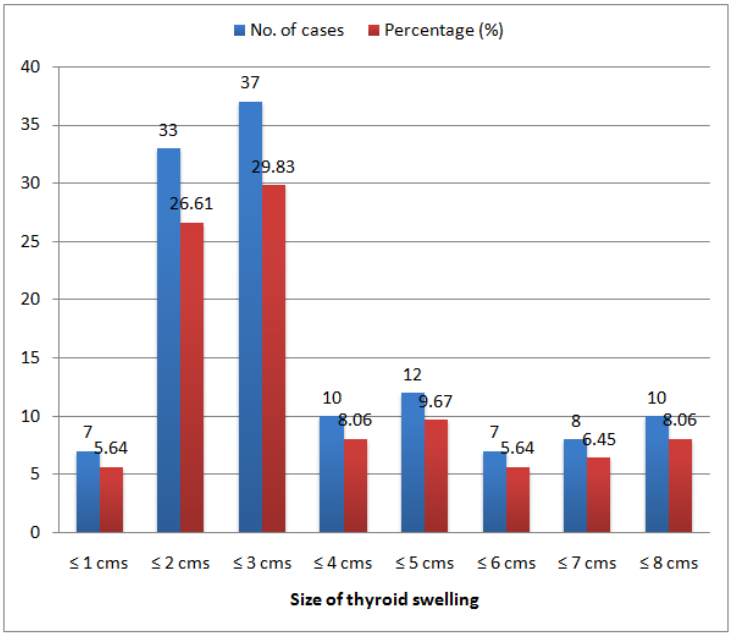


Table No.4 and chart 4 shows that in maximum cases (29.83%), size of swelling was less than or equal to 3 cms. The size of smallest thyroid swelling was 1.1x1cms and the size of the largest swelling was 8x6.5cms.

Tenderness

Table no 5: Tenderness of thyroid swelling in 124 cases.

Additional features	No. of cases	Percentage
Tender	29	23.38
Non-tender	95	76.61
Total	124	100

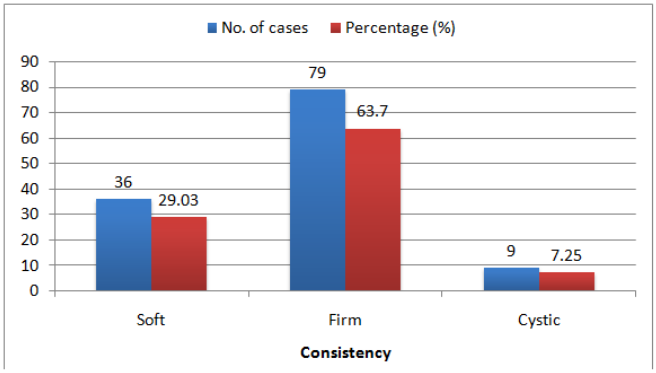
Table No.5 shows that out of total 124 palpable thyroid swellings, majority of the thyroid cases-76.61% were not associated with tenderness on clinical palpation of the thyroid swelling.

Consistency

Table 6: Consistency of thyroid swelling in 124 patients.

Sr. No	Consistency	No. of cases	Percentage
1.	Soft	36	29.03
2.	Firm	79	63.70
3.	Cystic	9	7.25

Chart no 5: Bar diagram showing consistency of thyroid swelling.



From Table No.6 and chart 5, it is observed that the maximum number of thyroid lesions were firm in consistency (63.70%), followed by thyroid lesions of soft and cystic consistency.

Clinical diagnosis

Table no 7: Distribution of cases on clinical diagnosis.

Cases	On Clinical Examination	
	No. of Cases	%
Solitary	61	49.19
Multinodular	63	50.80
Total	124	100

Table No.7 shows that out of 124 palpable thyroid swellings the most common type of clinical presentation was multinodular goitre- 50.80% patients while 49.19% patients had solitary thyroid nodule.

USG diagnosis

Table no 8: USG diagnosis of 124 cases.

USG Diagnosis	No. of cases	Percentage (%)
Adenoma	1	0.80
Colloid goitre/ MNG	68	54.83
Cystic thyroid nodule Colloid cyst/ simple cyst	7	5.64
Neoplasm	5	4.03
Solitary thyroid nodule	37	29.83
Thyroiditis	6	4.83
Total	124	100

USG thyroid was done in all 124 cases. Table No.8 shows that out of 124 cases, the maximum number of thyroid cases that were investigated on USG was diagnosed as Colloid goitre/MNG accounting for 54.83% of cases.

Comparison of nodularity on clinical with USG examination

Table no 9: Comparison of nodularity on clinical examination with USG thyroid Examination.

Cases	On Clinical Examination		On USG neck examination	
	No. of cases	%	No. of cases	%
Single swelling	61	49.19	56	45.16
Multiple swellings	63	50.80	68	54.83
Total	124	100	124	100

In our study in all 124 thyroid cases the swellings were palpable. 49.19% of thyroid cases were solitary on palpation but only 45.16% proved to be solitary on USG examination. On comparison of nodularity on clinical examination with USG thyroid examination, we noted that USG thyroid was better in diagnosing STN cases than clinical examination.

Routine Cytological diagnosis

Table no 10: Routine cytological diagnosis of 124 cases.

Routine cytological Reporting	No. of Cases	Percentage (%)
Colloid cyst/ cystic colloid nodule	9	7.25
Hyperplastic nodule / Adenomatoid goiter	6	4.83
Benign follicular nodule	15	12.09
Nodular colloid goiter	59	47.58
Granulomatous thyroiditis	1	0.80
Hashimoto's thyroiditis	4	3.22
Lymphocytic thyroiditis	1	0.80
Atypia of Undetermined Significance	3	2.41
Follicular neoplasm / Hurthle cell neoplasm	8	6.45
Papillary carcinoma	6	4.83
Medullary carcinoma	4	3.22
Inadequate for opinion	8	6.45

Table No.10 shows that maximum of thyroid FNACs in our study were diagnosed as nodular colloid goitre (47.58% cases)

Categorization based on Bethesda classification

Table no 11: Diagnostic categorization of 124 thyroid FNACs based on Bethesda classification**.**

Categories	Total no. of cases	%
Group 1 : Nondiagnostic or Unsatisfactory	8	6.45
Group 2 : Benign	95	76.61
Group 3 : Atypia with undetermined significance	3	2.41
Group 4: Suspicious for follicular neoplasm/follicular neoplasm	8	6.45
Group 5 : Suspicious for malignancy	4	3.22
Group 6 : Malignant	6	4.83
Total	124	100

Chart no 6: Bar diagram showing diagnostic categorization of 124 thyroid FNACs based on Bethesda classification.

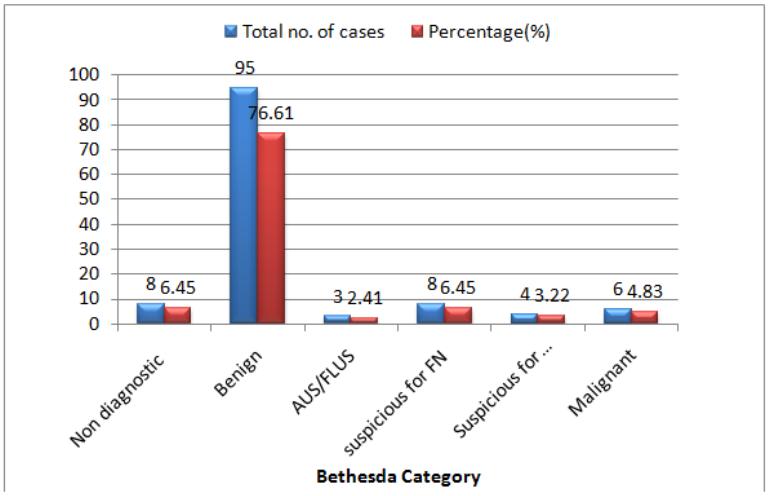


Table no 12: FNAC Report

Category	Classification	FNAC lesion	N = 124
Thy 1	Nondiagnostic or Unsatisfactory (8)	Inadequate for opinion	8
Thy 2	Benign (95)	Colloid goitre / Cystic thyroid nodule/Nodular goitre	65
		Adenomatous goiter	3
		Follicular nodule	14
		Benign cystic lesion	3
		lymphocytic thyroiditis	1
		Hashimoto's thyroiditis	5
		Granulomatous thyroiditis	1
		Hyperplastic thyroid nodule	3
Thy 3	AUS/FLUS (3)	Adenomatous goiter	2
		Follicular carcinoma	1
Thy 4	Suspicious for FN/ FN (8)	Suspicious for follicular neoplasm/ Follicular neoplasm	7
		Hurthle cell neoplasm	1
Thy 5	Suspicious for malignancy (4)	Suspicious of medullary thyroid carcinoma	2
		Suspicious of papillary carcinoma	2
Thy 6	Malignant (6)	Papillary Carcinoma	4
		Medullary Carcinoma	2

Table No.11, 12 and Chart 6 shows that on FNAC 76.61 % of nodules were benign. 65 out of 95 benign lesions (68.42%) were colloid or nodular goiter. There were three cases under the Atypia of undetermined significance (AUS) category- one was diagnosed as Follicular carcinoma and two as Adenomatous goitre. There were eight cases under the suspicious of follicular neoplasm category- Seven cases cytologically diagnosed as Suspicious for follicular neoplasm/Follicular neoplasm and only one case was diagnosed as Hurthle cell neoplasm. Suspicious for malignancy category included four cases- out of this; two cases were diagnosed as Suspicious of medullary thyroid carcinoma and two as Suspicious of papillary carcinoma. Under the malignant category, there were six cytologically diagnosed cases-four cases were

diagnosed as papillary carcinoma, and two as medullary carcinoma. Also, in the Non-diagnostic or unsatisfactory category there were 8 cases comprising 6.45% of cases.

Correlation of FNAC lesion with histopathology along with malignancy rate

Table no 13: Comparison of routine cytological diagnosis, with histopathologic correlation

Category	FNAC lesions	Histopathological diagnosis	N = 65
Thy 1 Non-diagnostic or unsatisfactory (3)	Inadequate for opinion	Benign Follicular Adenoma	1
		Adenomatous goiter	1
		Nodular goiter	1
Thy 2 Benign (46)	Colloid goitre/ Cystic thyroid nodule (13)	Colloid goitre/ colloid cyst	6
		Nodular goiter	7
	Nodular goitre (12)	Nodular goiter	10
		Cystic colloid nodule	1
		Adenomatous goiter	1
	Benign cystic lesion (3)	Cystic colloid nodule	2
		Nodular goiter	1
	Follicular nodule (8)	Adenomatous goitre	4
		Cystic colloid nodule	1
		Colloid goitre	1
		Follicular adenoma	2
	lymphocytic thyroiditis (1)	Hashimoto's thyroiditis	1
	Hashimoto's thyroiditis (5)	Hashimoto's thyroiditis	4
		Diffuse large cell lymphoma	1
	Granulomatous thyroiditis (1)	Granulomatous thyroiditis	1
	Hyperplastic thyroid nodule (3)	Adenomatous goitre	2
		Hurthle cell adenoma	1
Thy 3 AUS/FLUS (3)	FLUS (3)	Adenomatous goitre	2
		Follicular carcinoma	1
Thy 4 Suspicious for Follicular neoplasm/ FN (6)	Suspicious for follicular neoplasm (5)	Benign Follicular Adenoma	2
		Follicular Carcinoma	2
		Adenomatous goitre	1
	Hurthle cell neoplasm (1)	Hurthle cell carcinoma	1
Thy 5 Suspicious for malignancy (4)	Suspicious of medullary thyroid carcinoma (2)	Medullary carcinoma	2
	Suspicious of papillary carcinoma (2)	Papillary Carcinoma	2
Thy 6 Malignant (3)	Papillary carcinoma (2)	Papillary Carcinoma	2
	Medullary Carcinoma (1)	Medullary Carcinoma	1

Table no 14: Malignancy rate of each Bethesda category

Bethesda Category	Histopathogical Diagnosis	No. of cases which turn out to be malignant	Malignancy Risk (%)
Non-diagnostic or unsatisfactory (n=3)	Benign follicular adenoma -1 Adenomatous goitre -1 Nodular goitre -1	0	0
Benign (n=46)	Colloid goitre / Colloid cyst -7 Nodular goitre -18 Cystic colloid nodule - 4 Adenomatous goitre -7 Follicular adenoma -2 Hashimoto's thyroiditis - 4 Hurthle cell adenoma -1 Diffuse large cell lymphoma -1 (False negative) Lymphocytic thyroiditis -1 Granulomatous thyroiditis -1	1	2.17
AUS (n=3)	Adenomatous goitre -2 Follicular carcinoma -1	1	33.33
Suspicious for follicular neoplasm (n=6)	Follicular Carcinoma -2 Benign Follicular Adenoma -2 Hurthle cell carcinoma -1 Adenomatous goitre -1	3	50
Suspicious for malignancy (n=4)	Medullary Carcinoma -2 Columnar variant of papillary carcinoma -2	4	100
Malignant (n=3)	Papillary carcinoma -2 Medullary carcinoma -1	3	100
Total cases = 65		12	-

Table No.13 and 14 shows that out of total 124 cases, 65 cases underwent surgery and histopathologic correlation. Cytodiagnosis of thyroid lesions was categorized using Bethesda system of classification in six categories with corresponding histopathologic diagnosis in each category to calculate the malignancy risk in each category. 12 out of 65 cases were malignant on cyto-histopathology correlation with malignancy rate was 18.46%.. Maximum cases (n=46) were included under the Benign category of Bethesda system among the 65 cases, with Nodular or colloid goitre as the most common histopathology diagnosis (n=25). There was a single false negative case with cytological diagnosis of Hashimoto's thyroiditis and histopathological diagnosis as diffuse large cell lymphoma, bringing down the malignancy rate to 2.17%. The AUS category included three cases in which two cases were benign on histopathologic study and one case was malignant with 33.33% malignancy rate. The category of suspicious for follicular neoplasm included six cases, out of which three cases were benign while three cases were malignant on histopathology, resulting in malignancy risk of 50% in our study. The category of suspicious for malignancy included four cases, in which all cases were malignant on histopathology with malignancy rate of 100%. The malignant category included 3 cases which were confirmed as malignant on histopathology with malignancy rate of 100%. The non-diagnostic category included three cytological cases which were benign on histopathologic study. The malignancy risk in this category was 0%.

Table no 15: Calculation of malignant risk for each Bethesda category in 65 cases.

Bethesda Category	Malignancy rate (%)
I	0
II	2.17
III	33.33
IV	50
V	100
VI	100

In present study malignancy rate of category I was zero, 2.17% for category II, 33.33% for category III, 50% for category IV and 100% for category V and VI lesions. (Table 15).

Statistical analysis

True positive, true negative, false positive and false negative results were obtained in table 16. From those values sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were calculated. (Table 17).

Table no16

FNAC ⇨ / HPE ⇩	Inadequate	Benign	AUS	Follicular neoplasm	Suspicious For malignancy	Malignant	n
Benign	03	45TN	02	03	00	00FP	53
Malignant	00	01FN	01	03	04	03TP	12
Total	03	46	03	06	04	03	65

Table no 17

	Indicators	Percentage
1	Sensitivity = TP/ (TP+ FN)	3/3+1=75%
2	Specificity = TN/ (TN+ FP)	45/45+0=100%
3	Positive predictive value = TP/ (TP+FP)	3/3+0=100%
4	Negative predictive value = TN/ (TN+FN)	45/45+1=97.82%
5	Diagnostic accuracy = TP+TN/(TP+TN+FP+FN)	3+45/3+45+0+1=97.95%

IV. Figures

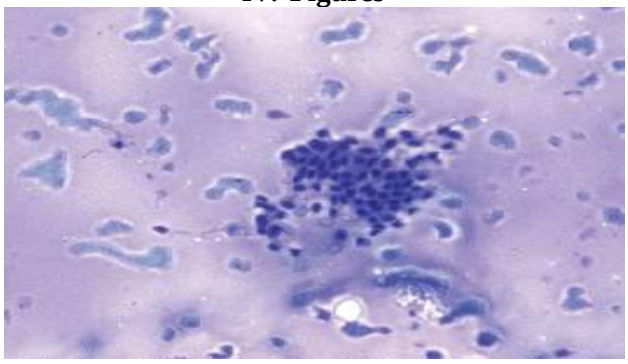


Figure 1: Nodular goiter/ colloid goiter showing sheet of follicular epithelial cells in background of thick and thin colloid (MGG X 10)

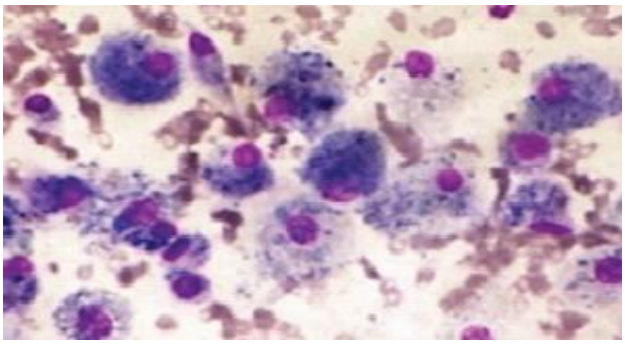


Figure 2: Nodular goiter/ colloid goiter / cystic colloid nodule showing Haemosiderin-laden macrophages (MGG X 40)

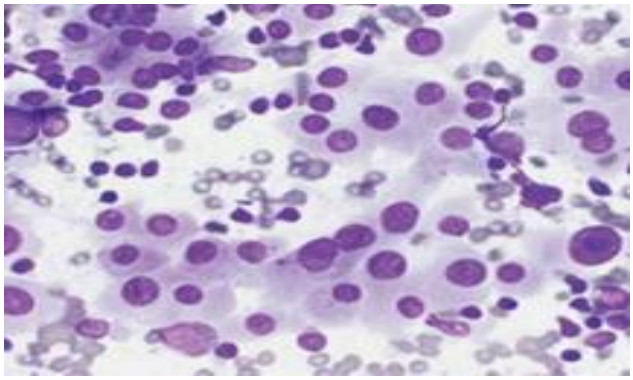


Figure 3: Hashimoto's thyroiditis showing groups of Hurthle cells infiltrated by lymphocytes (MGG X 40)

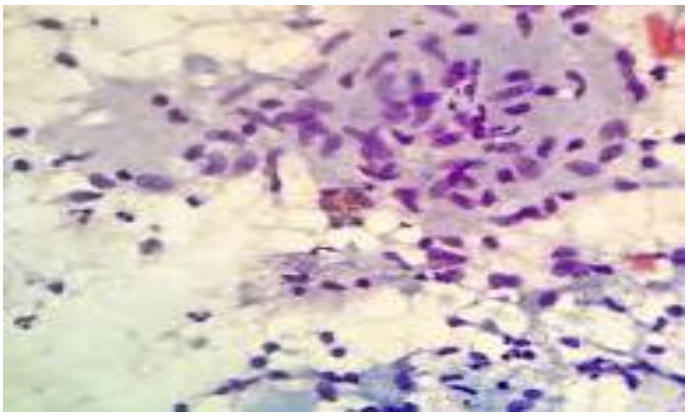


Figure 4: Granulomatous thyroiditis showing epithelioid cells forming granuloma (PAP X 10).

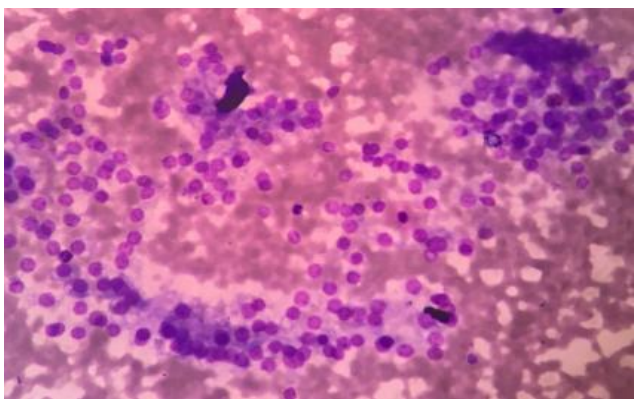


Figure 5: Follicular Lesion of Undetermined Significance (MGG X 10).

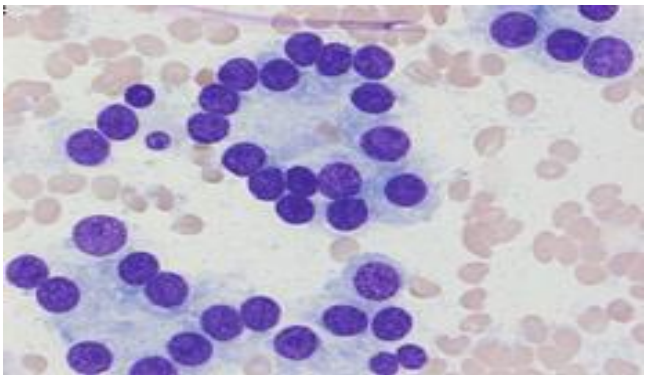


Figure 6: Follicular neoplasm showing microfollicular clusters (PAP X 40).

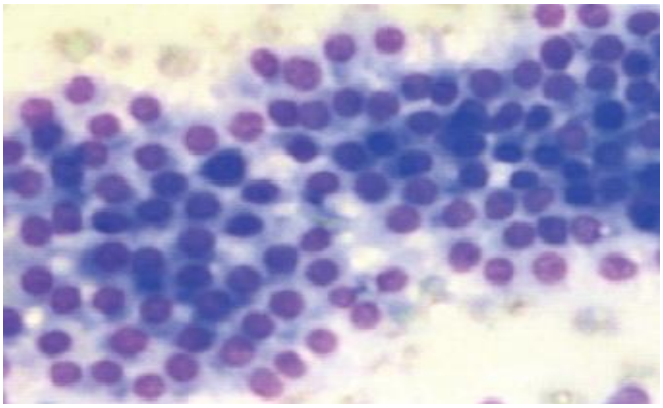


Figure 7: Follicular neoplasm showing aggregates of follicular epithelial cells with scanty colloid (MGG X 40).

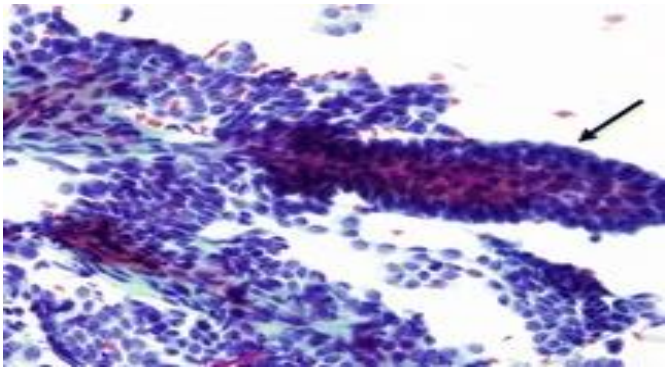


Figure 8: Papillary carcinoma showing cells arranged in papillae with a central fibrovascular core (PAP X 10).

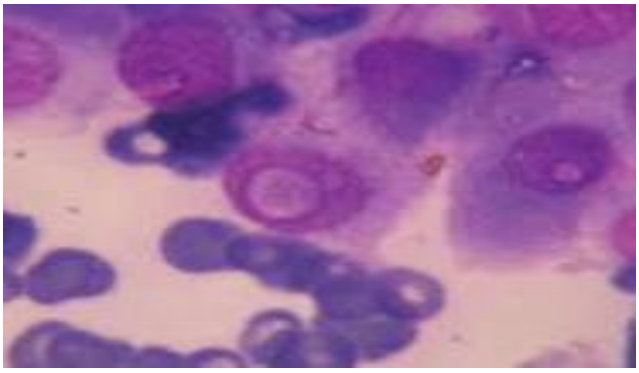


Figure 9: Papillary carcinoma showing tumour cells with intra-nuclear inclusions. (MGG X 40)

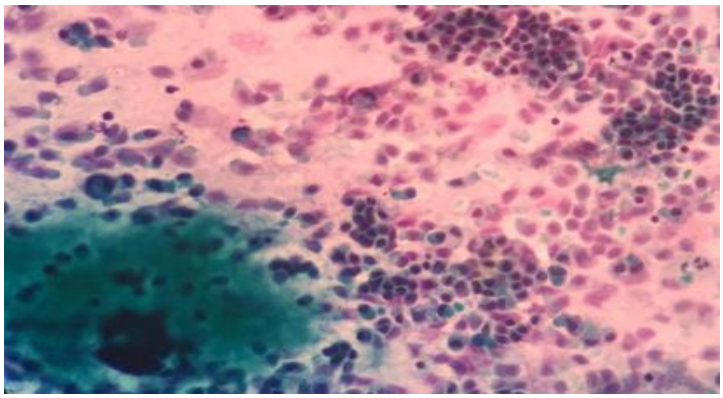


Figure 10: Medullary thyroid carcinoma showing amyloid with plasmacytoid tumour cells. (PAP X 100)

V. Discussion

In the present study, in benign category youngest case was 18 years of age, whereas oldest patient was 85 years of age. In the malignant category youngest patient was 45 years of age, whereas oldest patient was of 65 years. In present study, maximum number of cases were seen in the 41 to 50 yrs. (33.87%) followed by 31-40 years (21.77%). Mean age of presentation of patients was 51.5 which was comparable to study of Silverman JF et al[7] and Arvinthan T et al[8] . The mean age of Qurat UI Ain Batool et al[9] study was lower than the present study. Female to Male ratio in our study was 7:1. It was comparable to most of the studies[10,11] and was closest to Kumbhakar D[12] in which the female: male ratio was 6.69:1. It is a well-known fact that thyroid diseases affect females more commonly than males. The adequacy rate of the current study was 93.54% which was comparable with studies of Kumbhakar D[12] and Ashwini BR et al[13].

The most common complaint of swelling in front of the neck in present study was in accordance to all the mentioned studies[10,12,14]. The duration varied in different studies. In the present study the maximum number of patients-69.35% were having thyroid lesions with symptoms in between 1 to 6 months. Similar finding was observed by Handa U et al[15].

In present study, the majority of the patients-37 cases (29.83%) had the size of the thyroid swelling between ≤ 3 cms and 26 out of 37 cases (70%) were non- malignant. It has already been stated in literature that lower size of the thyroid swelling mostly favours benign pathology[8]. In present study, 21 cases (17 cases of nodular/ colloid goiter/ adenomatous goiter/ follicular adenoma and 4 cases of thyroiditis) out 29 cases with tenderness were associated with benign pathology. This was in agreement with Hennessey JV [16]. In present study, the majority of the swellings- 95 (76.61%) out of total 124 cases were not associated with tenderness on clinical palpation of the thyroid lesions. This finding was in accordance to study by Ananthakrishnan N et al (1993)[17] which had 10% of their cases with associated pain and tenderness and non-tender thyroid lesions comprised 90% of the cases. In present study, majority of thyroid lesions were firm on palpation (63.70%), followed by those with soft consistency (29.03%). Similar observation was made by Hennessey JV [16].

In present study on clinical examination ,49.19% of thyroid cases which were solitary on palpation were reduced to 45.16% on USG evaluation. USG examination of thyroid is more accurate and sensitive diagnostic modality to detect thyroid nodularity.[16,18]

Non-neoplastic non-inflammatory lesions were common (76.67%) with commonest lesion being nodular colloid goitre (47.58% cases) on routine cytological reporting in present study. Similar finding was observed by other authors[19,20]. In present study, based on Bethesda system we noted 76.61% in benign, 2.41% in AUS, 6.45% in suspicious for follicular neoplasm/ follicular neoplasm, 3.22% in suspicious for category and 4.83% in malignant category which was comparable to most of the studies [21,22,23] and was closest to Mufti ST et al[24].

In present study, malignancy risk for non-diagnostic category was 0% which was similar to Mondal SK et al[22] but lower than other studies [23,24,25]. 46 cases were included under benign category in present study. There was a single false negative case with cytological diagnosis of Hashimoto's thyroiditis and histopathological diagnosis as diffuse large cell lymphoma. So malignancy risk for this category is 2.17%, which was lower or higher than other studies, may be due to different study population [22,23,24,25]. AUS category included only three cases in which two cases were benign on histopathologic study and one case was malignant with 33.33% malignancy rate, which again varied with other studies [22,23,24,25]. This must be due to limited cases. Malignancy risk for Suspicious for follicular neoplasm category is 50 % in our study, which was higher than other studies [22,23,24,25], because 3 out of 6 cases in this category turned out to be malignant on histopathology. Malignancy risk for Suspicious for malignancy category was 100 % in our study, which was higher than other studies [22,23,24,25], because 4 cases were included in this category and all turned out to be malignant on

histopathology. Malignancy risk for malignancy category was 100 % in our study, which was similar to other studies [23,24]. This study inferred that the Bethesda system is a very useful method for a standardized system of reporting of thyroid cytopathology and improving the communication between clinicians and cytopathologists that lead to more consistent management approaches.

In the present study specificity, positive predictive value and negative predictive value were all in concordance with studies of Handa U et al[15], Qurat UI Ain Batool et al[9], Divyesh G et al[19]. The low rate of sensitivity may be due to small sample size or smaller size of malignant lesion in a large gland. In present study diagnostic accuracy was 97.95% which was similar to studies of Handa U et al[15], Hathila R[11] and higher than studies of Bukhari MH et al [26], Flanagan MB et al[27].

VI. Conclusion

Thyroid cytology proves to be a reliable, simple and cost-effective first line diagnostic procedure with high patient acceptance and without complications. The results of thyroid cytology must be assessed in conjunction with the clinical findings and other investigations like USG findings, in view of the possibility of false negative or false positive cytological diagnosis. The procedure has acceptable sensitivity and specificity in wide range group of patients in experienced hands and hence can be followed as a pre-operative diagnostic modality in the management of patients with thyroid lesions, thus reducing the number of surgeries. Maximum numbers of interpretative errors occur in the category with indeterminate or atypical cytological findings. This suggests that there is need of further clarity for diagnostic categorization in this grey zone. It could be further refined by applying more advanced immunocytochemical and molecular genetic analysis to these patients falling in the grey zone. Thus, as a screening test before surgery, FNAC still needs to be followed as a routine procedure for successful patient management.

.

References

[1]. Cibas ES, Ali SZ. The Bethesda System for reporting thyroid cytopathology. Am J Clin Pathol 2009; 132: 658-65.
[2]. Orell SR, Vielh P. The techniques of FNA cytology: i) Basic techniques ii) Miscellaneous techniques. In: Orell SR, Sterrett GF, editors. Fine Needle Aspiration Cytology. 5th ed. Gurgaon: Reed Elsevier India Private Limited; 2012. p. 8-27.
[3]. Sanchez MA, Stahl RE. The Thyroid, Parathyroid, and Neck Masses Other Than Lymph Nodes. In: Koss LG, Melamed MR, editors. Koss' Diagnostic Cytology and Its Histopathologic Bases, 5th ed. China: Lippincott Williams & Wilkins; 2006. P.1148-85.
[4]. Vielh P. The techniques of FNA Cytology In : Orell SR, Sterrett GF, Walters M N-I, Whitaker D, editors. Manual and Atlas of Fine Needle Aspiration Cytology, 3 rd ed. Harcourt Brace and company Limited; 1999. P. 14-17
[5]. Jayaram G, Orell SR. Thyroid. In: Orell SR, Sterrett GF, editors. Fine Needle Aspiration Cytology, 5 th ed. Gurgaon: Reed Elsevier India Private Limited; 2012. P.118-55.
[6]. Cibas ES, Ali SZ. The 2017 Bethesda System for Reporting Thyroid Cytopathology. Nov 2017; 27(11): 1341-1346.doi: 10.1089/thy.2017.0500.
[7]. Silverman JF, West RL, Larkin EW, et al. The role of fine needle aspiration biopsy in the rapid diagnosis and management of thyroid neoplasm. Cancer 1986; 57(6): 1164-70.
[8]. Arvinthan T, Banagala ASK, Gamage KJPK. Use of fine needle aspiration cytology on thyroid lumps. Galle Medical Journal 2007; 12 (1): 25-9.
[9]. Qurat UI Ain Batool, Baba Aijaz Khaliq, et al. USG guided FNAC vs. Blind FNAC in Evaluation of Thyroid Swellings- A Comparative Study. IJIR, Vol-3, Issuse-3, 2017, p. 899-902.
[10]. Sida Tagore, H. T. Jayaprakash, Arun Sasidharan et al. Cytological Study of Thyroid Lesions by fine needle aspiration cytology, Journal of Medicine, Radiology, Pathology & Surgery, vol- 2, 2016, p.12-15.
[11]. Rasik Hathila. Cytology findings of the thyroid lesions with the Histopathology findings correlation, International Journal of Medical Science and Public Health 2016;5(04):642-646.
[12]. Kumbhakar D. Cytological patterns of thyroid lesions: A hospital based study. J. Evolution Med. Dent. Sci. 2016; 5(65): 4661-4665.
[13]. B R Ashwini, Vernekar S, Kulkarni Mohan H, T Kiran. Comparative Study of Conventional and Ultrasound guided Fine Needle Aspiration Cytology of Thyroid In a Tertiary Care Center of North Karnataka, Int J Cur Res Rev, Nov 2012;04 (21) :64-69.
[14]. Sheela Chaudhari, Deepa Hatwal, Pawan Bhat, et al. Cytological Evaluation Of Thyroid Lesions and its Correlation with Histopathology: A Prospective Study. International Journal of Scientific Study, Nov 2015; 3: 132-135.
[15]. Handa U, Sukant G, Mohan H, Nagarkar N. Role of fine needle aspiraton cytology in diagnosis and management of thyroid lesions: A study on 434 patients. J Cytol 2008; 25(1):13-7.
[16]. Hennessey JV. Physical examination of the thyroid gland. In: Braverman LE, Cooper DS, editors. Werner & Ingbar's The thyroid: A fundamental and clinical text. 10th ed. China: Lippincott Williams & Wilkins; 2013. P.320-5.
[17]. Ananthakrishnan N, Rao KM, Narasimhans R, Veliath, et al. Problems and limitations with fine needle aspiration cytology, Am J Surg 1993; 166: 346-349.
[18]. Jameson JL, Weetman AP. Disorders of the thyroid gland. Kasper DL, Braunwald E, Fauci AS, Hausr SL, Longo DL, Jameson JL, editors. Harrison's principles of internal Medicine.16th ed. New York: Mc Graw-Hill; 2005. p.2104-27.
[19]. Divyesh Goswami, Preeti Agrawal, Princy Shinde. Accuracy of fine needle aspiration Cytology (FNAC) in comparison to Histopathological examination for the diagnosis of thyroid swellings, International Journal of Medical Science and Public Health 2017; 6(1): 6-11.
[20]. Sengupta A, Pal R, Kar S, Zaman FA, Sengupta S, Pal S. Fine needle aspiration cytology as the primary diagnostic tool in thyroid enlargement. Journal of Natural Science, Biology, and Medicine. 2011;2(1):113-118.
[21]. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, Gawande AA, et al. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. Cancer. 2007; 111(6):508-16.
[22]. Mondal SK, Sinha S, Basak B, et al. The Bethesda system for reporting thyroid fine needle aspirates: A cytologic study with histologic follow-up. J Cytol 2013; 30(2):94-9.

[23]. Sameep Garg, Nandini J. Desai, Dimple Mehta, Mitsu Vaishnav. To establish Bethesda system for diagnosis of Thyroid Nodules on the basis of FNAC with Histopathological correlation, JCDR, Dec 2015; 9(12): EC17-EC-21.
[24]. Mufti ST, Molah R. The Bethesda system for reporting Thyroid Cytopathology: A Five year retrospective review of one center experience. Int J Health Sci 2012; 6(2):159-73.
[25]. Jo VY, Stelow EB, Dustin SM, Hanley KZ. Malignancy risk for Fine needle aspiration of thyroid lesions according to Bethesda System for reporting thyroid cytopathology. Am J Clin Pathol 2010; 134: 450-56.
[26]. Bukhari MH, Niazi S, Hanif G, Qureshi SS, Munir M, Hasan M, et al. An updated audit of fine needle aspiration cytology procedure of Solitary thyroid nodule. Diagn Cytopathol. 2008; 36(2): 104-12.
[27]. Flanagan MB, Ohori NP, Carty SE, Hunt JL. Repeat thyroid nodule fine- needle aspiration in patients with initial benign cytologic results. Am J Clin Pathol 2006; 125(5):698-702.

Dr. Neha Mukesh Goel ," ‘‘Cytological Evaluation of Thyroid Lesions and its Correlation with Histopathology: A Study in a Rural Tertiary Care Hospital, Konkan belt of Maharashtra, India." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 10, 2018, pp 01-14.