# Evaluation of thyroid lesions by Fine Needle Aspiration Cytology according to the Bethesda System

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**Abstract**

**Background:** FNAC of the thyroid gland is now a well-established, first line diagnostic test for the evaluation of diffuse thyroid lesions. The Bethesda system is useful in categorization of lesions and providing a uniform framework allowing standardized management algorithms for each diagnosis. **Aims and Objectives:** This study was carried out to evaluate thyroid lesions by FNAC based on Bethesda system of reporting and to correlate the cytological findings with histopathology examination wherever it was possible. **Materials and methods:** This is a prospective study of 110 patients with thyroid lesions attending ENT OPD in a tertiary care centre, Ahmedabad. The case history was evaluated along with radiological and serological findings were recorded and correlation with Histopathology findings was done wherever it was possible. **Results:** In the FNAC, preponderance of the cases belonging to the Bethesda category II was observed, most of the cases of being colloid goitre followed by thyroiditis. The overall prevalence of malignancy was 9.09 percent by FNAC. The female to male ratio in the study is 9:1 and the average age of patients is 42.5 years. The specificity of FNAC results when compared to the HPE was 86.33%, accuracy and sensitivity were 97.01 and 98.21% respectively. **Conclusion:** The study shows that most of the patients with thyroid lesions fall into The Bethesda category III are females and FNAC of thyroid nodules found to be one of the most useful, safe, accurate, relatively simple, inexpensive, less time-consuming OPD procedures, highly patient-compliant tool in the diagnosis of thyroid pathology.

**Keywords :** Bethesda system, Fine needle aspiration cytology, Histopathology, Thyroid lesions

## Introduction:

Thyroid Fine Needle Aspiration Cytology (FNAC) was introduced in Scandinavian countries in 1950s and became popular in the United States in 1970s and then worldwide in the 1980s.[1] FNAC of the thyroid gland is now a well-established, first line diagnostic test for the evaluation of diffuse thyroid lesions as well as thyroid nodules with main purpose of confirming benign lesions and malignant lesions thereby, triaging the patients into candidates for surgical or conservative treatment.[2] The distinction of these neoplastic from non-neoplastic lesions cannot be solely reliable on clinical presentation for which the first line diagnostic method of FNAC is needed. The simplicity of FNAC makes it an OPD procedure.

Different imaging techniques are now used for diagnosis of thyroid lesions like radionucleotide scanning, high resolution ultrasonography, etc. However, FNAC is still regarded as the single most accurate and cost-effective procedure, particularly if ultrasonography is used as guide for better sample collection, especially for cystic lesions.[3]

Thyroid nodules are a common clinical finding and have a reported prevalence of 4–7% in the general population.[4] The vast majority of these nodules are non-neoplastic lesions.

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population.[4] The vast majority of these nodules are non-neoplastic lesions.

Historically, terminology for thyroid FNA has varied significantly from one laboratory to another, creating confusion in some cases and hindering the sharing of clinically meaningful data among multiple institutions. To address terminology and other issues related to thyroid FNA, the Bethesda system is followed for uniformity in reporting system for thyroid cytology that facilitates the clarity of communication among pathologists, radiologists, surgeons and facilitates cytohistological correlation for thyroid diseases.

**Aims and Objectives:**

This study was carried out to evaluate thyroid lesions by FNAC based on Bethesda system of reporting and to correlate the cytological findings with histopathology examination wherever it was possible.

**Materials and Method:**

This was a prospective study on 110 subjects with incidental thyroid swelling attending the otorhinolaryngology (ENT) outpatient department (OPD) at a tertiary care teaching hospital in Ahmedabad, Gujarat from August 2018 to July 2019.

The cases notes were retrieved and information regarding age, sex, thyroid function tests, anti-TPO antibody and ultrasound findings was reviewed of each patient.Patients were asked to lie down in supine position on a flat surface and hyper-extension of neck, placing a pillow under patient's shoulders for support. The patients were asked not to talk or swallow during the procedure. Ultrasonography guided aspiration was preferred whenever necessary (like in small or cystic lesions).Thyroid swellings were aspirated using 22-gauge needle by standard procedures. Thyroid being a vascular organ, after the prick during FNAC procedure forceful negative suction of the syringe avoided to prevent the aspirate and the consequent smears from being hemorrhagic. The aspirated contents of the needle were expelled onto glass slides. Slide smears were made for each case and immediately fixed in 95% methanol for about 30 minutes. All slides were stained with hematoxylin and eosin, Papanicolaou(Pap) and May Grűnwald Giemsa (MGG).Diagnosis of cytological smears was done according to standard criteria, following the Bethesda system. The results were compared with histopathology wherever possible.

**Results:**

Total 110 thyroid FNAs were done in our institute between August 2018 and July 2019. Patients ranged from 9 years to 81 years of age. Most of the patients were in the age group 30–50 years. The average age of patients presenting with thyroid lesions was 42.5 years while median and mode were 40 and 38years respectively. There were 90.09% female and 9.90% male patients. Out of these 110 cases, the FNA sample was adequate in 108 cases. Histopathology correlation was available for 67 cases.

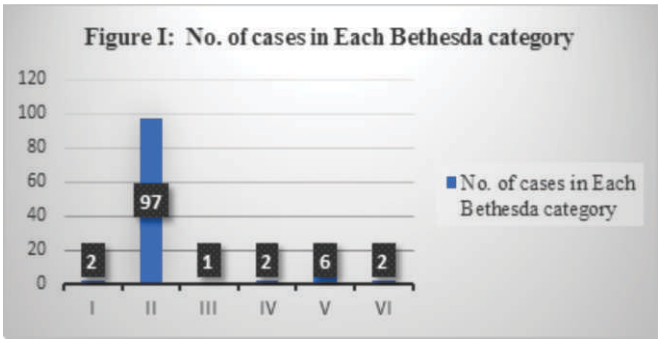
In all of the reports, the Bethesda system of reporting was used. After studying the morphology of each of the subjects, their respective Bethesda score (According to Table 1) was included in the reports necessarily.

Segregating the results on the basis of the Bethesda scoring system of cytopathology of thyroid (Figure 1), most of the lesions, that is 89.09% belonged to the benign category of lesions that is, Bethesda category II; followed by 6 lesions from category V making 5.45% of lesions. Two patients were put into category VI and IV each of Bethesda and 1 into category III. In two cases where only cyst fluid was aspirated, after two pricks, were given the category I.

The diagnosis in the Bethesda category II were as follows: 57 were goitre, 26 were thyroiditis, 13 were benign follicular lesions, 1 was thyroglossal cyst. The diagnosis of goitre was always specified according to its morphology. 48 out of 57 were given the diagnosis of colloid goitre and if associated with cystic changes it was specified. The rest of the cases were of nodular goitre with the presence or absence of cystic changes. There was one patient belonging to Bethesda category III who was diagnosed with Follicular lesion of undetermined significance, 2 patients in Bethesda IV

**Table 1: The Bethesda System for Reporting Thyroid Cytopathology : Recommended Diagnostic Categories**

| | |
|---|---|
| **I. Non- Diagnostic OR Unsatisfactory**<br>• Cyst Fluid only<br>• Virtually acellular specimen<br>• Other(Obscuring blood, clotting artefact etc) | **IV. Follicular Neoplasm Or Suspicious For A Follicular Neoplasm** Specify If Hurthle Cell (Oncocytic) Type |
| **II. Benign**<br>• Consistent with a benign follicular nodule (includes adenomatoid nodule, colloid nodule, etc.)<br>• Consistent with lymphocytic (Hashimoto) thyroiditis in the proper clinical context<br>• Consistent with granulomatous (subacute) thyroiditis<br>• Other | **V. Suspicious For Malignancy**<br>• Suspicious for papillary carcinoma<br>• Suspicious for medullary carcinoma<br>• Suspicious for metastatic carcinoma<br>• Suspicious for lymphoma<br>• Other |
| **III. Atypia Of Undetermined Significance Or Follicular Lesion Of Undetermined Significance** | **VI. MALIGNANT**<br>• Papillary thyroid carcinoma<br>• Poorly differentiated carcinoma<br>• Medullary thyroid carcinoma<br>• Undifferentiated (anaplastic) carcinoma<br>• Squamous cell carcinoma<br>• Carcinoma with mixed features (specify)<br>• Metastatic carcinoma<br>• Non-Hodgkin's lymphoma<br>• Other |




category were diagnosed with suspicion of follicular lesion, 2 patients in Bethesda VI were diagnosed with malignant lesion and Papillary carcinoma. The 6 patients under Bethesda Category V, all of which were given the diagnosed with suspicion of papillary carcinoma.

**Discussion:**

FNAC is well established, safe, non-invasive, cost-effective and efficient out-patient procedure used to differentiate between benign and malignant thyroid swellings.[5] Before the routine use of thyroid FNA, the percentage of surgically resected thyroid nodules that were malignant was 14%. With current thyroid FNA practice, the percentage of resected nodules that are malignant surpasses 50%.[6] We used H&E and MGG(without fixing) staining methods for the glass slide smears after fixing with 95% methanol. Papanicolaou and/ or H&E stains help in characterization of nuclear features. MGG stains define cytoplasmic characteristics. The smears then were examined under light microscopy and reporting was done. There is lack of uniformity in the reporting systems used, which vary from laboratory to laboratory. Also, each observer has his or her own findings and thus every smear can have subjective variations. To address this common issue, the Bethesda System of Reporting Thyroid Cytopathology (TBSRTC) was introduced upon the proceedings of "The NCI Thyroid Fine Needle Aspiration State of the Science Conference" held in Bethesda in Maryland.

**Table 2 : The Bethesda System for Reporting Thyroid Cytopathology: Implied Risk of Malignancy and Recommended Clinical Management**

| Diagnostic Category | Risk of malignancy (%) | Usual management |
|---|---|---|
| Non-diagnostic or unsatisfactory | 1–4 | Repeat FNA with ultrasound guidance |
| Benign | 0–3 | Clinical follow-up |
| Atypia of undetermined significance or follicular lesion of undetermined significance | 5–15 | Repeat FNA |
| Follicular neoplasm or suspicious for a follicular neoplasm | 15–30 | Surgical lobectomy |
| Suspicious for malignancy | 60–75 | Near-total thyroidectomy or surgical lobectomy |
| Malignant | 97–99 | Near-total thyroidectomy |

**Table 3: Comparison of results of present study with other previous studies**

| | Study by P K. Bagga | Study by A. Sengupta | Our Study |
|---|---|---|---|
| Female:Male | 9:1 | 8:1 | 9:1 |
| Average Age of presentation | 41 years | 45 years | 42.5 years |
| Bethesda I(inadequate material) | 1.61% | - | 1.82% |
| Bethesda II | 89.09% | 90.05% | 88.12% |
| Neoplastic lesions(Bethesda IV,V,VI) | 8% | 10% | 9.09% |
| Diagnostic accuracy | 97.7% | 95.4% | 97.01% |

TBSRTC encompasses six thyroid cytology categories, with each one having an implied cancer risk and the best modality of management ( Table II).[7] Thus, reporting of thyroid aspirate smears has evolved tremendously over the past years; changing from two categories of non-neoplastic and neoplastic to six categories under Bethesda.In several studies, it has been found that following the Bethesda system has increased the sensitivity and specificity. Thus, The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) provides a 6-tier diagnostic framework using uniform criteria in reports of thyroid aspirates.

One of the major advantages of this framework is its association with defined risks of malignancy, allowing standardized management algorithms for each diagnosis. We compared our results with other studies, by P. K Bagga and NC Mahajan[8] andby Arup Sengupta, Ranabir. [9] Some of the key findings of the studies including female: male ratio, average age of presentation, number of patients in Bethesda I,II and diagnosed with neoplastic lesions, diagnostic accuracy are compared with our study in Table III. Both the studies showed female preponderance in thyroid lesions, which was the comparable with our study, being 90.09% ; the female to male ratio being 9:1. Both the studies showed the highest number of patients belonging toBethesda II category of lesions, being benign in behavior which corresponds with our cases (89.09%). According to study by P.K Bagga and NC Mahajan of all patients 1.2% had malignant neoplasms and 6.7% were suspicious of malignancy

which in our study was 1.81% and around 5.45% respectively.

Out of the 110 cases, 67 patients underwent surgical intervention. This was the sample size used in calculating specificity, sensitivity and accuracy. The patients belonging to the non-neoplastic category underwent partial thyroidectomy because of cosmetic purposes. The histopathological examination (HPE) of 55 out of 57 cases were found to be benign as well, thus co-relating with the FNAC findings.Patients diagnosed with malignancy on FNAC were operated for total thyroidectomy and confirmed on HPE. One patient who was diagnosed into Bethesda category III, with Follicular lesion of undetermined significance, after hemi-thyroidectomy, HPE was suggestive of Multinodular Goiter which did not correlate with the FNAC findings. One of ten male patients had malignant lesion on FNAC being 10% while 9 out of 100 female patients had malignant lesions, being 9% of females. Thus, chances of males having malignant lesions are slightly higher than females, which was found to be the same in the study by Arup Sengupta and Ranabir Pal.

Statistical analysis: The specificity of FNAC results when compared to the HPE was 86.33%, accuracy and sensitivity were 97.01 and 98.21% respectively. The high accuracy and sensitivity are due to radiological, clinical and cytopathological correlation in case of uncertainty.

## Conclusion:

After studying the series of cases in our institution and comparing it with similar other studies we can conclude that there is striking female preponderance of patients presenting with thyroid lesions. The average age of presentation is around 40 years. Around 90% lesions fall in benign category, in the group II of Bethesda Reporting system. It is thus beneficial to rely on FNAC reporting to direct the patients to either medical or surgical management by consultants. Reviewing the thyroid FNACs with the Bethesda system for reporting allowed precise cytological diagnosis. To conclude, FNAC of thyroid nodules has become one of the most useful, safe, accurate, relatively simple, inexpensive, less time-consuming OPD procedures, highly patient-compliant tool in the diagnosis of thyroid pathology.Though FNAC is not a substitute for conventional surgical histopathology, it is regarded as extremely valuable first line diagnostic test for management of thyroid swellings.

## References:


1. G. Jayaram, Papillary carcinoma. Atlas and text of thyroid cytology; Arya publications, New Delhi (2006)p. 35–48 Google Scholar.
2. S R. Orell ;S R. Orell, G. F Sterrett, M. N Walters, D. Whitaker (Eds), Manual and atlas of fine needle aspiration cytology (5th edition) Churchill- Livingstone, New Delhi pp 125-164 View record in in Scopus Google Scholar.
3. M. Amrikachi, I. Ramzy, S. Rubenfeld, T.M. Wheeler; Accuracy of fine needle aspiration of thyroid: a review of 6226 cases and correlation with surgical and clinical outcome. Arch pathol Lab Med , 125 (2001) pp 484-488 View in Scopus Google Scholar.
4. H.A Nggada, A.B Musa, B.M Gali and M.I Khali: FNAC of thyroid Nodules A Tertiary Hospital Experience. The internet Journal of Pathology. 2006 Volume 5 Number.
5. Yassa L, Cibas ES, Benson CB, et al. Long-term assessment of a multidisciplinary approach to thyroid nodule diagnostic evaluation. Cancer. 2007;111:508-516.
6. Baloch ZW, LiVolsi VA, ASA SL, el al. Diagnostic terminology and morphologic criteria for cytologic diagnosis of thyroid lesions: a synopsis of the National Cancer institute Thyroid Fine needle aspiration State conference . Diagn cytopathol. 2008; 36: 425-37. [PubMed] [Google scholar].
7. Mamatha M, Sekhar SC, Rani HS, Anil SS, Vandana G. A comparative study between conventional system and the Bethesda system applied for reporting thyroid cytopathology. Int Arch Integr Med. 2015; 2:87-95 [Google scholar].
8. "Fine needle aspiration cytology of thyroid swellings: How useful and accurate is it?" by P. K Bagga and NC Mahajan published in 2017 from IndianJCancer ( www.Indian J cancer.com) 47(4):437-42.
9. Fine needle aspiration cytology as the primary diagnostic tool in thyroid enl argement; Arup Sengupta, RanabirJ Nat Sci Biol Med. 2011 Jan-Jun; 2(1): 113–118.