

## Correlation of Cytomorphological Pattern and Thyroid Hormone Profile: Role of Fine Needle Aspiration Cytology (FNAC) in Reducing the Surgical Intervention of Thyroid Lesions

Gummalla Swetha<sup>1</sup>, G Santhoshi<sup>2</sup>, Vijayalakshmi Koduri<sup>3</sup>, Byram Bheeshma<sup>4</sup>

<sup>1</sup>Assistant Professor, Department of Pathology, RVM Institute of Medical Sciences and Research Centre, Mulugu, Siddipet, Telangana

<sup>2</sup>Associate Professor, Department of Pathology, Institute of Medical Sciences and Research Centre, Mulugu, Siddipet, Telangana

<sup>3</sup>Professor, Department of Pathology, RVM Institute of Medical Sciences and Research Centre, Mulugu, Siddipet, Telangana

<sup>4</sup>Professor & HOD, Department of Pathology, Institute of Medical Sciences and Research Centre, Mulugu, Siddipet, Telangana

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Corresponding author: Dr. G. Santhoshi,

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### Abstract

**Background:** Fine needle aspiration cytology (FNAC) of the Thyroid is over half a century old and has been shown to be superior to clinical, radionucleotide or thyroid ultrasound assessment alone. It is the most accurate, cost-effective, and simplest screening test for rapid diagnosis of thyroid nodules. Evaluation of both cytomorphological pattern and thyroid hormone profile aids in early detection of various thyroid diseases there by reducing surgical intervention.

**Aims and Objectives:** To correlate role of thyroid hormone profile (T3, T4 and TSH) with cytology results, in various thyroid disorders like diffuse nontoxic goiter, diagnosis of solitary/dominant thyroid nodule and thyroid malignancy. To evaluate the clinical correlation with Euthyroid, Hypo and Hyperthyroid picture in various disorders. To calculate the percentage of surgical intervention for various thyroid disorders in view of FNAC findings in correlation with thyroid profile.

**Material and Methods:** All patients who underwent thyroid FNAC from July 2020 to July 2022 have been included in the study only if Thyroid profile has been done. The various lesions have been categorised as Euthyroid, Hypothyroid and Hyperthyroid as per the hormone analysis results. The FNAC findings have been reported as per the Bethesda System and classified as per the latest WHO guidelines.

**Results:** Predominantly affected gender was females (91.25%), most common affected age group was 41-50 years (30%), 88.75% were euthyroid patients, most common benign lesion on FNAC was nodular goiter (33.75%), malignant lesion was papillary thyroid carcinoma (18.75%), thyroid profile in various thyroid lesions were euthyroid.

**Conclusion:** FNAC along with thyroid hormone profiles helps clinician in early detection and accurate diagnosis of various thyroid lesions and to determine course of therapy in the management of thyroid nodules and possibility to reduce surgical intervention.

**Keywords:** FNAC thyroid, Thyroid profile, Surgical intervention, Euthyroid

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## Introduction

Fine needle aspiration cytology (FNAC) of Thyroid is over half century old [1]. FNAC of thyroid has been increasingly utilized for the investigation of thyroid lesions in the past five to six decades [2-6]. It is superior to clinical, radionuclide or ultrasound assessment alone [1]. It is safest, most accurate diagnostic tools in thyroid lesions [7,8]. FNAC cytology has accuracy rate exceeds 92% [9].

Goitre is usually due to various causes leading to hyperplasia and neoplasia, with or without hyper or hypothyroidism [10]. Sub Himalayan region of India has world's biggest goiter belt [1]. Clinicians evaluate thyroid dysfunction by measuring serum TSH, T3 and T4 that establishes euthyroidism, hyperthyroidism and hypothyroidism [10].

FNAC is an out-patient procedure used in primary diagnosis of thyroid swellings [1]. Correlation of both cytomorphological pattern and thyroid hormone profile aids in early detection thereby reducing surgical intervention [1]. The present study focused to assess cytological features of thyroid nodules in conjunction with the hormone profile of the patient and their treatment.

## Objectives

- To correlate cytology results with thyroid hormone profile in various thyroid disorders.
- To evaluate clinical correlation with euthyroid, hypo and hyperthyroid picture in various thyroid disorders.
- To calculate percentage of surgical intervention for various thyroid disorders in view of FNAC findings in correlation with thyroid profile.

## Material and Methods

Study design was a prospective study conducted during the period July 2020 to June 2022 on 80 cases in the Department of Pathology, RVM Institute of Medical Sciences and research centre, Mulugu, Siddipet. Patients referred for FNAC by Department of General Medicine and General surgery are included in the study whose thyroid hormonal status has been evaluated. Total 106 patients have done FNAC, out of which 80 patients underwent surgery in the same hospital.

Fine needle aspiration was done with a 22 gauge needle attached to a 10cc disposable syringe. The specimen was taken with minimum passes (to minimize hemorrhage) without needle withdrawal and under constant negative pressure, smears are made after fixation. Cytomorphology evaluation carried out on Haematoxylin and Eosin and Giemsa stained smears. Statistics was compiled and p value calculated using SPSS software version 22. Thyroid profile was done using Beckman coulter.

## Results

In the present study, predominantly affected gender was females accounting for 91.25% and affected males were 8.75%. Affected age group was in fifth decade (4-50) with 30% followed by fourth decade (31-40) with 25%. Least affected age groups are in extremes of age i.e. >70 years 1.25% and <10 years none.

There were 83.75% of euthyroid patients out of which 77.5% were females and 6.25% were males. Out of 15% hyperthyroid patients 12.5% were females and 2.5% were males and 1.25% of hypothyroid patients were females.

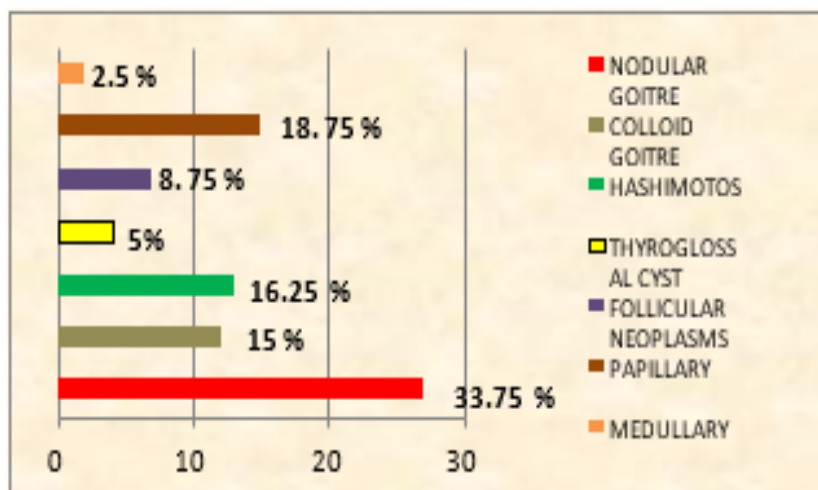


Figure 1: FNAC diagnosis

On FNAC diagnosis, among benign lesions most common was nodular goiter accounting for 33.75% followed by hashimotos thyroiditis 16.25% and colloid goiter 15%. In malignant lesions most common was papillary thyroid carcinoma 18.75% followed by follicular neoplasms 8.75% (Fig 1).

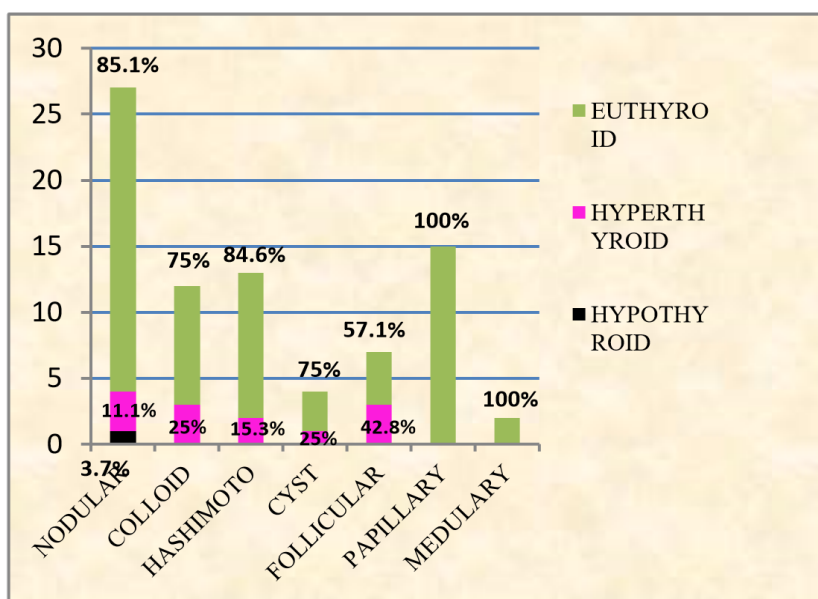
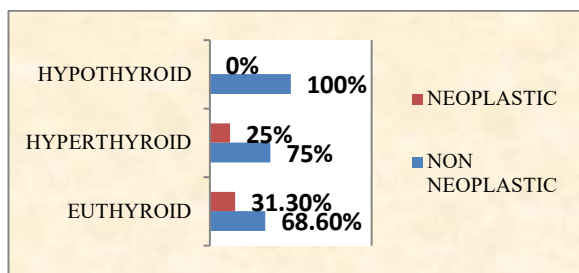


Figure 2: Thyroid profile in different thyroid lesions

Fig 2 explains about thyroid profile in different thyroid lesions. Maximum number of patients were euthyroid. In nodular goiter 85.1%, colloid goiter and thyroglossal cyst 75%, hashimotos 84.6%, follicular neoplasms 57.1%, papillary and medullary thyroid carcinoma 100% patients were euthyroid. In nodular goiter 11.1%, colloid goiter and thyroglossal cyst 25%, hashimotos 15.3%, follicular neoplasms 42.8% patients were hyperthyroid. Nodular goiter has shown 3.7% patients were hypothyroid.

Diagnosis according to the different age groups- nodular goiter is most commonly seen in the age group between 31-40 with 33.3%, colloid goitre, hashimotos, thyroglossal cyst and papillary thyroid carcinoma in the age 41-50 with 41.6%, 46.1%, 50%, 46.6% respectively, follicular neoplasms in the age 51-60 with 41.8% and medullary thyroid carcinoma in the age 21-30 and 31-40 with 50% each

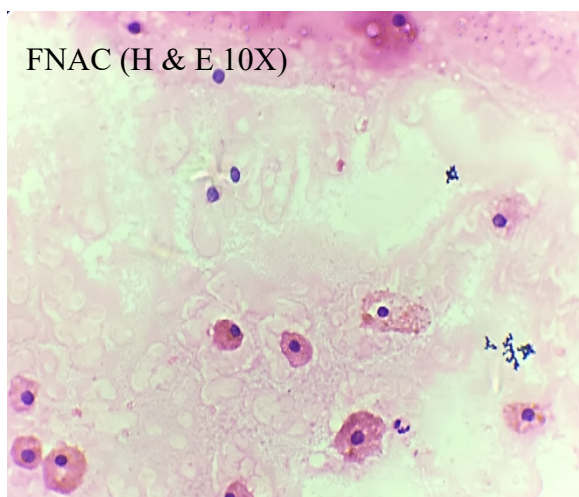


**Figure 3: Hormonal status in neoplastic and non-neoplastic thyroid lesions**

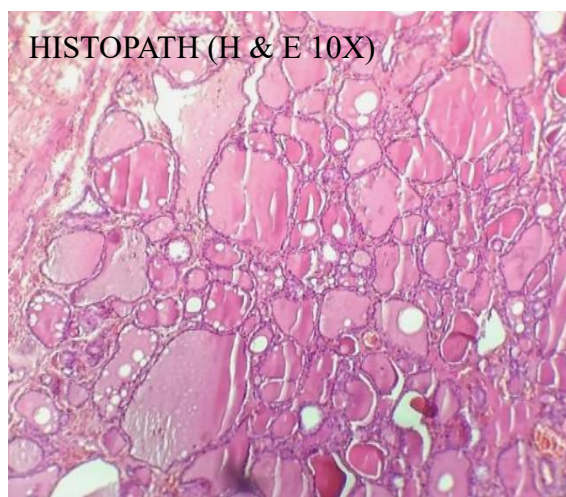
Figure 3 explains about the hormonal status in non-neoplastic and neoplastic thyroid lesions. In hypothyroid patients all were non-neoplastic lesions, in hyperthyroid patients 75% were non-neoplastic and 25% were neoplastic lesions and in euthyroid patients 68.6% were non-neoplastic and 31.3% were neoplastic lesions.

**FNAC findings**

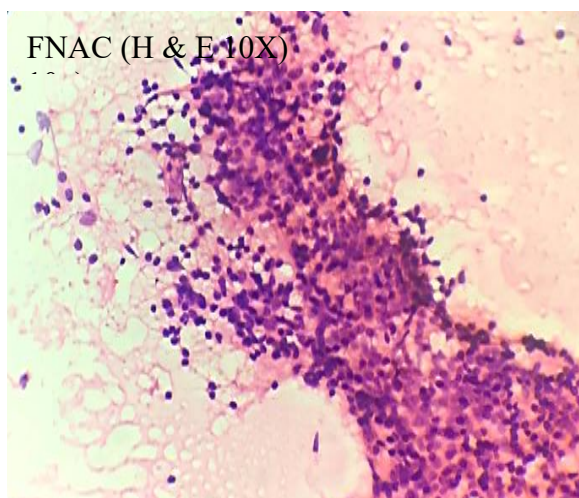
**Nodular Goitre**



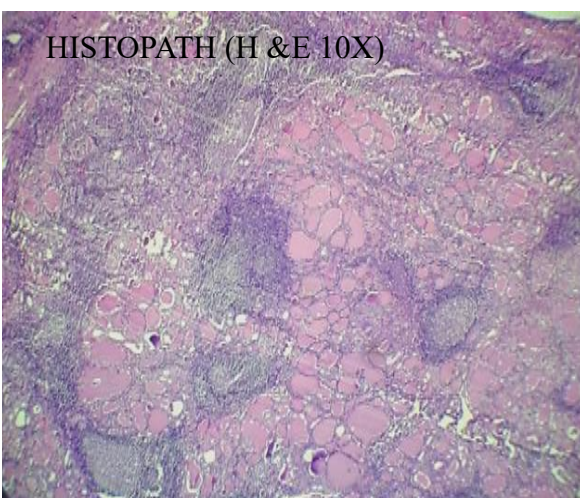
**A: FNAC- Nodular Goitre**



**B: HPE- Nodular Goitre**

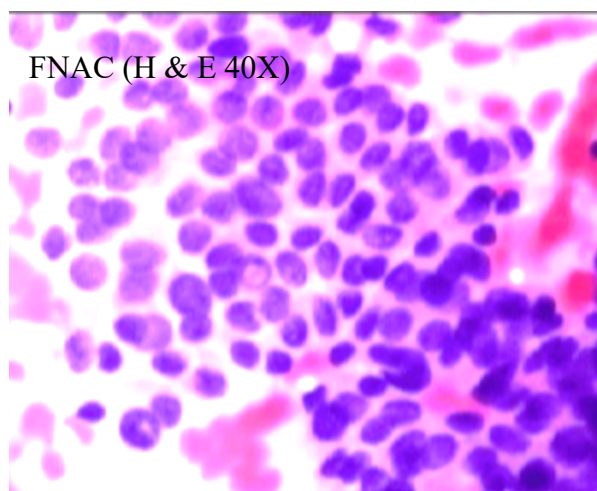


**C: FNAC- Hashimoto's Thyroiditis**

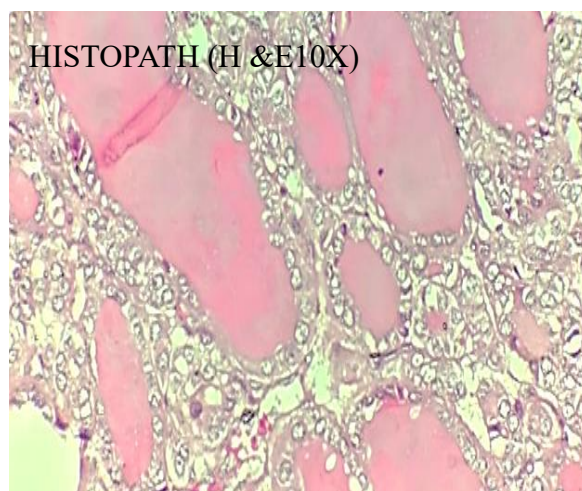


**D: HPE- Hashimoto's Thyroiditis**





**E: FNAC-Papillary Thyroid Carcinoma  
(Arrow – intranuclear cytoplasmic inclusion)**



**F: HPE Papillary Thyroid Carcinoma**

### Discussion

Thyroid lesions are a common problem encountered in clinical practice [11]. Thyroid nodules are most common occurring in 4% of population in age between 30 and 60, many are benign, only 10%-20% are malignant. Thyroid ultrasound can distinguish solid from cystic lesions. Thyroid isotope scans using technetium-99 classify nodules as hot and cold [1].

Thyroid enlargement needs thorough investigation, mainly to rule out malignancy and thyroiditis. The recommendation of American thyroid association (ATA) 2015 state that any thyroid nodule > or equal to 2cm, ultrasound should be the initial investigation followed by FNAC [11]. Hormonal evaluation of patients with thyroid lesions is essential for proper management of the patients [12].

To come to the diagnosis of FNA thyroid lesions, various cytomorphological variables like cellularity, pattern, morphology of follicular cells, hurthle cells, foam cells, giant cells, inflammatory infiltrate and background of the smear were evaluated. In the present study most common affected age group was fifth decade i.e. 41-50, whereas in other studies like Suman *et al* [13], Leonard *et al* [14],

Silverman *et al* [15] and Patel *et al* [16] most common age group affected ranged from 20-50 years.

Nodular goiter as most common nonneoplastic lesion with 33.75% similar to studies done by Sood *et al* [18] and Mahar *et al* [17] and most common neoplastic lesion as papillary thyroid carcinoma with 18.75% similar to studies done by Mahar *et al* [17], Sood *et al* [18] and Jayaram *et al* [19].

In the present study predominant lesions were non-neoplastic accounting for 70% similar to the studies done by Junudevi *et al* [9] 94.4%, Siddagowde *et al* [11] 95.1% and Ritica *et al* [1] 94%. Predominant patients were euthyroid accounting for 83.75% followed by hyperthyroid similar to the studies done by Junudevi *et al* [9] 70.9%, Siddagowde *et al* [11] and Ritica *et al* [1]. In the present study the relationship between hormonal status and cytomorphology was statistically significant i.e. <0.05 similar to studies done by Singh *et al* and Paudel *et al* [12].

### Conclusion

FNAC is an easy technique of obtaining material for examination with little discomfort to the patient. It is a simple, safe and cost-effective diagnostic modality for

thyroid lesions with high specificity and accuracy, especially in developing countries like India. It helps in rapid diagnosis of non-neoplastic, neoplastic and inflammatory lesions. In the present study most common age group affected was 5 decades with female predominance. Most common non neoplastic lesion was Nodular goitre (33.75%) and neoplastic lesion was papillary thyroid carcinoma (18.75%), majority of patients were euthyroid with 83.75%.

The relationship between the cytomorphology and hormonal status was statistically significant <0.05%. FNAC along with thyroid hormone profiles helps clinician in early detection and accurate diagnosis of various thyroid lesions and to determine course of therapy in the management of thyroid nodules and possibility to reduce surgical intervention.

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