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Original Research Article

# CYTOMORPHOLOGICAL EVALUATION OF THYROID LESIONS BASED ON BETHESDA CLASSIFICATION IN ENDEMIC GOITER BELT – KASHMIR

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**ABSTRACT**

**Background:** Kashmir belongs to the largest goiter belt of world characterized by endemic goiter which is nodular enlargement of thyroid. Thyroid nodules are evaluated by FNAC and categorized into different diagnostic categories based on Bethesda classification. **Aims and objective**: To study the spectrum of cytomorphology of thyroid lesions according to Bethesda system.
**Material and Methods**: A two year retrospective study was done in the Department of Pathology. A total of 163 cases were retrieved and categorized in diagnostic categories based on Bethesda system of reporting thyroid cytology.
**Results**: It was observed that 57% cases belonged to category I, followed by category VI with 11.6% cases. Category I and V each had 9.8% cases, while as, category III and IV had 3.6% and 7.9% cases respectively.
**Conclusion**: Benign cases were common lesions observed with preponderance of goiter. Papillary carcinoma of thyroid was common malignancy noted.
**Keywords:** Bethesda, cytomorphology, FNAC, Goiter, kashmir, Thyroid lesions.

## INTRODUCTION

The commonest endocrine disorder in the world is thyroid disease with India being no exception to it. About 42 million people in India suffer from thyroid diseases.[1] The "Himalayan goiter belt", which extends over 2400 kilometers, is one of the largest goiter belt stretching from Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttar Pradesh, Bihar, West Bengal, Assam, Arunachal Pradesh, Nagaland, Mizoram, Meghalaya, Tripura and Manipur. This belt is characterized by deficiency of iodine in the soil resulting in prevalence of goiter.[2,3]

Goiter is categorized either as diffuse, when there is diffuse enlargement of the thyroid gland and nodular when one or more nodules of different sizes are palpated.[4,5] If only one nodule is palpated, it is called as solitary thyroid nodule, whereas if there are multiple nodules, it is defined as Multi Nodular Goiter (MNG). Furthermore, MNG can be classified as sporadic or endemic based on epidemiological criteria. It is defined as endemic if the prevalence is more than 10% in a geographic area.[6] In endemic areas goiter presents commonly as thyroid nodules with increased prevalence in females. About 4% of patients present with evident nodules on anterior aspect of neck. However, with the use of ultrasound, this incidence of thyroid nodules reaches up to 50%.[7,8] Thyroid swellings are an important clinical problem in the population but most of them are non-neoplastic and do not require surgery. Less than 5 % of thyroid nodules are malignant.[3,9] Surgical excision of thyroid makes individual dependant on thyroid hormones replacement, adding cost to living and also risk of various intraoperative & post-operative complications. Fine Needle Aspiration Cytology (FNAC) in conjunction with ultrasonography is considered as the best initial diagnostic test for thyroid swelling in identifying the

various lesions with good precision. FNAC is simple, safe, speedy, minimally invasive and cost effective procedure that can differentiate neoplastic from non neoplastic lesions. The accurate preoperative diagnosis of benign condition helps in avoiding unnecessary surgery. The Bethesda system of thyroid cytology reporting makes the reports clinically relevant thereby helping the clinicians to take appropriate therapeutic interventions.[10,11] Recent studies indicate a similar likelihood of malignancy in MNG and solitary nodules, contrary to earlier theories that strongly associated solitary nodules with malignancy.[4]

**Aims & Objectives**

To study the spectrum of cytomorphology of thyroid lesions according to Bethesda system in tertiary care centre of Kashmir valley falling in world's largest goiter belt.

## MATERIALS AND METHODS

The retrospective study was carried out in the Department of Pathology, Sheri Kashmir Institute of Medical Sciences Medical college and Hospital (SKIMS - MCH), Bemina (District Srinagar) Kashmir for a period of 2 years from January 2023-Dec 2024. The clinical history and examination were taken from the requisition forms of the patients retrieved from the records of our department. FNAC had been done either blindly or was guided by ultrasonography. Cases where the reporting had not been done according to the Bethesda system were retrieved and slides were reviewed and categorized according to the Bethesda system. A total of 163 cases were retrieved and categorized according to the Bethesda system of thyroid cytology and reported into six diagnostic categories given in Table 1.

**Table 1: The Bethesda system of thyroid cytology reporting**

| Diagnostic category | Cytological diagnosis | Risk of malignancy, % | Usual management |
|---|---|---|---|
| I | Nondiagnostic or unsatisfactory | 1-4 | Repeat FNA with ultrasound guidance |
| II | Benign | 0-3 | Clinical follow up |
| III | AUS/FLUS | 5-15 | Repeat FNA |
| IV | FNS/SFN | 15-30 | Surgical lobectomy |
| V | Suspicious for malignancy | 60-75 | Near total thyroidectomy/ lobectomy |
| VI | Malignant | 97-99 | Near total thyroidectomy |

**FNA**: Fine-needle aspiration; **AUS/FLUS**: Atypia of undetermined significance or follicular lesion of undetermined significance; **FNS/SFN**: Follicular neoplasm or suspicious for follicular neoplasm

The category I (Non-diagnostic or Unsatisfactory) included cases which on smears showed cyst fluid only or acellular smear or else obscured morphology, clotting artifact, etc. The category II (Benign) shows cytomorphology consistent with a Benign Follicular nodule (includes adenomatoid nodule, Colloid Nodule, etc) or Lymphocytic (Hashimoto) Thyroiditis or Granulomatous (subacute) Thyroiditis. The category III (Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance) has architectural or nuclear atypia in cells but not enough to be put in any other category. The category IV represents cytomorphological features of Follicular Neoplasm or Suspicious for a Follicular Neoplasm- (Specified if Hürthle cell). The category V is Suspicious for any Malignancy (Papillary carcinoma, Medullary Carcinoma, Metastatic Carcinoma, and Lymphoma). The category VI are cases which are definitely Malignant on cytomorphology ( Papillary Thyroid carcinoma, Poorly Differentiated Carcinoma, Medullary Thyroid Carcinoma, Undifferentiated (anaplastic) Carcinoma, Squamous Cell Carcinoma Carcinoma, Metastatic Carcinoma, Non-Hodgkins Lymphoma).

## RESULTS

In total 163 cases were retrieved among which 29 were males and 134 females making male to female ratio of 1: 4.62. Diffuse nodularity of thyroid was observed in 80 cases while solitary nodule on right lobe was noted in 56 patients, on the left lobe in 26 patients and on isthmus in one patient.

**Table 2: Distribution of cases in different categories**

| Category | No of cases | Percentage |
|---|---|---|
| I | 16 | 9.8% |
| II | 93 | 57% |
| III | 6 | 3.6% |
| IV | 13 | 7.9% |
| V | 16 | 9.8% |
| VI | 19 | 11.6% |

**Table 3: Distribution of cases in category II**

| Diagnosis | No. of cases | Percentage |
|---|---|---|
| Colloid Nodule (CN) | 43 | 46.2% |
| Nodular Follicular Hyperplasia (NFH) | 23 | 24.7% |
| Lymphocytic Thyroiditis (LT) | 25 | 26.8% |

| | | |
|---|---|---|
| Subacute Thyroiditis (SAT) | 2 | 2.1% |
| Total | 93 | |

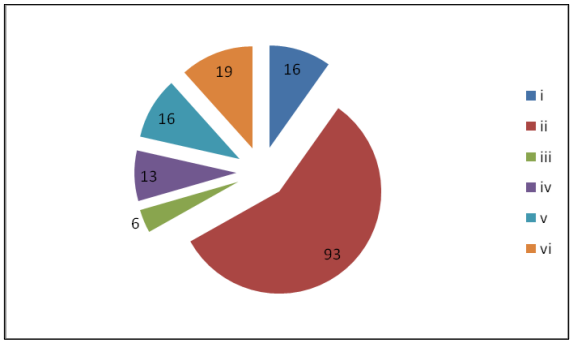


**Figure 1: Pie chart showing distribution of cases in each category**

While evaluating the results, the commonest pattern noted was of category II, which showed that most lesion were benign on FNAC and did not require surgical intervention. 93 cases included Colloid nodule, Nodular Follicular Hyperplasia, Lymphocytic Thyroiditis and Subacute Thyroiditis.


**Figure 2: Pie chart shows distribution of cases in category II**

CN: Colloid Nodule, NFH: Nodular follicular hyperplasia, LT: Lmphocytic Thyroiditis, SAT: Subacute Thyroiditis

The category IV had 13 cases, out of which 5 were categorised as suspicious for Hurthle cell neoplasm. The category V and VI had 16 and 19 cases respectively and all of them were either suspected or confirmed Papillary Carcinoma Thyroid. No case suggestive of Medullary Carcinoma, Anaplastic Carcinoma, Lymphoma etc was reported. The category I and Category III had 16 and 6 cases respectively and required repeat or guided FNAC.

This study showed that, out of 163 patients, 48 cases belonging to category VI, V and VI needed surgical intervention. The commonest malignancy noted was Papillary carcinoma. The most common benign lesion forming thyroid nodule was Colloid nodule follwed by Lymphocytic Thyroiditis and Nodular Hyperplasia.

The 16 cases in category I that lacked adequate cellular material or had obscured cellular material needed to undergo repeat FNAC for clinical management. The 6 cases in category III reported as atypia of undetermined significance also required ultrasonographic guided FNAC to rule out malignancy as this category has higher risk of malignancy than category I as reported by Bethesda.

## DISCUSSIONS

The Bethesda system of Thyroid cytology reporting makes the reports clinically relevant and helps the clinicians to take appropriate therapeutic interventions.[10] In our study of 163 cases 29 were males and 134 females making male to female ratio of 1: 4.62. In an another study of 542 patients from Kashmir, a male to female ratio of 1:5.42 was observed.[12] Other studies have also quoted female preponderance like Bhagat et al,[13] and Kumar et al found male to female ratio of 1:5.67 and 1:4.4 respectively.[14]

In this study out of 163 cases, 9.8% belonged to category I, 57% to category II, and 3.6% to category III. The category IV, V and VI had 7.9%, 9.8%and 11.6% cases respectively. Within the category II, 46.2% and 24.6% belonged to Colloid Nodule and Nodular Hyperplasia respectively, which represents the morphology of goiter. Therefore, this study shows that goiter exists in good proportion and is common cause of thyroid enlargement in Kashmiri population. In a study which was conducted to survey Iodine Deficiency Disorders in four districts of Kashmir, showed that there was a decline in the total goiter rate from a prevalence of 14.8% in 2017 to 12.6% in 2022. However, Iodine deficiency disorder continues to be a public health problem of local and national significance.[15]

In yet another study from the goiter belt of India, in which 1738 thyroid aspirations were studied, showed 76.75% cases in category II of Bethesda system which includes Benign Follicular Nodule (adenomatoid nodule, Colloid nodule, etc), Lymphocytic Thyroiditis, Granulomatous (subacute) Thyroiditis and others. Out of these 69.49% (n= 927) were benign nodules, 29.68% (n=396) were of Autoimmune Thyroiditis. Out of 927 cases of benign nodule, 62 cases had co-existing Thyroiditis reaching to conclusion that goitre has not been eradicated as per expectations of the government,[3]

The comparison of our study with other studies regarding the spectrum of cases in different Bethesda categories is given in table 4.

**Table 4: Comparison of cases in different studies as per Bethesda category**

| Study | No.of cases | Category I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|---|
| Present study | 163 | 9.8% | 57% | 3.6% | 7.9% | 9.8% | 11.6% |
| Sheikh S et al[12] | 642 | 18.3% | 61.21% | 1.40% | 6.23% | 2.80% | 9.96% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Prathima et at[16] | 178 | 11.7% | 77.5% | 1.12% | 3.9% | 2.2% | 3.3% |
| Bhagat et al[13] | 172 | 5.6% | 87.5% | 15% | 3.1% | 0.6% | 3.1% |
| Sinna et al[17] | 296 | 7.1% | 33.1% | 13.5% | 8.5% | 10.1% | 19.5% |
| Mondak et al[18] | 1020 | 1.2% | 87.5% | 1% | 4.2% | 14% | 4.7% |
| Prerena et al[3] | 1738 | 19.6% | 76.75% | 0 | 1.2% | 0.46% | 1.9% |
| Al Dawish et al[19] | 1433 | 3.2% | 75.3% | 9.1% | 5% | 2.2% | 5.1% |

All studies show benign lesions outnumbering malignant ones as noted by the fact that in all studies most cases fall in category II of Bethesda which is suggestive of benign morphology.

Although the Bethesda system has standardized thyroid cytology reporting into different categories with assigned risk of malignancy to each category and thus helped concerned clinician to intervene accordingly.[12] Despite this, some studies have found high rate of incidentally detected malignancies in patients operated for multinodular goiter and, categorized as category II (benign) on FNA.[20,21] Such studies indicate that risk of malignancy associated with each category in Bethesda cannot be extrapolated for general population. The risk of malignancy needs to be calculated in each population group especially the areas with endemic goiter.

## CONCLUSION

In this study, FNAC showed most lesions of thyroid belonged to benign category with preponderance of Colloid Nodule and Nodular Hyperplasia, both of which represent morphology of goiter. Most common malignancy noted was Papillary Carcinoma Thyroid. The limitation of study was that it was retrospective in nature and based on single centre.

However, literature review has indicated the need of multicentre studies to identify risk of malignancy in Multinodular Goiter by comparing cytopathology results with histopathology reports in endemic areas.

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