

Original Research Article

## Role of FNAC in Thyroid Diseases

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### ABSTRACT

**Objectives:** The objectives of this study were: 1] To determine the utility and diagnostic accuracy of FNAC of thyroid lesions performed at our institute.

2] To compare it with the values obtained from similar studies performed internationally.

**Study design:** A prospective study of FNAC of thyroid lesions performed on patients in the pathology department of our institute, Otorhinolaryngology Head and Neck surgery at B.D.B.A who later underwent thyroid surgery in our institute between January 2011 to August 2012.

**Methods:** A total of 51 patients underwent FNAC followed by thyroid surgery subsequently. Results of FNAC were compared to the final HP diagnosis. FNAC on all these patients was performed by experienced cytologists. The procedure was performed without local anesthesia using 23-25 gauge needles. Coagulation screening was not routinely done unless there was a pre-existing risk of bleeding. The procedure was well tolerated with no significant complication. Both air dried and wet fixed smears (fixed in 95% alcohol for 30 minutes) were made from the aspirated material and stained with May Grunwald Giemsa (MGG) and Haematoxlyn and Eosin (H & E) stains respectively and examined under a light microscope.

**Results:** Our study showed that thyroid nodules were 6.2 times more common in females than males. The false negative rate was 3.9% in cases of neoplastic lesions. The false positive rate was 13.3% for neoplastic lesions but none of these lesions were malignant. Sensitivity and accuracy of FNAC for detection of neoplasm in our study were 75% and 96.07%, respectively. The sensitivity, specificity, and accuracy of FNAC for solitary thyroid nodules were 75%, 100%, and 96.07%, respectively, in our study. In our study, sensitivity and specificity are found to be 75% and 100%.

**Conclusion:** We conclude that FNAC diagnosis of malignancy is highly accurate in 96.07% of the cases. A benign FNAC should be viewed with caution as false negative results do occur (3.9%) and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery.

**Keywords:** Thyroid, FNAC,

**Project summary:** We sought to determine the utility and diagnostic accuracy of FNAC of thyroid lesions performed at our institute and to compare it with the values obtained from similar studies performed internationally.

### INTRODUCTION

Thyroid diseases remain a problem of enormous magnitude in our country. The problem in clinical practice is to distinguish reliably the few malignant tumors from the

many harmless nodules so that a definitive pre-operative diagnosis allows planning of appropriate surgery and patient counseling. The prevalence of thyroid swelling is 4-10 % in the general population. <sup>[1]</sup> The majority

of clinically diagnosed thyroid nodules are nonneoplastic; only 5%–30% are malignant and require surgical intervention. [2] A variety of tests have been employed to separate benign from malignant thyroid nodules. [3,4] Laboratory investigations other than FNAC have limited role to find out the nature of the thyroid swelling. Isotope scanning can demonstrate the functional capacity but cannot predict the histopathological character. Only 5 to 15% of the cold nodules are malignant. [5,6] Ultrasonographic scanning can differentiate a solid from a cystic lesion but not a benign from a malignant one. Fine needle aspiration cytology (FNAC) is a simple, cost effective, time-saving and almost accurate diagnostic technique for investigation of thyroid swelling. The major pitfall of this procedure is that fine needle aspiration cytology cannot differentiate between follicular adenoma and follicular carcinoma. [6,7] Histopathological examination of the removed thyroid swelling is the most accurate way to determine the pathology. The main stem of diagnosis of nodular thyroid swelling is by clinical means, FNAC and histopathology. But they differ on many occasions and therefore this comparison is done with a view to make a correlation between FNC and histopathology. Previous studies show that the sensitivity of thyroid FNAC ranges from 80-98% and specificity from 58-100 %.

**AIMS AND OBJECTIVES:**

1. To determine the utility and diagnostic accuracy of FNAC of thyroid lesions performed at our institute.
2. To compare it with the values obtained from similar studies performed internationally.

**MATERIALS AND METHODS**

This is a prospective study of FNAC of thyroid lesions performed on patients in the pathology department of our institute who later underwent thyroid surgery in our

institute between January 2011 to August 2012. A total of 51 patients underwent FNAC followed by thyroid surgery subsequently. Results of FNAC were compared to the final HP diagnosis. FNAC on all these patients was performed by experienced cytologists. The procedure was performed without local anesthesia using 23-25 gauge needles. Coagulation screening was not routinely done unless there was a pre-existing risk of bleeding. The procedure was well tolerated with no significant complication. Both air dried and wet fixed smears (fixed in 95% alcohol for 30 minutes) were made from the aspirated material and stained with May Grunwald Giemsa (MGG) AND Haematoxlyn and Eosin (H & E) stains respectively and examined under a light microscope.

**Inclusion criteria**

Those patients presenting with thyroid swelling who underwent FNAC, thyroid surgery and histopathological examination.

**Exclusion criteria**

All the cases of thyroiditis were excluded. Those patients having FNAC done but didn't had thyroid surgery were excluded

**RESULTS**

Age Group	No. Of Patients	Percentage
0-20	3	5.88
21-40	30	58.82
41-60	11	21.56
61-80	7	13.72

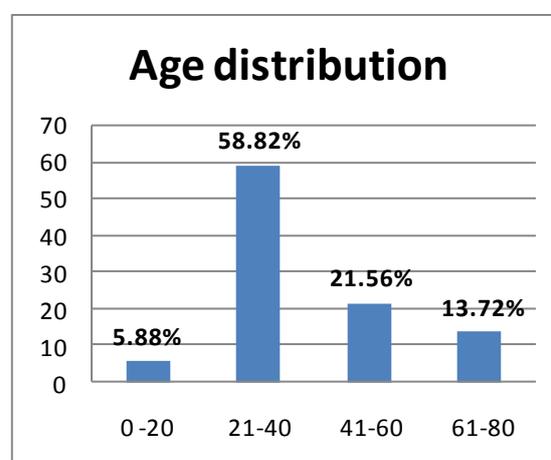


Chart 1. Bar chart showing age group distribution of patients.

Sex	No.	Percentage
Males	7	13.73
Females	44	86.27

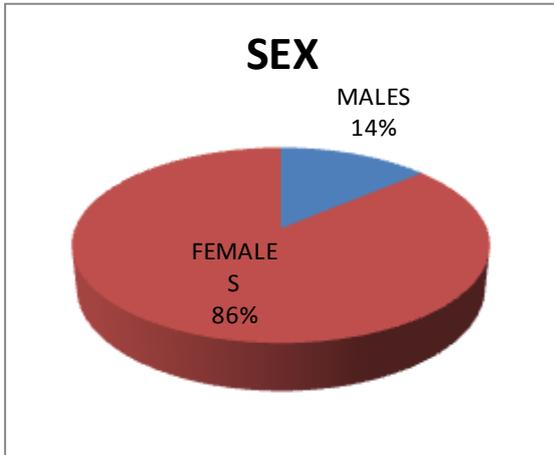


Chart 2. Pie chart showing sex distribution of patients.

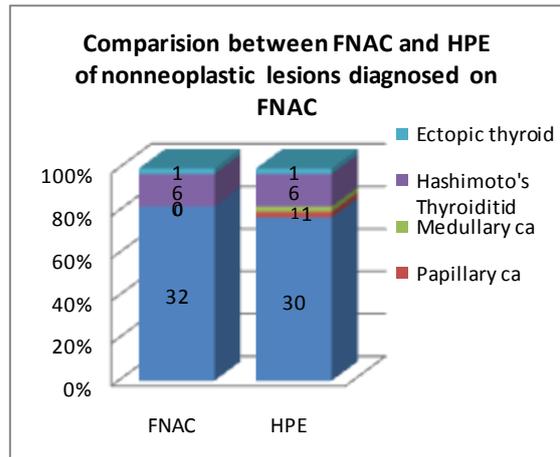


Chart 3. Bar chart depicting comparison between FNAC and HPE of nonneoplastic lesions diagnosed on FNAC

FNAC Report	No. of Pts. (n=39)	Histopathological Report	No. of Pts. (n=39)	Remarks
Colloid nodular goitre and benign cystic lesions	32	Colloid nodular goitre	30	True negative
		Papillary Ca	1	False negative
		Medullary Ca	1	False negative
Hashimoto's Thyroiditis	6	Hashimoto's Thyroiditis	6	True negative
Ectopic Thyroid	1	Ectopic Thyroid	1	True negative

FNAC Report	No. of Pts. (n=12)	Histopathological diagnosis	NO. OF PTS. (n=12)	REMARKS
Follicular adenoma	5	Follicular adenoma	5	True negative
Follicular neoplasm	1	Follicular carcinoma	1	True negative
Papillary Carcinoma	4	Papillary carcinoma	4	True positive
Medullary Carcinoma	2	Medullary carcinoma	2	True Positive

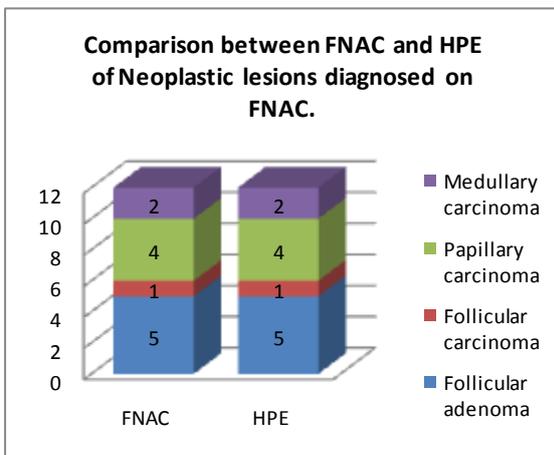


Chart 4. Bar chart depicting comparison between FNAC and HPE of Neoplastic lesions diagnosed on FNAC.

Test (FNAC)	Malignant on histopathology	Benign on histopathology
Positive test	True positive (TP) (6)	False positive (FP) (0)
Negative test	False negative (FN) (2)	True negative (TN) (43)

**Calculations:**

**Sensitivity:** This is the proportion of the patients with associated carcinoma and positive cytological diagnosis for malignancy on FNAC.

$$\text{Sensitivity} = \frac{TP}{TP + FN} \times 100$$

$$= \frac{6}{6 + 2} \times 100$$

$$= 75 \%$$

**Specificity:** This is the proportion of the patients without associated carcinoma and with a negative cytological result for malignancy on FNAC.

$$\begin{aligned}\text{Specificity} &= \text{TN} / \text{TN} + \text{FP} \times 100 \\ &= 43 / 43 + 0 \times 100 \\ &= \mathbf{100\%}\end{aligned}$$

**Accuracy:** The proportion of the correct results ( True positive and true negative) in relation to the total cases studied.

$$\begin{aligned}\text{Accuracy} &= \text{TP} + \text{TN} / \text{TOTAL} \times 100 \\ &= 6 + 43 / 51 \times 100 \\ &= \mathbf{96.07\%}\end{aligned}$$

**Positive Predictive Value (PPV):** The probability of having malignant thyroid disease following positive FNAC findings.

$$\begin{aligned}\text{PPV} &= \text{TP} / \text{TP} + \text{FP} \times 100 \\ &= 6 / 6 + 0 \times 100 \\ &= \mathbf{100\%}\end{aligned}$$

**Negative Predictive Value (NPV):** The probability of not having malignant thyroid disease following negative FNAC findings.

$$\begin{aligned}\text{NPV} &= \text{TN} / \text{TN} + \text{FN} \times 100 \\ &= 43 / 43 + 2 \times 100 \\ &= \mathbf{95.55\%}\end{aligned}$$

## DISCUSSION

FNAC contributes significantly to the preoperative investigation in patients with thyroid swelling but despite its well recognised value there are limitations to the technique. The first such drawback of FNAC is the high inadequate sample rate. [7,8] The second major limitation of thyroid cytology is its inability to distinguish follicular adenoma from follicular carcinoma. [9-12] This diagnosis requires detailed histological examination for vascular or capsular invasion and cannot be reliably made on routine FNAC specimens. [13-15] Hence, follicular neoplasm (lesion) is given as diagnosis in FNAC. Thyroid nodules were 4–9 times more common in females as compared to males. [16-17] Our study showed that thyroid nodules were 6.2 times more common in females than males. These results are close to Hussain and

Anwar, who found female to male ratio as 6.9 : 1. [4] We found that majority of patients (59%) were between 20-40 years of age. This is in accordance with the study by Dorairajan and Jayashree. [16] The false negative rate was 3.9% in cases of neoplastic lesions. It constitutes a serious limitation of this technique since these malignant lesions would go untreated. The incidence of false negative results is as low as 1% to as high as 30%. [12,18] The false positive rate was 13.3% for neoplastic lesions but none of these lesions were malignant. The false negative rate (FNR) is defined as the percentage of patients with benign cytology in whom malignant lesions are later confirmed on histopathology. Comparison of results of present study with various previous studies is shown in the Table below. The methods used for the calculation of sensitivity, specificity, accuracy, positive predictive value, and negative predictive value were similar to previous studies. [19,20] Sensitivity and accuracy of FNAC for detection of neoplasm in our study were 75% and 96.07%, respectively, whereas they were 76% and 69%, respectively, in a study by Cusick et al. [20] The sensitivity, specificity, and accuracy of FNAC for solitary thyroid nodules were 75%, 100%, and 96.07%, respectively, in our study whereas sensitivity, specificity, and accuracy of FNAC were 93.5%, 75%, and 79.6%, respectively, in a study by Bouvet et al. [9] and 79%, 98.5%, and 87%, respectively, in a study by Kessler et al. [21] In our study, sensitivity and specificity are found to be 75% and 100% whereas it is 98% and 100% in a study by Nggada et al. [5] similarly, it was found to be 90% and 100% in a study by Abdulqadir et al. [22] The incidence of malignancy in this study was 23.5% which is in accordance with study by Dorairajan and Jayashree. [16] The incidence of malignancy can be as high as 43.6%. [17]

STUDY	YEAR	NO. OF PTS.	SENSITIVITY	SPECIFICITY	ACCURACY	PPV	NPV
AL-SAYER ET AL	1985	70	86	93	92	80	96
CUSICK ET AL	1990	283	76	58	69	72	64V
BOUVET ET AL	1992	78	93.5	75	79.6	85.3	88.2
AFROZE ET AL	2002	170	61.9	99.3	94.5	92.8	94.7
KO HM ET AL	2003	207	78.4	98.2	84.4	99	66.3
KESSLER ET AL	2005	170	79	98.5	87	98.7	76.6
PRESENT SERIES	2014	51	75	100	96.07	100	95.55NPV

## CONCLUSION

We conclude that FNAC diagnosis of malignancy is highly accurate in 96.07% of the cases. A benign FNAC should be viewed with caution as false negative results do occur (3.9%) and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery.

## ABBREVIATIONS:

FNAC- Fine needle aspiration cytology  
MGG-May Grunwald Giemsa  
H & E-Haematoxylin and Eosin  
HPE- Histopathology  
TP-True positive  
TN-True negative  
FP-False positive  
FN-False negative  
PPV-Positive predictive value  
NPV-Negative predictive value  
CA-Carcinoma

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