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Evaluation of Bethesda System for Reporting Thyroid FNAC in Rural Setup

Sanjay Khandekar*

Department of Pathology, Shri Vasantrao Naik Government Medical College, Yavatmal, Maharashtra, India- 445001

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***Correspondence Info:**
Dr. Sanjay Khandekar
Department of Pathology,
Shri Vasantrao Naik Government Medical College,
Yavatmal, Maharashtra, India- 445001

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Abstract

Aims and Objectives: The present research was undertaken to study the diagnostic utility of TBSRTC at our institution and correlate the cytological diagnosis with the histological diagnosis wherever available.
Methods: A total of 108 patients with thyroid swellings were subjected to fine needle aspiration cytology (FNAC) during a period of 10 months i.e. from January 2016 to October 2016 were included in the study. Out of these 31 patients (28.70%) underwent surgery subsequently and histopathological examination was done. Cytological diagnosis was compared with histopathology diagnosis wherever it was available.
Results: Out of 108 patients, majority were females (87.03%) and in younger age group (*n* = 66 [61.11%], 21–40 years). The FNAC diagnosis was categorized as unsatisfactory (2.77%), benign (87.03%), Atypia of Undetermined Significance (0.92%), Follicular/ Hurthle cell neoplasm (4.62%), suspicious for malignancy (0.92%) and malignant (3.70%). The malignancy rate for benign category was 4.5%, 20% for follicular neoplasm, 100% for each suspicious for malignancy and malignant category. 29 cases (93.54%) out of 31 had a consistent cytological diagnosis with histological diagnosis while 2 cases (6.45%) showed discordance. There was a good correlation between cytological and histopathological diagnosis.
Conclusion: The Bethesda system is very useful standardized system of reporting thyroid cytopathology. It improves communication between cytopathologist's and clinicians, leading to more consistent management approaches.
Keywords: The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC), Fine Needle Aspiration Cytology.

1. Introduction

Fine needle aspiration cytology (FNAC) of thyroid occupies an extremely important role worldwide. This minimally invasive and cost-effective technique is extremely useful in identifying a substantial proportion of thyroid nodules as benign and reducing unnecessary surgery for patients with benign disease [1]. Previously pathologists have been using variable terminologies for cytological reporting of thyroid lesions which were all ambiguous and inconsistent. Different reporting criteria were used in different laboratories. The results did not show proper clinical relevance and created confusion among pathologists, endocrinologists, surgeons and radiologists [2].

To address the terminology and other issues related to thyroid FNA, The National Cancer Institute (NCI) hosted the NCI Thyroid Fine needle Aspiration State of Science Conference. The NCI conference participants acknowledged the importance of developing a uniform terminology for reporting thyroid FNA results. An inspiration for thyroid proposal was the Bethesda System for reporting cervical cytology interpretations, first developed at an NCI workshop in 1988 and widely adopted in United States for reporting Papanicolaou test results [3]. It is expected that many benefits, clinical as well as investigational of the Bethesda cervical terminology will also apply to the Bethesda thyroid terminology. A uniform reporting system for thyroid FNA will facilitate effective communication among cytopathologist's, endocrinologist, surgeons, radiologists and other health care providers. It will also facilitate cytologic-histological correlation for thyroid diseases. It will help in research on the epidemiology, molecular biology, pathology and diagnosis of thyroid diseases, particularly neoplasia and allow easy

and reliable sharing of data from different laboratories for national and interventional collaborative studies [2].

With this background, the present study aims to diagnosing thyroid diseases according to the Bethesda classification for thyroid cytopathology and reporting the diagnostic utility of fine needle aspiration cytology (FNAC) at our institution.

2. Materials and Methods

Total 108 patients who were diagnosed clinically as having thyroid swellings and who were referred to cytology section of Pathology Department at Shri Vasantrao Naik Government Medical College and Hospital over a period of 10 months i.e. from January 2016 to October 2016 were taken up for the study irrespective of the age group and sex. Patients presenting with non-palpable thyroid lesions and congenital anomalies of thyroid were excluded from the study.

FNAC was done either palpation guided or under ultrasound (US) guidance under aseptic precautions with prior consent after recording the relevant clinical details. The technique involved aspiration of material from the thyroid lesions using 22-23 G needle. In palpation guided FNAC, the needle was inserted into the swelling in resting state. In case of US guided FNAC, the needle was inserted obliquely in the lesion along a path parallel to the scanning plane, so that the tip and shaft of the needle were continuously visualized. The needle was inserted into the lesion without attachment of a syringe and to and fro movement performed quickly in all the directions. The material gets collected in the bore by capillary suction. When material appeared in hub, the needle was withdrawn, fixed to air filled syringe and material was expressed gently on glass slides. Whenever fluid was obtained all the contents were aspirated using a syringe attached to the aspiration needle. Macroscopic examination of the fluid was done and then centrifuged. Smears were prepared by spreading the material gently with another slide. Both dry and wet fixed smears (using 95% ethyl alcohol) were prepared, stained and examined microscopically. We categorized our results into 6 diagnostic categories according to The Bethesda System for Reporting Thyroid Cytopathology as unsatisfactory, benign, Atypia of Undetermined Significance, Follicular/ Hurthle cell neoplasm, suspicious for malignancy and malignant.

Histopathological diagnosis wherever available were reviewed and the cytological diagnosis and histologic findings were correlated with each other. Statistical analysis was then carried out by calculating the sensitivity, specificity, positive and negative predictive value and diagnostic accuracy of the aspirates. Data were analyzed using SPSS software Ver.16 and Diagnostic accuracy by open Epi 2.3. $p<0.05$ was considered as statistically significant.

3. Observations and Results

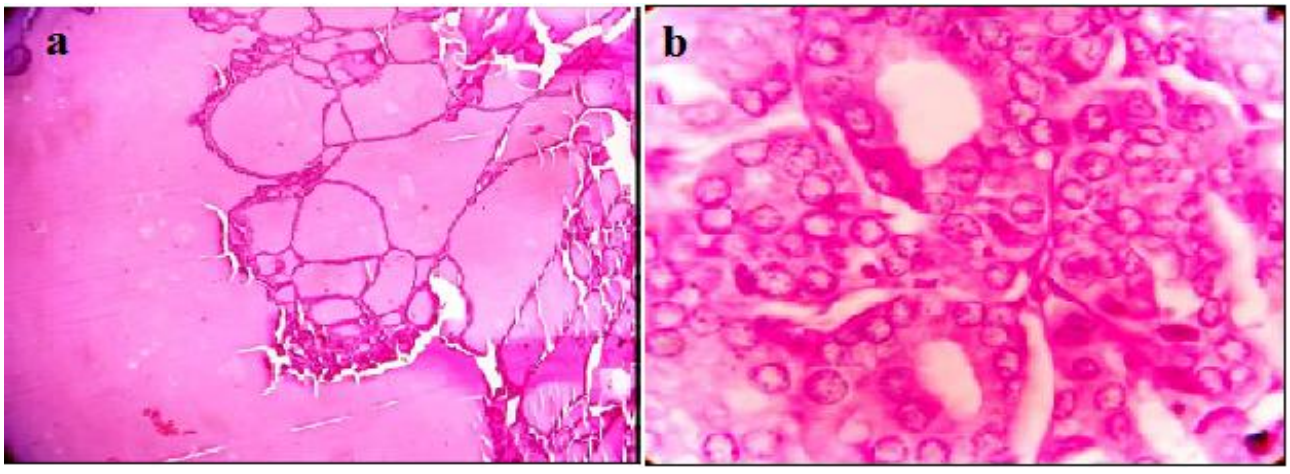
Total 108 fine needle aspirations of thyroid lesions were done in the cytology department of our institute during the period of 10 months. Age of the patients were ranged from 10-80 years with maximum (35.18%) cases in the ranged of 31-40 years followed by 25.92% in the ranged of 21-30 years. There was female predominance (87.03% cases) in the study with male: female ratio of 1:6.7. These aspirates were categorized into 6 diagnostic categories as shown in Table 1.

Table 1: Distribution of cases according to Bethesda diagnostic categories

Bethesda diagnostic categories	No. of Cases	Percentage
Unsatisfactory	3	2.77
Benign	94	87.03
Atypia of Undetermined Significance	1	0.92
Follicular/ Hurthle cell neoplasm	5	4.62
Suspicious for malignancy	1	0.92
Malignant	4	3.70

TSH estimation was done in 74 cases out of them, maximum patients were Euthyroid i.e. 58 (78.37%), 9 (12.16%) patient were hyperthyroid and 7 (9.45%) cases were hypothyroid. We had histopathology follow up of 31 cases (28.70%), out of 31 cases, colloid goiter (Figure 1a) was the most common lesion and papillary carcinoma (Figure 1b) was the most common malignant lesion on histopathology.

Figure 1: a) Colloid Goiter showing varying sized, distended thyroid follicles containing colloid and lined by flattened epithelium, (H and E, 40x), b) Papillary Carcinoma showing nuclei are typically large, crowded and ground- glass, (H and E, 100x)



Based on the cytological and histopathological correlation of the 31 cases, it was found that, 29 cases (93.54%) had a consistent cytological diagnosis with histological diagnosis (Table 2), while 2 cases (6.45%) showed discordance. One false negative case was papillary carcinoma which was wrongly diagnosed as cystic colloid goiter on cytology, other false positive case of chronic lymphocytic thyroiditis which was wrongly diagnosed as suspicious for a follicular neoplasm. Thus there was a good correlation between cytological and histopathological diagnosis.

Table 2: Correlation of cytological findings with histopathology

Bethesda diagnostic categories	Number of FNAC Cases	Patient Underwent Surgery And Histopathological Findings						Total
		Non-neoplastic	Benign		Malignant			
		CG/CC/NG/HT	FA	HA	PTC	FC	MTC	
Unsatisfactory	3	0	0	0	0	0	0	0
Benign	94	21	0	0	1	0	0	22
Atypia of Undetermined Significance	1	0	0	0	0	0	0	0
Follicular/ Hurthle cell neoplasm	5	1	2	1	0	1	0	5
Suspicious for malignancy	1	0	0	0	1	0	0	1
Malignant	4	0	0	0	2	0	1	3
Total	108	22	2	1	4	1	1	31

(CG - Colloid Goiter, CC - Colloid Cyst, NG – Nodular Goiter, HT- Hashimoto's thyroiditis, FA- Follicular Adenoma, HA- Hurthle cell adenoma, PTC- Papillary Carcinoma, FC- Follicular Carcinoma, MTC - Medullary Carcinoma)

The malignancy rate for benign category was 4.5%, 20% for follicular neoplasm and 100% each for suspicious for malignancy and malignant category. Statistical analysis of fine needle aspiration cytology in predicting neoplastic lesion when compared with the histopathological results was: sensitivity 88.88%, specificity- 95.45%, positive predictive value- 88.88%, negative predictive value 95.45 % and accuracy-93.54%.

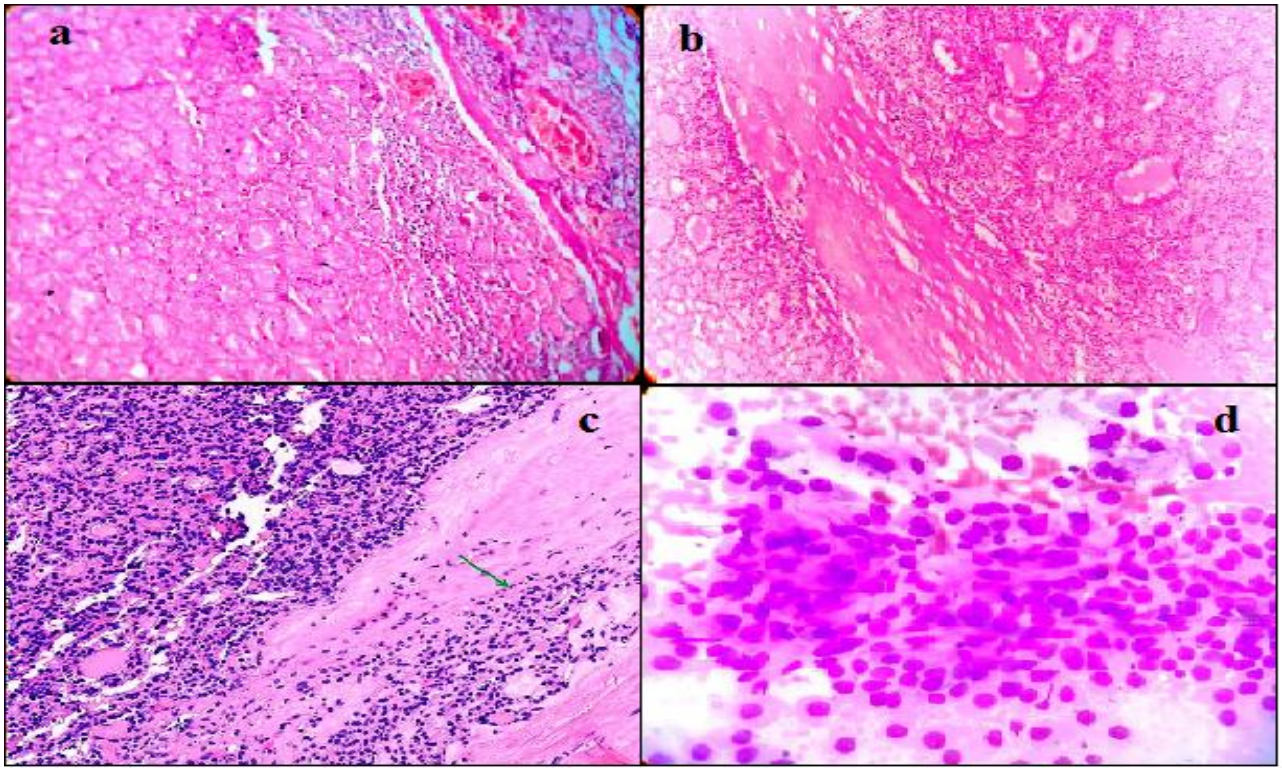
4. Discussion

FNAC of thyroid swelling is an accurate and relatively precise tool for the diagnosis of thyroid lesions. The 6-tiered BSRTC system is very useful for triaging patient with thyroid nodules for clinical management.

In present study, the percentage of cases in each category of Bethesda system for reporting thyroid cytopathology (BSRTC) was in accordance with the Bhagat *et al* [4] and Basak *et al* [5]. Before FNAC, TSH levels of patients were checked. The majority of patients (78.37%) both neoplastic and non-neoplastic were euthyroid, 9 (12.16%) cases were hyperthyroid and 7 (9.45%) cases had hypothyroidism. All the 107 malignancies reported belonged to euthyroid group. Hence the serum TSH determination was found to be helpful for correlation with FNAC findings in case of thyroiditis. Also, serum TSH was found to be an important tool in the evaluation of lesions of thyroid. Our findings were in accordance with those of Chandanwale *et al* [6].

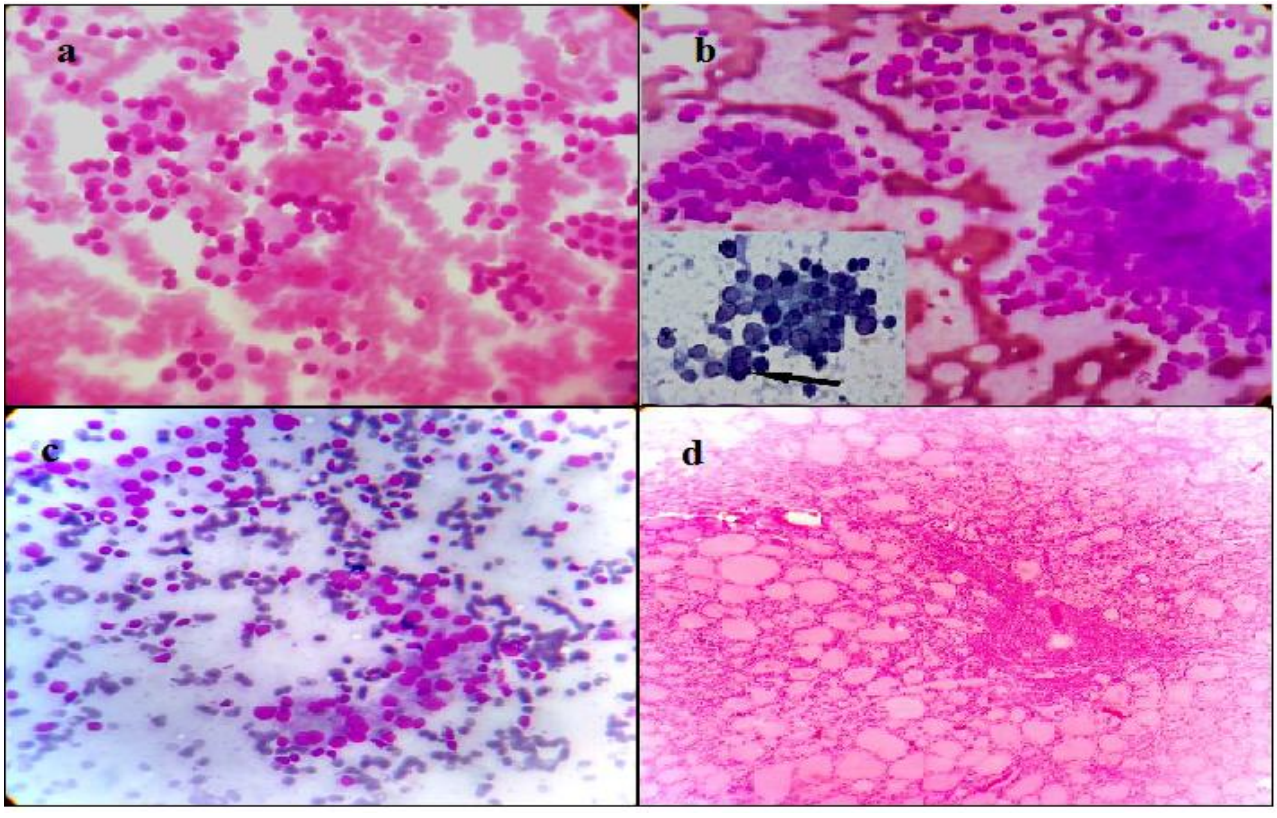
Overall 31 (28.70%) cases underwent surgical resection that included either partial or total thyroidectomy. Out of them, 22 cases were non neoplastic and 9 cases were neoplastic on histopathology follow up. Out of 9 neoplastic cases, 2 cases were of benign neoplasm consisting of Follicular adenoma (Figure 2a) and one case was Hurthle cell adenoma (Figure 2b). The remaining 6 cases had malignant neoplastic histopathology which included 4 cases of papillary carcinoma (Figure 1b) and 1 case each of follicular carcinoma (Figure 2c) and medullary carcinoma (Figure 2d). These findings were comparable with other studies [6,7].

Figure 2: a) Follicular Adenoma with fibrous capsule and surrounding compressed parenchyma, b) Hurthle Cell Adenoma showing fibrous capsule with surrounding compressed parenchyma, c) Follicular Carcinoma showing capsular invasion, d) Medullary Carcinoma with highly cellular smears showing plasmacytoid cells having round nuclei with stippled chromatin, binucleation & multinucleation forms and deposition of amorphous pink material (Amyloid), (H & E, 100x)



Based on the cytological and histopathological correlation of the 31 cases, it was found that, 29 cases (93.54%) had a consistent cytological diagnosis with histological diagnosis, among them, the concordance rate for each category was: 95.45% (21 out of 22 cases) for benign category, 80% (4 out of 5 cases) for follicular neoplasm (Figure 3a), 100 % for suspicious for malignancy and 100% (3 out of 3 cases) for malignant category. Out of the 2 discordant cases, 1 case diagnosed as benign follicular nodule on cytology was diagnosed as papillary carcinoma on histopathology. The case was diagnosed as colloid goiter with cystic degeneration on cytology. It is known that 25% of papillary carcinomas show cystic change (Figure 3b) [8]. This one false negative case can be explained on the basis of the sampling of cystic areas rather than solid cellular areas. Another discordant case was diagnosed as follicular neoplasm category that turned out to be chronic lymphocytic thyroiditis (Figure 3c) in histological examination. This one false negative case can be explained on the basis of smear shows marked Hurthle cell metaplasia in addition to lymphocytic infiltration. Thyroid follicular cells in this type of thyroiditis may show a mild to moderate degree of cellular atypia (Figure 3d). In addition, Hurthle cell metaplasia may produce cytological atypia. Overemphasis on the cellularity that may be seen in this disease may lead us to categorize it as follicular neoplasm [9].

Figure 3: a) Follicular Neoplasm showing highly cellular smear, repetitive microfollicular pattern, cellular crowding and overlapping of follicular cells against hemorrhagic background FNAC (H & E, 100x), b) Papillary Carcinoma showing monolayer sheet of neoplastic cells FNAC (H & E, 40x), c) Hashimoto Thyroiditis showing sheets of Hurthle cell change having abundant granular cytoplasm and large nucleus and lymphocytes in background. FNAC (H & E, 100x), d) Hashimoto Thyroiditis showing atrophy of the thyroid follicles and abundant lymphoplasmacytic infiltrate with lymphoid follicles, Tissue section (H & E, 40x)



In unsatisfactory category we have three cases and in Atypia of undetermined significance (AUS) category only one case diagnosed on cytology and patient was lost in follow up. Hence repeat aspiration and histopathology follow up was not available. So we could not predict the malignancy rate on histopathology. However, AUS is a heterogeneous category, which reflects the difficulty in the cytological diagnosis of the follicular lesions of thyroid. It includes cases in which the cytomorphological findings are not representative of a benign lesion yet the degree of cellular or architectural atypia is not sufficient to render an interpretation of follicular neoplasm/suspicious for a follicular neoplasm or suspicious for malignancy. This diagnosis may also be used in thyroid FNA specimens that are less than optimal due to limited cellularity, poor fixation and obscuring blood. However, because the category is heterogeneous and somewhat subjective, there exist and will likely remain differences between observers in using this diagnosis. In Benign category, the malignancy rate was 4.5% as 1 case out of 22 total benign FNAs while in Follicular neoplasm / suspicious for follicular neoplasm (FN/SFN) category one was found to be malignant out of 5 cases, giving a malignancy rate of 20%. In suspicious for malignancy category, the malignancy rate was 100%. However in malignant category, 3 out of 4 cases underwent surgery. All 3 cases i.e. 2 cases of papillary carcinoma and 1 case of medullary carcinoma proved to be malignant on histopathology, so malignancy rate for this category was 100%. These findings were in accordance with the finding of previous studies [5,10].

As per NCI's recommendation, two diagnostic categories AUS and FN were used to donate diagnostic uncertainty. The former category consisted of cases that were of low / borderline cell, had a relatively low risk of malignancy (5–10%), and would benefit from repeat FNA. The latter category was designated for cases that demonstrated cytological features of follicular adenoma, and follicular carcinoma. Because of the substantial risk of malignancy (25–33%), patients with a cytologic diagnosis of FN would benefit from immediate surgical intervention.

5. Conclusion

The Bethesda system is very useful standardized system of reporting thyroid cytopathology. It improves communication between cytopathologist's and clinicians, leading to more consistent management approaches. An additional point which is in favor of the implementation of this system is that the classification is directly related to the

risk of malignancy in each category, which helps in clinical management of that category. All patients belonging to categories of follicular neoplasms, suspicious for malignancy and malignancy should always be operated.

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References

[1]. Mehra P and Verma AK. Thyroid cytopathology reporting by the bethesda system: a two-year prospective study in an academic institution. *Pathology Research International* 2015, Article ID 240505, P-11.

[2]. Ali SZ. Thyroid cytopathology: Bethesda and beyond. *Acta Cytol*. 2011; 55(1): 4-12.

[3]. Cibas ES and Ali SZ. The Bethesda System for Reporting Thyroid Cytopathology. *Am J Clin Pathol* 2009; 132: 658-665.

[4]. Bhagat VM, Tailor HJ, Kaptan KR, Baladawa V, Prasad GH, Saini PK. Diagnostic Role of the Bethesda System for Reporting Thyroid Lesions: Effective Tool for Managing Thyroid Lesions. *Global J of Medical research* 2014; 14(1): 13-18.

[5]. Basak B, Mondal S, Roy DN, Sinha S. The Bethesda system for reporting thyroid fine needle aspirates: A cytologic study with histologic follow-up. *J of cytology* 2013; 30(2): 94-99.

[6]. Chandanwale S, Singh N, Kumar H, Pradhan P, Gore C, Rajpal M. Clinicopatholological correlation of thyroid nodules. *Int J Pharm Biomed Sci* 2012; 3(3): 97-102.

[7]. Gulia S, Chaudhary M, Sitaraman E, Reddy K. Diagnostic Accuracy of Fine Needle Aspiration Cytology In The Diagnosis of Thyroid Lesions. *The Internet Journal of Pathology* 2010; 13 (1).

[8]. Al-Brahim N, Asa SL. Papillary thyroid carcinoma: an overview. *Arch Pathol Lab Med*. 2006; 130(7): 1057-62.

[9]. Hajmanoochehri F, Rabiee E. FNAC accuracy in diagnosis of thyroid neoplasms considering all diagnostic categories of the Bethesda reporting system: A single-institute experience. *Journal of Cytology* 2015; 32(4): 238-243.

[10]. Mufti ST, Molah R. The Bethesda system for reporting thyroid cytopathology: a five-year retrospective review of one center experience. *Int J Health Sci (Qassim)* 2012; 6(2): 159-73.