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Cytomorphological Correlational Study of Thyroid Disorders with Imaging and Biochemical Serum Markers

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INTRODUCTION

The thyroid disorders are diagnosed through ultrasonography and USG guided fine-needle aspiration cytology (FNAC) worldwide with implementation of the Bethesda system of reporting Thyroid cytology as an excellent less invasive primary line of investigation.[1] The thyroid is an important and prime endocrine organ. The swelling of the thyroid gland is the commonest manifestation of various disorders affecting the thyroid, including non-neoplastic lesions and neoplastic both benign and malignant disorders.[2] Bethesda categorization in FNAC aids in the decision for the management along with thyroid profile and radiological imaging. The Bethesda system of reporting thyroid cytology after FNAC is a uniform reporting system of thyroid cytology. FNAC is cheap, cost-effective, less invasive and less time-consuming.[3,4] The thyroid gland composed histologically of 20-40 thyroid follicles, they produce triiodothyronine(T3) and thyroxin (T4) which are in turn regulated by thyroid-stimulating hormone (TSH) which is produced by the anterior pituitary gland. Thyroid lesions can be categorized as euthyroid, hypothyroid or hyperthyroid based on T3, T4, and TSH levels.[5] The current goal in thyroid nodule evaluation is to determine whether it is benign or malignant. High resolution ultrasonography (USG) is the first line of investigation in evaluation of thyroid nodules. Thyroid imaging reporting and data system (TIRADS) is an USG-based risk stratification system for classification of thyroid nodules. Subjects with high-risk category of TIRADS undergo USG-guided fine needle aspiration cytology. Conventional FNAC usually yields fewer results compared to USG-guided FNAC.[1] Data regarding sonographic classification of thyroid nodule and its cytological association with respect to biochemical findings and final histopathological diagnosis is less studied in the Indian population. Hence, justifying the correlation of various thyroid lesions involving FNAC, biochemical markers, and imaging by USG.

The Bethesda System for Reporting Thyroid Cytopathology is divided into six categories[6]:

I. Non diagnostic/inadequate
II. Benign
III. Atypia /follicular lesion of undetermined significance
IV. Follicular neoplasm or suspicious of follicular neoplasm
V. Suspicious of malignancy
VI. Malignant.

The American College of Radiology Thyroid Imaging Reporting and Data Systems (TIRADS) is a 5point classification[7]:

1. Normal thyroid
2. Benign
3. Probably benign
4. a. Low suspicious b. High suspicious with one or two signs and no adenopathy
5. High suspicious with ≥3 signs and/or adenopathy.

AIM AND OBJECTIVES OF THE STUDY:

1. To study the cytomorphological features of thyroid lesions based on Bethesda System-2014.
2. To correlate the cytomorphological features with radiological imaging based on TIRADS classification-2017
3. To correlate the cytomorphological features with biochemical markers and histopathological findings if available.

MATERIALS AND METHODS:

Source of data: The present study of cytology, biochemical markers, radiology and histopathology of thyroid disorders was carried out in the tertiary care centre north Karnataka, in the department of Pathology. Includes All patients visited with thyroid associated problems to the clinical departments, from March-2021-April-2022.

METHOD OF COLLECTION OF DATA (INCLUDING SAMPLING PROCEDURE, IF ANY):

Each patient's age, gender, biochemical markers, FNAC and USG findings were recorded from the reports. Histopathology findings were noted wherever available.

STUDY DESIGN: Observational, retrospective, correlational study.

Sample size: - Sample size was calculated based on formula

$n \geq (Z^2) \times (100-p/d^2)$

$n \geq 1.96 \times 1.96 \times 3.2 (100-3.2) / 5^2$

$n \geq 1.96 \times 1.96 \times 3.2 (96.8)/25$

$n \geq 1189.9740 /25$

$n \geq 47.59$

Total cases selected were more than n value (70)

Where, n= Sample size. Z = 1.96 For 95% Confidence, d= margin of error – 5%

P= Percentage of prevalence of diseases of thyroid in India.

Inclusion criteria: All cases of thyroid and neck swellings of all age groups, from KBNTGH, Khaja Banda Nawaz University, Gulbarga, from March-2021-April-2022.

Exclusion criteria:

All the cases recognized as Bethesda category I.

Ethical clearance: Study has been approved by the Institutional Ethics Committee.

Observation and results:

This is a single centre retrospective Correlational study on 70 patients of thyroid disorders. Out of 70 cases majority (32.8%) of the cases were between the age group of 31 to 40 years. Out of 70 cases 63(90%) patients were females and 7 (10%) were males. The FNAC interpretations were classified under Bethesda classification 2014. Majority of the cases 57 (81.4%) were benign. Among benign lesions colloid goitre was accounted for majority of the cases 31 (44.2%) followed by Hashimoto's thyroiditis 16(22.8%) followed by adenomatoid nodule 10 cases (14.2%). 4 cases (5.7%) belong to category III. 3 cases (4.2%) belong to category IV. One case (1.4%) belonged to category V. 5 cases 7.4% belong to category VI. Out of these 5 cases, 4 cases were of papillary carcinoma one case was of medullary carcinoma thyroid. (Table:1)

Majority (32.8%) of the patients were between 31-40 years.

Around (90%) of the patients were females and around (10%) of the patients were males.

Biochemical serum markers T3, T4 and TSH findings were noted in all the 70 cases. Out of 70 cases 53 cases (75.7%) were euthyroid, 5 cases (7.1%) where hyperthyroid, 12 cases (17.14%) were hypothyroid. Majority of the patients with colloid goitre and adenomatoid nodule were found to be euthyroid whereas most patients of Hashimoto's thyroiditis presented with hypothyroidism. Majority of the malignant cases were euthyroid. 3 malignant cases presented with hyperthyroidism. (Table:2).

Ultrasonography findings based on TIRADS classification were noted. Out of 70 cases 54 cases (77%) were from TIRADS-2, 7 cases (10%) were from TIRADS-3, 3 cases (4.28%) from TIRADS-4a, 2 cases (2.8%) from TIRADS-4b, 4 cases (5.17%) from TIRADS-5. (Table: 3)

Out of 70 cases, 11cases were available for histopathological correlation, 2cases were of multinodular goitre, 1-Hashimoto's thyroiditis, 1-Hurthle cell adenoma, 1-Parathyroid adenoma, 1-Follicular adenoma, 4-Papillary thyroid carcinoma, 1-Medullary carcinoma.

DISCUSSION

The most common age group in this study was 31-40 years. This was similar to the observation made by Bhatia et al[8]. and Chaudhary et al[9] in their study.

In the present study female predominance was observed this is similar to the observation made by Bhatia et al and other studies in literature[8].

Out of 70 cases majority of the cases were euthyroid in this study, this finding was similar to the study done by Vaishali et al[10], and Siddegowda et al[11].

In this study majority the cases with Hashimoto's thyroiditis where hypothyroid, this is similar to the study by Bhatia et al[8] and Singh N et al[12]**.**

Majority of the malignant cases where euthyroid however, 2 out of 4 cases of papillary thyroid carcinoma were hyperthyroid. this is similar to the study done by Kadia et al[13].

Out of 70 cases majority of the cases i.e., 54 cases (81.4%) belonged to Bethesda category II, this finding was similar to the study done by Vaishali et al[10] and other studies in the literature. Among benign lesions colloid goitre was accounted for majority of the cases 31 (44.2%). This was followed by Hashimoto's thyroiditis (22.8%). This was similar to the findings in the study done by Sood en at al.[14] 10 cases (14.2%) were of adenomatoid nodule.

Out of 70 cases for cases 5.7% belong to Bethesda category III. This was similar to the study done by Fatemeh Hajmanoochehri et al[15]. Out of 70 cases, 3 cases 4.2% belong to Bethesda category IV. This was similar to the study done by Mondal SK et el[16]. Of 70 cases one case (1.4%) belonged to Bethesda category V. This was similar to the study done by Vaishali et al[10].Out of 70 cases 5 cases (7.1%) belonged to Bethesda category VI. This was similar to the study done by JOVY et al[17] and Yang J et al[18]. Out of 5 malignant cases 4 were papillary thyroid carcinoma and one was medullary carcinoma thyroid. In this study majority of the malignant cases were of papillary thyroid carcinoma. This was similar to the study done by Bakshi J et al[19] and other studies in the literature.

Out of 70 cases 54 cases (77%) were from TIRADS-2 and none of the case turned out to be malignant on FNAC. In contrast 2 cases classified as TIRADS 4 were turned out to be Bethesda II. This was similar to the study done by Vargas-Uricoechea et al[20]. None of the cases classified as TIRADS 5 turned out to be Bethesda category II. This study showed highest concordance among both the lowest risk (Bethesda category II and TIRADS -2) and higher risk categories (Bethesda category VI and TIRADS- 5) which is consistent with the study of Vargas-Uricoechea et al[20] and other studies. (Figure.1).

Out of 70 cases 11 cases were available for histopathology (HP) correlation. Out of 11 cases 2 were multi nodular goitre, one Hashimoto's thyroiditis.

Three cases which were diagnosed as Bethesda category IV (Follicular neoplasm) turned out to be Hurthle cell adenoma, parathyroid adenoma and follicular adenoma. One case which was Bethesda category V turned out to be papillary thyroid carcinoma. Out of 5 cases from Bethesda category VI, 4 were papillary carcinoma and one was medullary carcinoma thyroid.

One case which was reported on USG as degenerated heterogenous nodules, TIRADS-3, turned out to be follicular adenoma (Figure.2), on conventional FNAC. On USG guided FNAC it was reported as papillary thyroid carcinoma (Figure.3). Hemithyroidectomy was performed and the gross specimen showed 2 separate nodules (Figure.4). Microscopy from one nodule revealed the features of papillary thyroid carcinoma and from the other nodule features of follicular adenoma were observed. Ultrasonography guidance allows targeting of non-palpable nodules and the most suspicious site in the nodules.

Out of the 4 cases of papillary thyroid carcinoma (PTC), one was follicular variant, one was Hyalinizing trabecular variant, and one case of papillary thyroid carcinoma had spread to submental lymph node. In this study majority of the malignant cases were papillary thyroid carcinoma. This is similar to other studies in the literature[19].

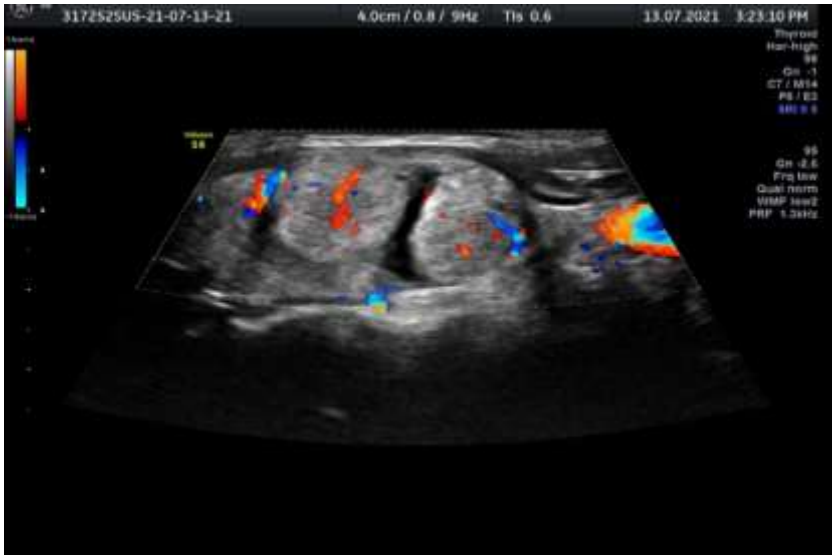
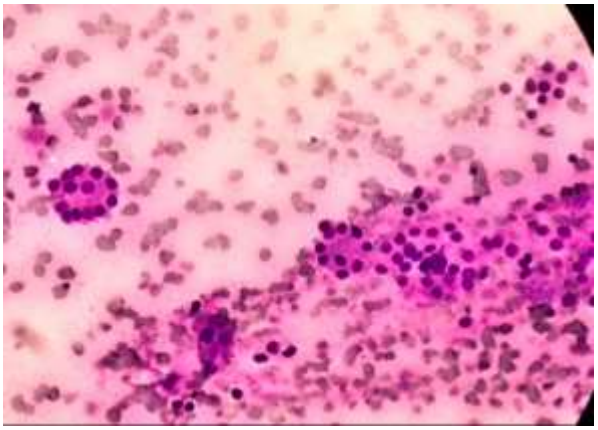
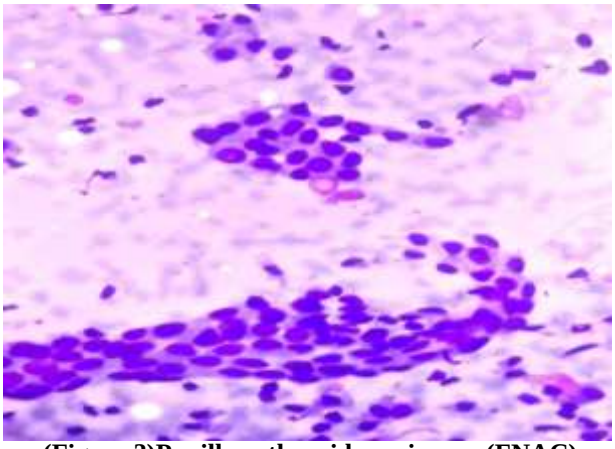


Figure.1 TIRADS-5 Well defined, heterogenous nodule in the right lobe of thyroid



(Figure.2) Follicular adenoma (FNAC)



(Figure.3)Papillary thyroid carcinoma (FNAC)

(Figure.4). Hemithyroidectomy specimen: Follicular adenoma upper end and Papillary carcinoma lower end

CONCLUSION

According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases[21]. USG and FNAC are equally sensitive in in diagnosing thyroid disorders. Though FNAC is more specific (90%). Thus, surgery is needed only on decision taken based on reporting by TIRADS and Bethesda minimising the number of invasive techniques and to confirm certain category of diseases. Histopathology is the gold standard in confirming the diagnosis and to know the extent of involvement. The correlation of biochemical parameters helps in understanding the disease process and their clinical outcome hence the study needed. Conventional FNAC usually yields fewer results compared to USG-guided FNAC. Data regarding sonographic classification of thyroid nodule and its cytological association with respect to biochemical findings and final histopathological diagnosis is less studied in the Indian population. Hence, justifying the correlation of various thyroid lesions involving FNAC, biochemical markers, and imaging by USG.

CONFLICTS OF INTEREST: None.

ETHICAL CLEARANCE: Obtained from Institutional Ethical Committee

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