



**Study of Fine Needle Aspiration Cytology of thyroid lesion with histological correlation in a District Hospital at Rajkot, Gujarat, India**

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**Abstract**

**Introduction:** We encounter thyroid lesions commonly in our clinical practice. Hence it is very important to make a correct diagnosis as early as possible. This study is to evaluate the cytology of palpable thyroid lesions to lessen surgical intervention and correlating the same with histopathological examination, confirming the diagnosis and planning post surgical management of various thyroid lesions.

**Method:** A retrospective study was conducted at district hospital, Rajkot for a period 1<sup>st</sup> March 2023 to 31<sup>st</sup> August 2024. A total of 52 cases from all age group were enrolled. Clinical details of all the patients were taken. Classification of the patients was done based on diagnostic profile.

**Results:** While assessing the 52 patients we find 43 were non neoplastic and 09 were neoplastic on a cytological interpretation while we conclude additional 46 non neoplastic cases and only 06 neoplastic cases with the help of histopathological overlooking. Hence Sensitivity, Specificity, Positive Predictive Value and Negative

Predictive value were 83.33%, 90.38%, 100% and 90.47% respectively. This study has given us accuracy of 90.38 %.

**Conclusion:** FNAC diagnosis of non neoplastic and neoplastic lesions which later on can be confirmed by histopathological examinations show having high significance and these patients should be managed by surgery. False negative results do occur in cases of benign lesions and these patients should be advised to follow up and if any clinical suspicion of malignancy arises even in the presence of benign FNAC result requires surgery.

**Keywords:** Fine needle aspiration cytology, Histopathology.

**Introduction**

We encounter thyroid lesions commonly in our clinical practice. Hence it is very important to make a correct diagnosis as early as possible. Most of the solitary thyroid nodules are benign. Malignancy has an incidence of only 5-20% in surgically removed thyroid nodules on histopathological examination. Percentage of solitary

thyroid nodule increases with age. Hence prevalence of malignancy in third, fourth and fifth decades of life is also increased. Female gender is more prevalent to have thyroid tumour. As the vast majority of these nodules are non neoplastic lesions or benign neoplasm, it is preferred to operate only on those patients with suspicious of cancer. And that's how we also avoid unnecessary surgery and possible injury. With the help of FNAC gun, syringe and fine needle we extract cells from palpable selling. Its advantages are that it is a simple, speedy, safe, cost effective and accurate technique.

### Aims and Objectives

The present study is undertaken with many of the following objectives like:

- To study cytopathological and Histopathological correlation of thyroid lesion.
- To study the incidence according to age and sex in various lesions of thyroid.
- To evaluate the accuracy of Fine needle aspiration cytology in correlation with Histopathological study.
- To study the advantages and usefulness of fine needle aspiration cytology in thyroid lesions.

### Materials and Methods

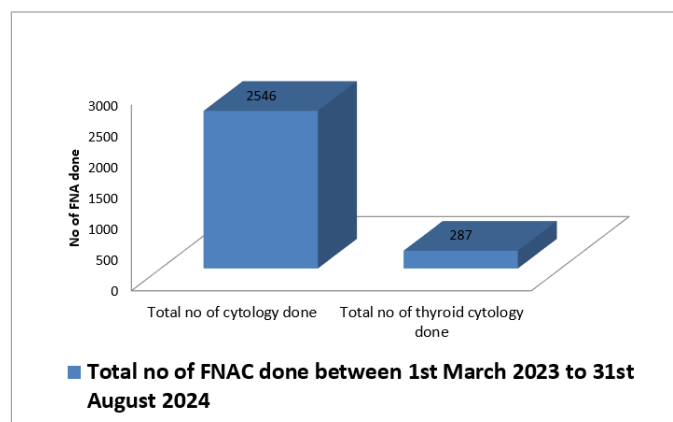
The present study of 'Fine needle aspiration cytology of thyroid gland lesion and its histopathological correlation at tertiary care centre' was carried out in cytopathology laboratory and histopathology laboratory of Department of Pathology, PDU Medical College and Hospital, Rajkot during the 1<sup>st</sup> March 2023 to 31<sup>st</sup> August 2024. These laboratories are situated at room no. 13 of the OPD building and room no. 157 at first floor of our medical college, respectively. FNAC of thyroid lesions are done by 22-24G needle with disposable syringes and smears are prepared and stained with H and E stain.

### Result

Present study was carried out from 1<sup>st</sup> March 2023 to 31<sup>st</sup> August 2024. During this period, 287 thyroid aspirates were done, out of which 52 cases were followed by Histopathological examination. So the cytohistological correlation was studied in 52 cases. The results were shown in various tables.

Table 1: No. of FNAC from Thyroid Lesions

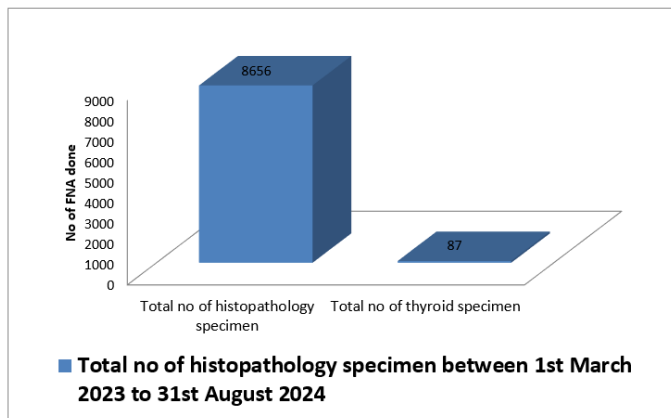
Duration	Total no. of cytology done	Total no of thyroid cytology done	Percentage of Thyroid cytology
1 <sup>st</sup> March 2023 to 31 <sup>st</sup> August 2024	2546	287	11.27%



As shown in table no. 1 and chart during the period of present study total 2546 no. of cytology were done. Out of total 2546 aspirates, 287 were the thyroid fine needle aspiration cytology smears comprising of 11.27% of the total no.

Table 2: No. of Thyroid Specimen for Histopathology

Duration	Total no. of specimen received	Total no. of Thyroid specimen received	Percentage of Thyroid histopathology
1 <sup>st</sup> March 2023 to 31 <sup>st</sup> August 2024	8656	87	1.005



As shown in the table no. 2 and chart, during the period of the present study, out of the total 8656 specimens received, 87 specimens were of the various thyroid lesions, which comprised 1.005% of the total specimens received for the histopathological examination.

Table 3: Cytological Diagnosis of Thyroid FNAC Are as Follows.

Cytological Diagnosis	No. of cases	Percentage
Cystic lesion	24	8.36
Thyroiditis	31	10.8
Lymphocytic thyroiditis	21	7.32
Hashimoto's thyroiditis	9	3.13
Granulomatous	1	0.35
Non-neoplastic lesions	198	68.98
Colloid goitre	147	51.21
Adenomatous goitre	25	8.71
Follicular Nodule	19	6.62
Hyperplastic thyroid lesion	7	2.44
Neoplastic lesions	29	10.11
Atypia of undetermined significance	4	1.39
Follicular neoplasm	15	5.23
Papillary	8	2.78
Medullary	0	0
Anaplastic	0	0
Poorly differentiated carcinoma	1	0.35
Hurthle cell	1	0.35
Unsatisfactory for evaluation	5	1.74
Total	287	100%

As shown in the table no. 3 and above chart out of the total 287 cases of thyroid aspirates, 31 (10.8%) cases were inflammatory lesions, 198 (68.98%) cases were non-neoplastic lesions, 29(10.11%) cases were neoplastic aspirates. The 5 (1.74%) cases were the unsatisfactory aspirates, which could not be reported in spite of the repeated fine needle aspiration cytology. Out of the total 287 thyroid FNAC, 52 cases were followed by the Histopathological examination, so the following data comprise only the cases having cytohistopathological correlation (i.e. 52 cases).

Table 4: Age wise distribution of thyroid lesions are as follows:

Age Range (yrs)	No. of cases	Percentage
Up to 10	0	0
11 – 20	02	3.84
21 – 30	18	34.61
31 – 40	17	32.69
41 – 50	06	11.5
51 – 60	04	7.69
61 – 70	03	5.76
71 – 80	02	3.84
Total	52	100

As shown in the table no. 4, the maximum incidence of thyroid lesions, are between the ages of 21 – 30 years, i.e. 18 cases (34.61%). There was no case reported up to 10-year age group and >80 years of age during presentation.

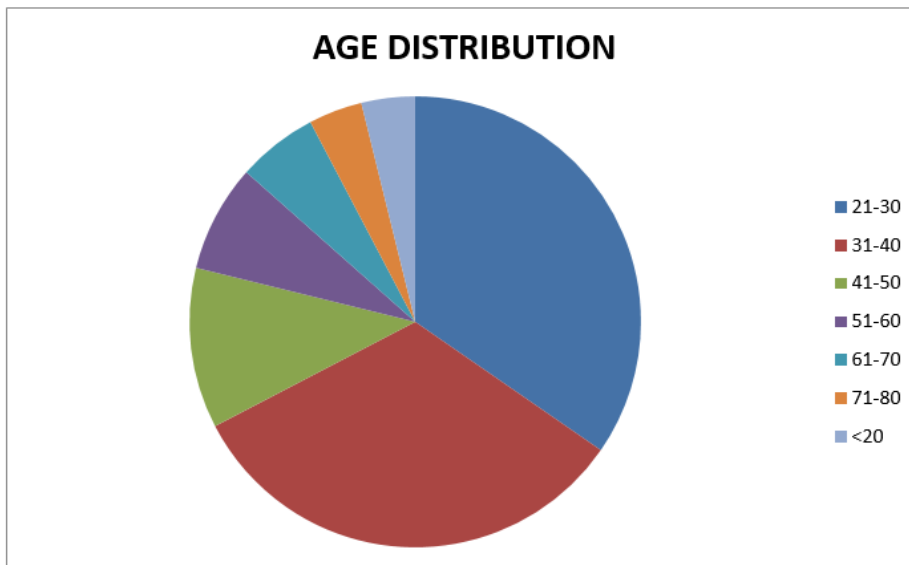
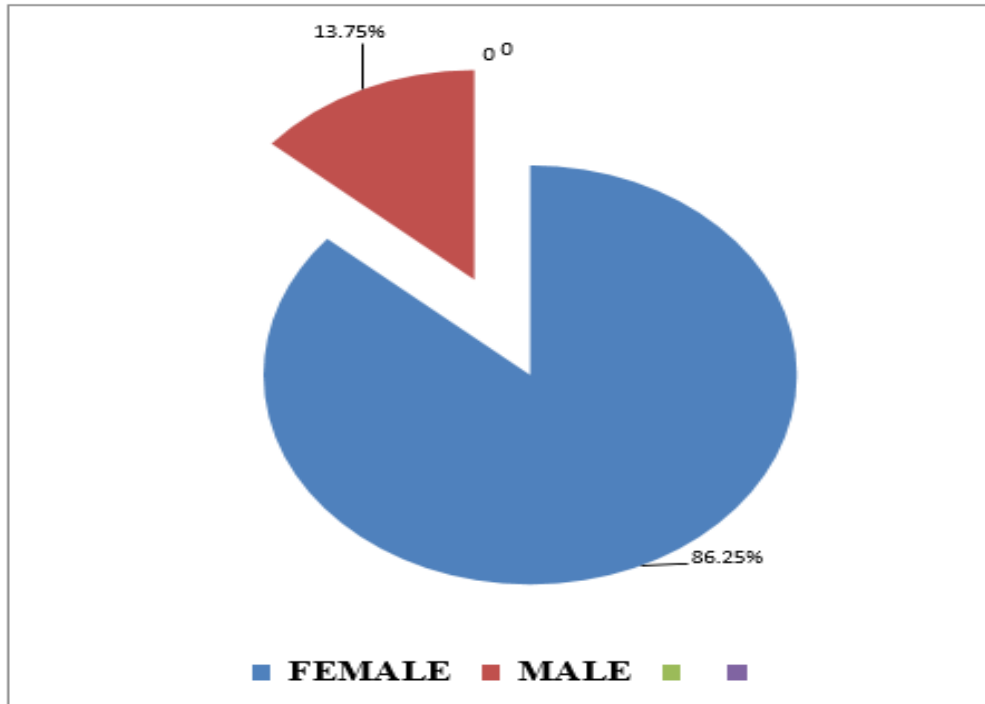


Table 5: Sex wise distribution of thyroid lesions are as follows:

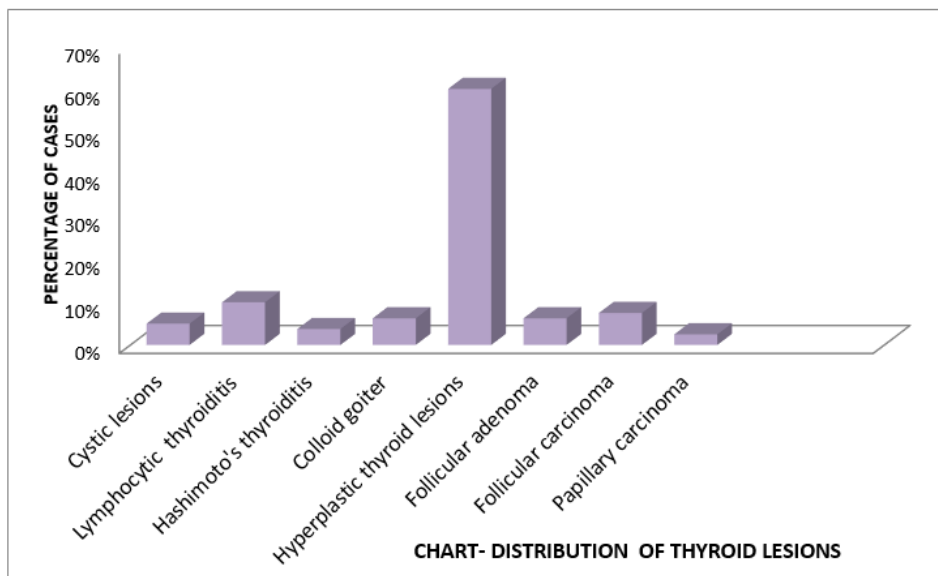
Sex	No. of cases	Percentage
Females	45	86.25%
Males	07	13.75%
Total	52	100%



As shown in the table no. 5, the present study of 52 cases comprised of 45 cases (86.25%) from the female thyroid lesions while 07 cases (13.75%) from the male thyroid lesions.

Table 6: Cytological diagnoses of 52 cases are as follows:

Cytological Diagnosis	No. of cases	Percentage
Cystic lesion	4	7.69
Lymphocytic thyroiditis	0	0
Hashimoto's thyroiditis	2	3.84
Colloid goitre	33	63.46
Adenomatous goitre	2	3.84
Hyperplastic thyroid lesion	2	3.84
Follicular neoplasm	4	7.69
Papillary carcinoma	5	9.61
Medullary carcinoma	0	0
Anaplastic carcinoma	0	0
Total	52	100%



As shown the table no. 6, out of 52 cytological diagnosed cases of thyroid lesions, 33 cases were of colloid goitre, 05 Papillary neoplasms, 04 cases were of cystic lesion and Follicular lesion each, 02 cases each were of Adenomatous goitre and Hyperplastic Thyroid Lesion and Hashimoto's thyroiditis.

Table 7: Histopathological diagnoses of 87 cases are as follows:

Histological Diagnosis	No. of cases	Percentage%
Cystic lesion	6	6
Lymphocytic thyroiditis	0	0
Hashimoto's thyroiditis	4	4.59
Colloid goitre	56	64.37
Adenomatous goitre	2	2.29
Hyperplastic thyroid lesion	5	5.74
Follicular adenoma	1	1.50
Follicular carcinoma	3	3.45
Papillary carcinoma	9	10.34
Medullary carcinoma	0	0
Anaplastic carcinoma	1	1.50
Total	87	100%

As shown in the table no. 7, out of 87 histopathological diagnosed cases of thyroid lesions, 56 cases were colloid goitre, followed by 9 cases of papillary thyroid carcinoma, 6 cases were of cystic lesion, 5 cases each were of hyperplastic lesions, 4 cases were of Hashimoto thyroiditis, 3 cases were of follicular carcinoma, 2 cases were of Adenomatous goitre, 1 case each were of Follicular Adenoma and anaplastic carcinoma.

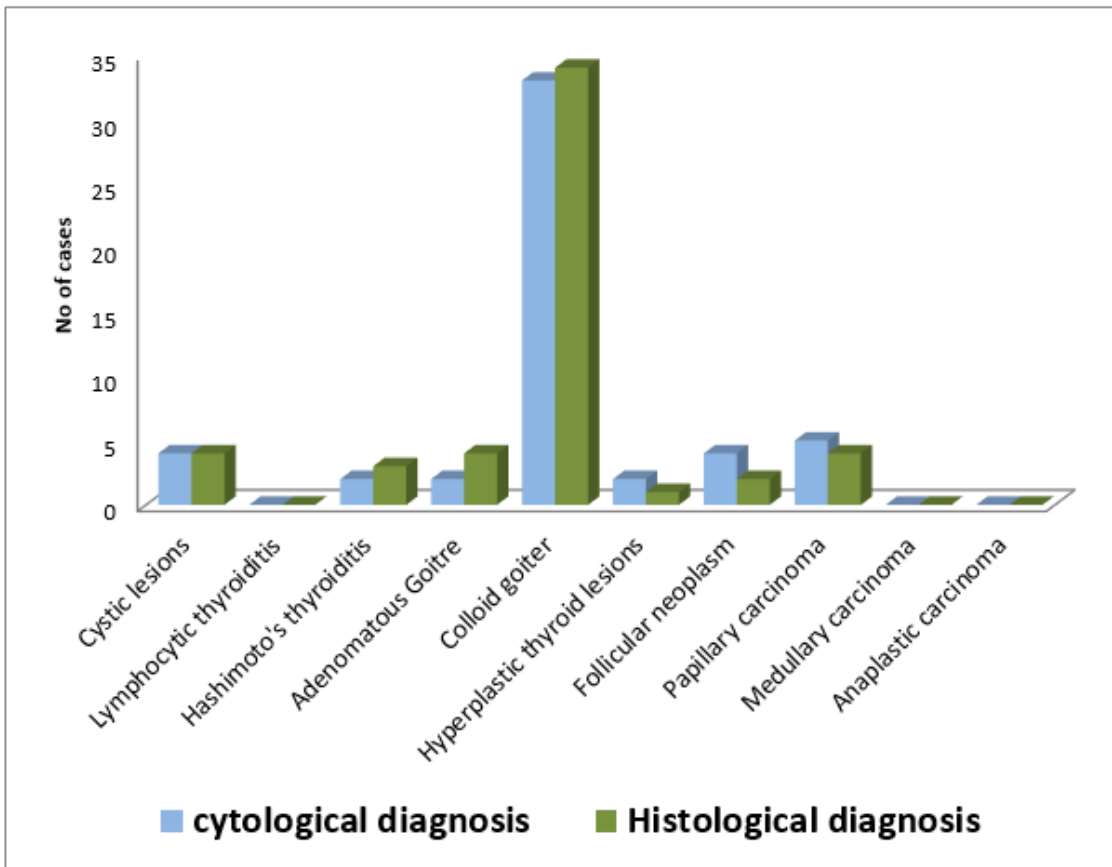
Table 8: Age and sex incidence of thyroid lesion

Age	Sex		Cystic lesion	Hashimoto's thyroiditis	Colloid goitre	Adenomatous goitre	Hyperplastic thyroid lesions	Follicular Adenoma	Follicular Carcinoma	Papillary Carcinoma
	M	F								
0-10	0	0								
11-20	0	2	1		1					
21-30	0	19	1	2	11	2	1			2
31-40	2	15	2	1	11	1		1		1
41-50	1	5			5					1
51-60	2	1			2	1				0
61-70	1	2			2				1	
71-80	1	1			2					
Total	52		4	3	34	4	1	1	1	4

As shown in the table no. 8, thyroid lesions are more common in females. In present study, only 07 cases were from the male thyroid lesions.

Table 9: Cyto-histopathological correlation of thyroid lesion of present study 1

Cytological diagnosis and no. of cases		Sensitivity %	Specificity %								
Diagnosis	No.	Cystic lesion	Hashimoto's thyroiditis	Adenomatous Goitre	Colloid goiter	Hyperplastic thy.	Follicular adenoma	Follicular ca	Papillary ca	Sensitivity %	Specificity %
Cystic lesion	4	4								100	100
Hashimoto's thyroiditis	2		2							66.66	100
Adenomatous Goitre	2			1	1					55	50
Colloid goite	33			2	30		1			88.23	90.90
Hyperplastic thy. Lesion	2		1			1				100	50
Follicular neoplasm	4			1	2			1		100	55
Papillary ca	5				1				4	100	80
Total	52	4	3	4	34	1	1	1	4		



As shown in above table and chart, there were 4 cases of cystic lesions and they were all diagnosed as cystic lesions histological. So in cystic lesions, 100% correlation was seen. All 2 cases of Hashimoto's thyroiditis were confirmed histologically and thus 100% correlation was seen. There were 33 cases of colloid goiter. Out of them 30 cases were confirmed histopathologically. Hence there was 90.90% correct diagnosis in these cases. Rest of 3 cases of colloid goiter, 2 were diagnosed as Adenomatous goitre 1 was diagnosed as follicular adenoma histologically. Out of the 2 cases of hyperplastic thyroid lesion, 1 was confirmed histopathologically, while 1 case was diagnosed as Hashimoto's thyroiditis. So there was 50% correct diagnosis in these cases. During the present study, out of 4 cases of follicular neoplasm, 1 was diagnosed as follicular carcinoma, 2 were diagnosed as colloid goitre, and another one as Adenomatous goitre.

So there was 55% correct diagnosis in these cases. 80% correct diagnosis seen in 5 cases of papillary carcinoma.

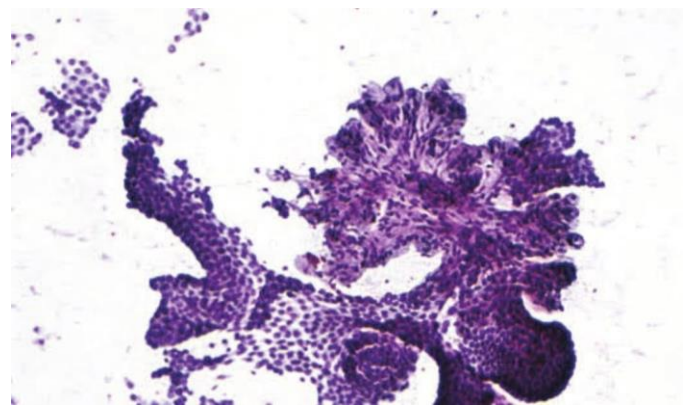


Figure 1: Papillary Carcinoma of Thyroid (BETHESDA CAT IV) (FNAC): Smear shows papillary pattern of arrangement. (H&E STAIN, 10x)

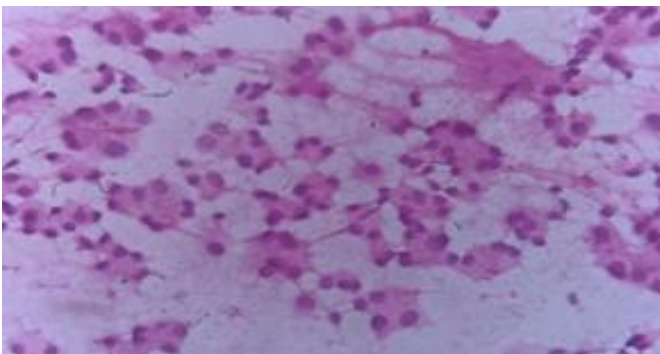


Figure 2: Follicular Neoplasm (FNAC) – Follicular neoplasm (BETHESDA CAT IV) – Smear showing follicular cells arranged in macro and micro follicular pattern. (H&E STAIN, 40x).

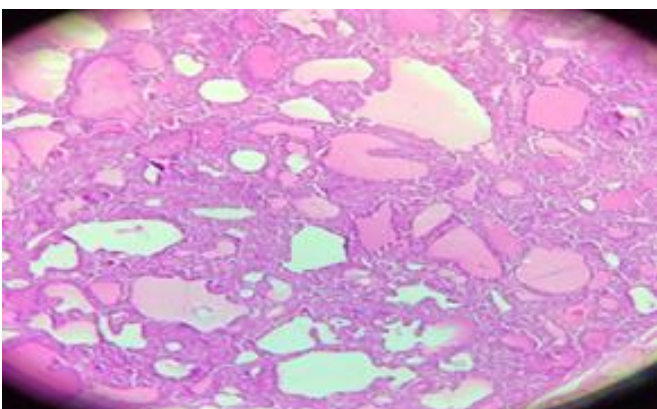


Figure 3: Follicular Carcinoma: Histopathological image shows variable sized follicles lined by pleomorphic follicular cells. (H&E STAIN, 10x)

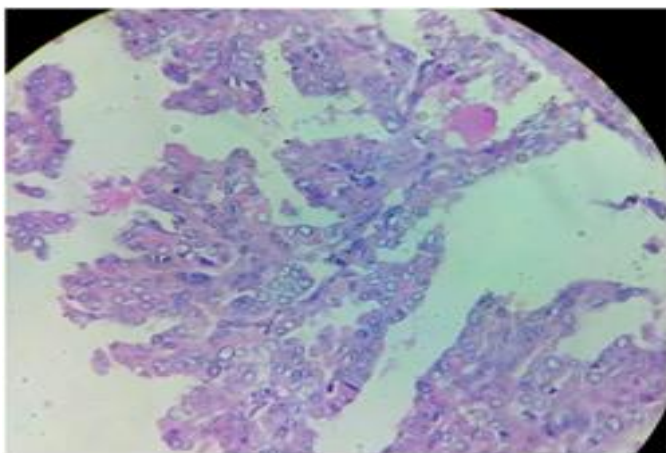


Figure 4: Papillary Carcinoma of Thyroid – (A) Histopathological image shows tumour cells arranged into papillary pattern besides normal thyroid follicles. (H&E STAIN, 10x)

Table 10: Cyto-histopathological correlation of thyroid lesion of present study 2

Cytological diagnosis	Histopathological diagnosis		Total
	Neoplastic	Non-neoplastic	
Neoplastic	05 (a)	04 (b)	09(a+b)
Non neoplastic	01 (c)	42 (d)	43 (c+d)
Total	06 (a+c)	46 (b+d)	52(a+b+c+d)

This table no. 10 shows the cytological and histological correlation in 80 cases of thyroid lesions. In this table cases of follicular neoplasm were considered as neoplastic lesion. From above table sensitivity, specificity, accuracy percentage of false positive and false negative for diagnosis of malignancy by FNAC is calculated by formulas.

$$\text{Sensitivity} = a / (a+c) \times 100 = 5/6 \times 100 = 83.33\%$$

$$\text{Specificity} = d / (b+d) \times 100 = 42/46 \times 100 = 91.30\%$$

$$\text{Accuracy} = (a+d) / (a+b+c+d) \times 100 = 90.38\%$$

$$\text{Percentage of false positive} = b / (b+d) \times 100 = 4/46 \times 100 = 8.69\%$$

$$\text{Percentage of false negative} = c / (a+c) \times 100 = 1/6 \times 100 = 16.16\%$$

### Discussion

FNAC is a method where a very small quantity of tissue, fluid and cells are aspirated from a lesion for cytological examination. Although needle aspiration cytology had been performed intermittently in the second half of the last century, it was popularized by Martin, Ellis and Stewart at Memorial Hospital for Cancer and Allied Diseases, New York in the 1930.

FNAC has been considered as the cost effective, less invasive, less complicating diagnosis. By these many benefits FNAC can triage patient in two groups such as operable and non operable. After locating the target cells are aspirated and procedure can be repeated if needed.

Thus diagnosis can help to plan proper surgical management in thyroid mass. Reliability and accuracy of FNAC highly lies in an experienced hands. High degree

of expertise is required for the process of performing the needle aspiration as well as in the interpretation of the smears.

Table 11: Comparison of age

Studies	Range of age in years	Median age in years
Handa et al(2008)	5 - 80	37.69
Gupta et al (2010)	22 - 58	38.72
Pinkypandey et al (2012)	18-76	39.00
Parikh et al (2012)	7-72	35.91
Rupam et al (2014)	11-70	37.36
Present Study (2023-24)	11-80	37.36

Table no 11 shows the comparison of age incidence in the present study with other studies. In the present study median age was 37 years. In Rupam et al and Handa et al also showed the same result. In pinkypandey et al showed median age 39 years and in Parikh et al showed median age 35 years. This variation is due to fact that these studies were not performed in particular age group or as a screening programmed, but randomly done on the patients coming to the hospital with thyroid lesion.

Table 12: Comparison of Male: Female Ratio:

Studies	Total cases	Male	Female	Male: Female
Handa et al (2008)	434	59	375	1:6.35
Gupta et al (2010)	75	6	69	1:11.5
Pinkypandey et al (2012)	447	65	382	1:5.8
Parikh et al (2012)	221	36	185	1:5.1
Rupam et al (2014)	122	13	109	1:8.3
Present Study (2023-24)	52	07	45	1:6.27

Table 12 shows the sex distribution in thyroid lesions. Female predominate in all of the aforementioned studies.

Table 13: Comparison of Thyroid Lesions

Studies	Cystic lesion	Thyroid-itis	Colloid goiter	Adenomatous goitre	Follicular Neo plasm.	Papillary ca.
	Handa (2008)	2 3.03%	0 0%	45 68.2%	13 19.70%	0 0%
Gupta (2010)	0 0%	3 4%	42 56%	15 20%	3 4%	12 16%
Rupam et al (2014)	4 3.27%	7 5.73%	81 66.4%	9 7.37%	5 4.09%	12 9.83%

Present study(2023-24)	4 7.69%	2 3.84%	33 63.46%	2 3.84%	4 7.69%	5 9.61%
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As shown in the above table, percentage of incidence of various thyroid lesions of present study is nearer to study of Rupam et al and Handa et al.

Table 14: Comparison of non-neoplastic to neoplastic ratio

Studies	Non-neoplastic(A)	Neoplastic (B)	A : B
Handa (2008)	47	19	2.47 : 1
Gupta et al(2010)	45	30	1.5:1
Pinkyandey et al (2012)	58	54	1.07:1
Parikh et al (2012)	100	23	4.34:1
Rupam et al (2014)	92	30	3.06
Present Study(2023-24)	43	09	4.77:1

As shown in above table, Non-neoplastic lesions were found in large number in present study. This study documented the fact that the benign lesions of thyroid are the most common lesions. This increased case of benign lesions indicates increase awareness of patients. In such lesions the reassurance is the main line of treatment though close follow up is mandatory.

Table 15: Comparison of cyto-histo correlation of benign lesions

Studies	Total no. of cases	No. of Benign lesions	Histopathological diagnosis	
			Benign	Malignant
Handa et al	66	60 (90.09%)	59 (98.33%)	1 (1.66%)
Gupta et al	75	63 (84%)	60 (95.24%)	3 (4.76%)
Pinkyandey et al (2012)	112	95 (84.82%)	83 (87.36%)	12 (12.63%)
Parikh et al (2012)	123	117 (95.12%)	105 (89.74%)	12 (10.25%)
Rupam et al (2014)	122	94 (77.04%)	84 (89.36%)	10 (10.63%)
Present study(2023-24)	52	43 (86%)	42 (97.67%)	01 (2.33%)

Table no 15 shows cyto-histo correlation of benign lesions of present study with other studies. In present study, out of 43 (86%) cytological diagnosed cases, 42 (97.67%) cases were confirmed benign on histological diagnosis and 1 (2.33%) was malignant on histological diagnosis.

Table 16: Comparison of cyto-histo correlation of malignant lesions

Studies	Total no of cases	No. of neoplastic smears	Histopathological diagnosis	
			Benign	Malignant
Handa et al(2008)	66	6 (9.09%)	0	6 (100%)
Gupta et al(2010)	75	12 (16%)	3 (25%)	9 (75%)
Pinkypandey et al (2012)	112	17 (15.17%)	5 (29.41%)	12 (70.58%)
Parikh et al (2012)	123	6 (4.87%)	0	6 (100%)
Rupam et al (2014)	122	28 (22.9%)	8 (28.57%)	20 (71.42%)
Present study (2023-24)	52	09 (17.30%)	03 (33.33%)	06 (66.6%)

Table 16 shows cyto-histo correlation of malignant lesions of present study with other studies.

Table 17: Comparison of diagnostic value for malignant lesion

Studies	Year	Sensitivity %	Specificity %	Accuracy %
Handa et al	2008	97	100	98.48
Gupta et al	2010	80	86.6	84
Pinkypandey et al	2012	57.14	90	80.28
Parikh et al	2012	71.43	100	90.24
Rupam et al	2014	82.14	86.8	83.60
Present Study	2023-24	83.33	91.30	90.38

The sensitivity of the test means the ability of the test to identify correctly all those who have the disease, which are ‘true positive’ results. Sensitivity of FNAC for diagnosis of malignancy means its ability to diagnose all those patients correctly who have malignancy. The sensitivity of the present study is 83.33%. In other studies 57% to 97% percentage of sensitivity were observed. The specificity of the test means the ability of the test to identify correctly all those who do not have the disease, which are ‘true negative’ results. Specificity of FNAC for diagnosis of malignancy means its ability to diagnose all those patients correctly who does not have malignancy.

The specificity of the present study is 91.30%. In other studies 86% to 100% percentage of sensitivity were observed. The accuracy means the portion of the correct results, true positive and true negative in relation to all cases studied. The accuracy of present study is 90.38%, which is nearer to study of Handa et al with accuracy 98.48%. In other study 80 to 90 percentage of accuracy were observed.

**Conclusion**

The fine needle aspiration cytology is a simple, safe, cost effective, time saving, and minimally invasive procedure which can be used as an outdoor patient procedure or as a

part of screening programme for the diagnosis of thyroid lesion with a high diagnostic yield, accuracy, sensitivity and specificity. FNAC is recommended as the first line investigation for the diagnosis of solitary thyroid nodule, especially in developing countries with limited resources, as it helps in differentiating lesions which help to distinguish lesions that require surgery and lesions that can be managed without surgery. FNAC diagnosis of Malignancy which is diagnosed in FNAC is having high significance and these patients should be managed by surgery. False negative results do occur in cases of benign lesions and these patients should be advised to follow up and if any clinical suspicion of malignancy arises even in the presence of benign FNAC result requires surgery. There are some limitations of FNAC and hence diagnosis and treatment should be based upon histopathology.

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