<u>**ORIGINAL RESEARCH**</u>

Correlation Between Thyroid Imaging And Thyroid Cytopathology Reporting Under The Bethesda Grading System

[1]Dr. Haseebuddin Khan, [2]Dr. Mandira Sharma, [3]Dr. Ruth Shifa Ecka

[1]Junior Resident, [2]Professor and Head, [3]Associate Professor, Department of General Pathology, Career Institute of Medical Science & Hospital, India

Corresponding Author
Dr. Haseebuddin Khan
Junior Resident, Department of General Pathology, Career Institute of Medical Science & Hospital, India

Abstract
Introduction: The initial screening procedures include ultrasonography, fine needle aspiration cytology (FNAC). An initial screening test which will diagnose thyroid lesions accurately will help to avoid surgery in nonneoplastic conditions. **Aim**: The aim of the present study is to correlate the ultrasonography findings corresponding TIRADS categories with cytology findings corresponding to intermediate Bethesda categories to check diagnostic accuracy.
Materials and Method: The present prospective study comprised of 50 patients who were having solitary thyroid nodule detected either on clinical examination or radiologically with thyroid nodule. All the patients were subjected to ultrasound examination of the thyroid gland and fine needle aspiration (FNA) of the nodule was at the same day. Comparative analysis of efficacy of TIRADS in differentiating benign from malignant nodules and thyroid cytopathology reporting under the bethesda grading system was conducted. Data was assessed finally accuracy, and statistical analysis was made with Chi-square tests.
Results: There is a good concordance between ultrasonography findings using TIRAD criteria and FNAC using Bethesda to evaluate thyroid nodule in benign lesions. However, discordance in detection of malignancy was found between TIRADS 4 and Bethesda IV.
Conclusion: The possibility of a particular nodule being malignant can be effectively deduced from the ultrasound-based TIRADS system. The nodules which appeared suspicious on ultrasound to be classified under TIRADS 4 and TIRADS 5 further need FNAC examination.
Keywords: Anthropometric, cardiovascular,biochemical.

Introduction

Thyroid nodules (TNs) are a common thyroid disorder with a global prevalence ranging from 4–7% by palpation, 19–68% by ultrasound (US), and 8–65% by pathologic examination at autopsy. [1,2] This increase is thought to be related to early detection by high-resolution ultrasound and the discovery of subclinical TNs. [3] TNs can be classified as either benign or malignant. Most them are benign, and less than 5–10% are malignant. [4] In Africa, the prevalence of benign TNs is 89%, while that of malignant TNs stands at 11%, showing some variation from the expected global benign and malignant TNs percentages. [5] This could be due to the high prevalence of iodine deficiency goiter. [6] In Uganda, nodular thyroid disease is more common than diffuse thyroid disease, accounting for 82% of all patients referred with thyroid symptoms. [7] Furthermore, a study performed at Mulago National Referral Hospital (MNRH) found that 5% of the TNs evaluated were malignant, 18% were suspicious, and 75% were benign. [7] Hence, the need to identify suitable tools to assess the risk of malignancy in patients with TNs is crucial. [8]The prevalence of thyroid nodules by palpation is 3%–8% and by ultrasound (US) is 20%–76% in general population. [9] The incidence of thyroid cancer has been increasing worldwide in the last few decades. [10] This increase is almost exclusively attributed by papillary thyroid carcinoma than other histological subtypes of thyroid carcinoma. [11] Introduction of highly sensitive detection method like high-resolution ultrasound is another contributor. Solitary thyroid nodule is a radiologically distinct discrete lesion with different

1134

echogenicity from surrounding thyroid parenchyma. Although US detects thyroid nodules more precisely, it differentiates benign from malignant lesion less accurately. Solid compositions, microcalcification, irregular margin, hypo-echogenicity, taller than wide shape, absent halo, and an increase in blood flow are the characteristic findings of malignancy in US. Based on the already existing breast imaging reporting and data system (BI-RADS) for breast nodule, an US-guided thyroid imaging reporting and data system (TIRADS) has been proposed for risk stratification of thyroid nodules to improve categorical management using this efficient low-cost measure. [12]Fine needle aspiration (FNA) cytology plays a vital role in the initial diagnostic workup of solitary thyroid nodules. Evaluation and categorization can be improved by incorporating strategic system proposed by the latest revised Bethesda System for Reporting of Thyroid cytopathology (BSRTC-2017). [13] Due to the abundant use of ultrasound, the increased access to cytology analysis through fine-needle aspiration cytology (FNAC) guided by ultrasound and with the recent advances in functional imaging modalities such as 18 FDG-PET imaging, the incidental diagnoses of thyroid nodules are increasing every day. It is controversial whether or n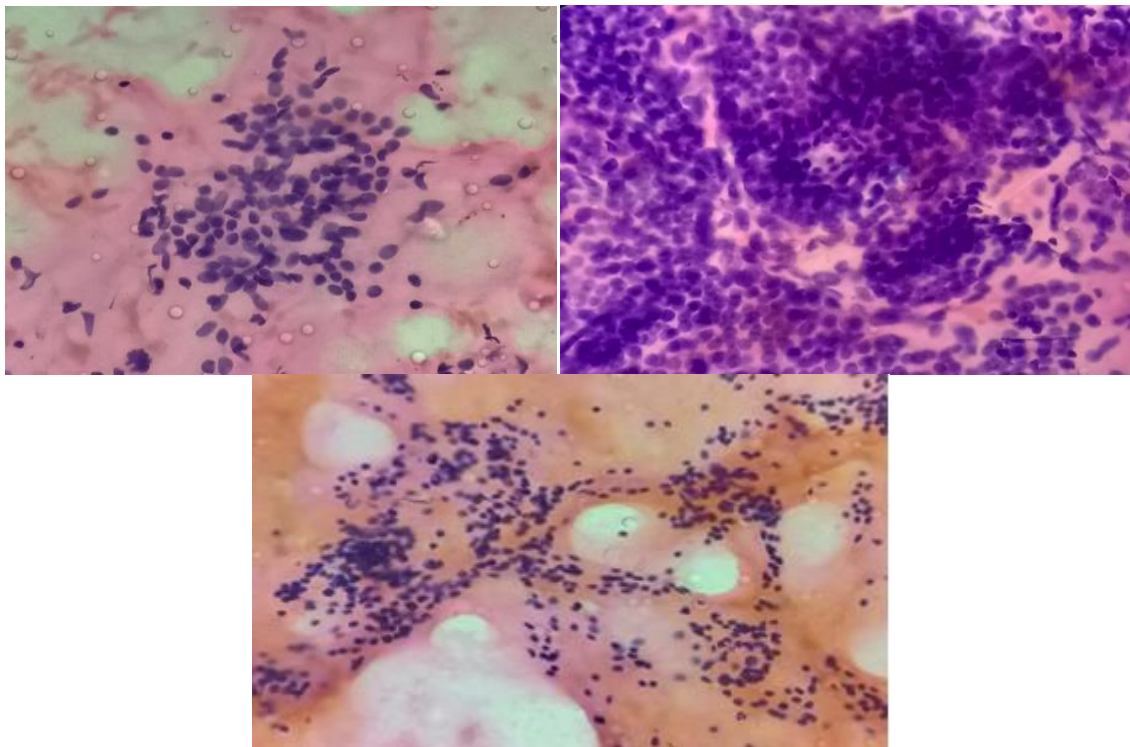ot such a benefit exists because most of the nodules are generally benign. [14,15] Hence, this study was conducted to correlate the ultrasonography findings corresponding TIRADS categories with cytology findings corresponding to intermediate Bethesda categories to check diagnostic accuracy.

Materials and Method
The present prospective study comprised of 50 patients who were having solitary thyroid nodule detected either on clinical examination or radiologically with thyroid nodule. All the patients were subjected to ultrasound examination of the thyroid gland and fine needle aspiration (FNA) of the nodule was at the same day. Comparative analysis of efficacy of TIRADS in differentiating benign from malignant nodules and thyroid cytopathology reporting under the bethesda grading system was conducted. Data was assessed finally accuracy, and statistical analysis was made with Chi-square tests.

Results
There is a good concordance between ultrasonography findings using TIRAD criteria and FNAC using Bethesda to evaluate thyroid nodule in benign lesions. However, discordance in detection of malignancy was found between TIRADS 4 and Bethesda IV.

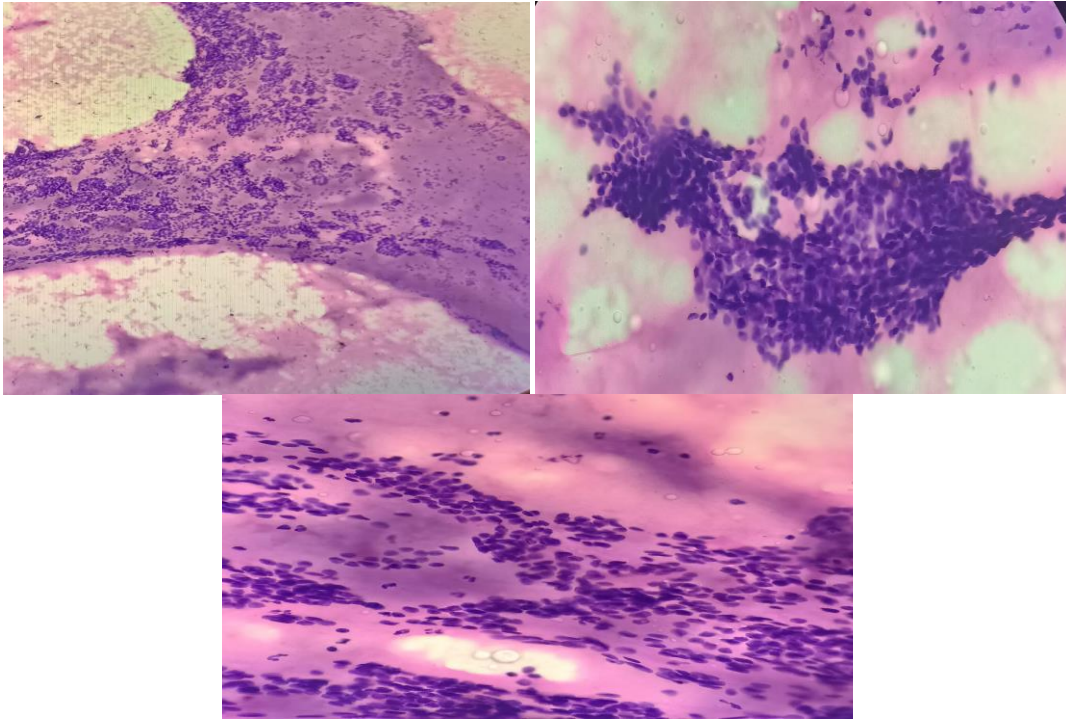**Fig 1: Microscopic Examination Adenocarcinoma**

Figure 2 Microscopic Examination Follicular Carcinoma

Table 1: TIRADS category

TIRADS Category	According to TIRADS Category			
	Subjects	**Benign**	**Malignant**	**ROM%**
II	25	20	5	20%
III	10	7	3	30%
IV	12	5	7	58.33%
V	3	1	2	66.66%
Total	50	33	17	34%
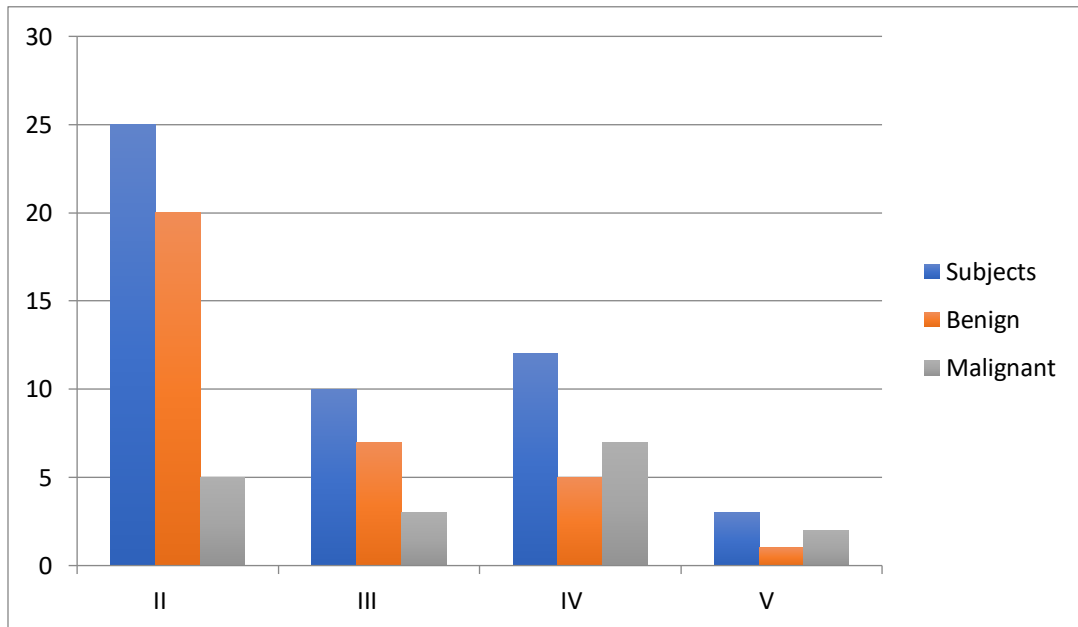
Graph 1:According to TIRADS Category

Table: 2 Bethesda category

BETHESDA Category	According to BETHESDA Category			
	Subjects	Benign	Malignant	ROM%
II	26	23	3	11.53%
III	9	8	1	11.11%
IV	10	7	3	30%
V	5	1	4	80%
Total	50	39	11	22%
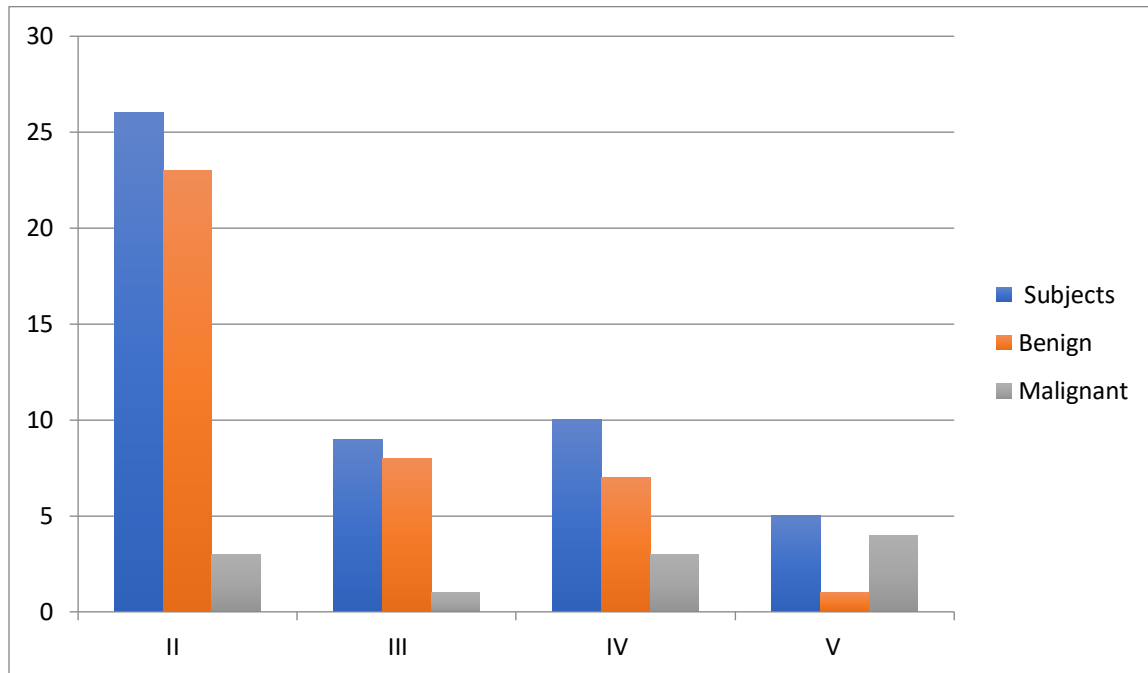
Graph 2: According to BETHESDA Category

Discussion

The incidence of nodules has been reported to be four times higher in women than in men. [16] This could be a result of hormonal influences of both estrogen and progesterone. [17] Smoking, radiation exposure, pregnancy, multiparity, and abnormal body mass index ranges have also been identified as predisposing factors. [18] Genetic factors, environmental influences, lifestyle, and access to medical care could be associated with variation in thyroid cancer incidence by geographic area and ethnicity.[19] Thyroid nodules are uncommonly cited in third world countries, where the disease is attributed to iodine deficiency disorders due to low salt consumption. [20]Hence, this study was conducted to correlate the ultrasonography findings corresponding TIRADS categories with cytology findings corresponding to intermediate Bethesda categories to check diagnostic accuracy.In the present study,there is a good concordance between ultrasonography findings using TIRAD criteria and FNAC using Bethesda to evaluate thyroid nodule in benign lesions.A study by Isse HM et al, aimed to correlate ACR TI-RADS with cytology among patients referred for US-guided fine-needle aspiration. The diagnostic accuracy of TI-RADS was assessed using sensitivity, specificity, positive and negative predictive values, and positive and negative likelihood ratios. Of 132 study participants, 90% (n = 117) were females, and the mean age was 41 ± 13 years. They found that ACR TI-RADS classification is an appropriate and noninvasive method for assessing thyroid nodules in routine practice.[21]In the present study,discordance in detection of malignancy was found between TIRADS 4 and Bethesda IV. Another study by Biswas A et al, assess the risk of malignancy (ROM) in the intermediate Bethesda categories of thyroid lesions and their correlation with the corresponding TIRADS categories. Careful application of both grading systems is essential for the proper segregation of thyroid nodules to facilitate effective clinical and surgical management. However, universally acceptable protocols need to be developed to avoid the heterogeneous approach. [22]Periakaruppan G et al, prospective study includes 184 patients studied over a period of 2 years. The risk of malignancy for TIRADS 2, TIRADS 3, TIRADS 4, and TIRADS 5 was 0, 2.2, 38.5, and 77.8%, respectively. There is a remarkable correlation exists between

TIRADS ultrasound classification and Bethesda cytology, especially for benign nodules. [23] Dhar L et al, the correlation between ACR TIRADS and TBSRTC, and between each system and the final histopathological report. The sensitivity values for TBSRTC and TIRADS were 69.4% and 65.8%; specificity, 99.3% and 96.5%; positive predictive value (PPV), 98.3% and 91.8%; and negative predictive value (NPV) 84.7% and 84.4%, respectively. The risk of malignancy (ROM) was also calculated and was found to be high, especially for TBSRTC II, III, IV and V and TIRADS 2 and 3. The TIRADS and TBSRTC systems of categorisation of thyroid lesions are concordant and could help improve the overall survival rate of patients with thyroid malignancies. [24]

Conclusion

It is essential for clinicians performing bedside ultrasound thyroid and guided FNAC to document their sonographic impression of the nodule in an objective fashion using the TIRADS classification and correlate with the gold standard cytology to improve their learning curve and audit their results.The possibility of a particular nodule being malignant can be effectively deduced from the ultrasound-based TIRADS system. The nodules which appeared suspicious on ultrasound to be classified under TIRADS 4 and TIRADS 5 further need FNAC examination.

References

1. Dean DS, Gharib H. Epidemiology of thyroid nodules. Best Pract Res Clin Endocrinol Metab. 2008;22(6):901–911.
2. Al Dawish MA, Alwin Robert A, Thabet MA, Braham R. Thyroid nodule management: thyroid-stimulating hormone, ultrasound, and cytological classification system for predicting malignancy. Cancer informatics. 2018;17:1176935118765132.
3. Wiltshire JJ, Drake TM, Uttley L, Balasubramanian SP. Systematic review of trends in the incidence rates of thyroid cancer. Thyroid : official journal of the American Thyroid Association. 2016;26(11):1541–1552.
4. Joseph-Auguste J, Lin L, Demar M, Duffas O, Molinie V, Sulpicy C, et al. Epidemiologic, clinical, ultrasonographic, and cytological features of thyroid nodules in predicting malignancy risk: a retrospective study of 442 French Afro-Caribbean patients. International journal of endocrinology. 2020;2020:4039290.
5. Bhuiyan MM, Machowski A. Nodular thyroid disease and thyroid malignancy: Experience at Polokwane Mankweng Hospital Complex, Limpopo Province, South Africa. South African medical journal = Suid-Afrikaanse tydskrif vir geneeskunde. 2015;105(7):570–2.
6. Melak T, Mathewos B, Enawgaw B, Damtie D. Prevalence and types of thyroid malignancies among thyroid enlarged patients in Gondar, Northwest Ethiopia: a three years institution based retrospective study. BMC Cancer. 2014;14:899.
7. Nassanga R, Kisembo H, Othieno E, Bugeza S, Fualal J. Sonographic correlation of thyroid nodules with ultrasound aided fine needle non aspiration cytology. East African Med J. 2015; 92(6):270
8. Tessler FN, Middleton WD, Grant EG. Thyroid imaging reporting and data system (TI-RADS): a user's guide. Radiology. 2018;287(1):29–36.
9. Gharib H, Papini E, Paschke R, Duick DS, Valcavi R, Hegedüs L, et al. American Association of clinical endocrinologists, associazione medici endocrinologi, and European thyroid association medical guidelines for clinical practice for the diagnosis and management of thyroid nodules. Endocr Pract. 2010;16:468–75.
10. Vargas-Uricoechea H, Meza-Cabrera M, Herrera–Chaprro J. Concordance between the TIRADS ultrasound criteria and the BETHESDA cytology criteria on the nontoxic thyroid nodule. Thyroid Res. 2017;10:1.
11. Ferlay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, et al. Cancer incidence and mortality worldwide: Sources, methods and major patterns in GLOBOCAN 2012. Int J Cancer. 2015;136:359–86.
12. Tessler FN, Middleton WD, Grant EG, Hoang JK, Berland LL, Teefey SA, et al. ACR thyroid imaging, reporting and data system (TI-RADS): White paper of the ACR TI-RADS committee. J Am Coll Radiol. 2017;14:587–95.
13. Cibas ES, Ali SZ. The 2017 Bethesda system for reporting thyroid cytopathology. Thyroid. 2017;27:1341–6.
14. Pazaitou-Panayiotou K, Capezzone M, Pacini F. Clinical features and therapeutic implication of papillary thyroid micro carcinoma. Thyroid. 2007;17:1085–92.
15. Sugitani I, Toda K, Yamada K, Yamamoto N, Ikenaga M, Fujimoto Y. Three distinctly different kinds of papillary thyroid micro carcinoma should be recognized: Our treatment strategies and outcomes. World J Surg. 2010;34:1222–31.
16. Periakaruppan G, Seshadri KG, Vignesh Krishna GM, Mandava R, Sai VPM, Rajendiran S. Correlation between Ultrasound-based TIRADS and Bethesda system for reporting thyroid-cytopathology: 2-year experience at a tertiary care center in India. Indian J Endocrinol Metabol. 2018;22(5):651–655.
17. Kung AW, Chau MT, Lao TT, Tam SC, Low LC. The effect of pregnancy on thyroid nodule formation. J Clin Endocrinol Metab. 2002;87(3):1010–1014.
18. Knudsen N, Laurberg P, Perrild H, Bülow I, Ovesen L, Jørgensen T. Risk factors for goiter and thyroid nodules. Thyroid : official journal of the American Thyroid Association. 2002;12(10):879–888.
19. Pellegriti G, Frasca F, Regalbuto C, Squatrito S, Vigneri R. Worldwide increasing incidence of thyroid cancer: update on epidemiology and risk factors. Journal of cancer epidemiology. 2013;2013:965212.
20. Kelly FC, Snedden WW. Prevalence and geographical distribution of endemic goitre. Bull World Health Organ. 1958;18(1–2):5–173.
21. Isse HM, Lukande R, Sereke SG, Odubu FJ, Nassanga R, Bugeza S. Correlation of the ultrasound thyroid imaging reporting and data system with cytology findings among patients in Uganda. Thyroid Res. 2023 Sep 1;16(1):26.

22. Biswas A, Basu K, De S, Karmakar S, De D, Sengupta M, Ghosh S. Correlation between Thyroid Imaging Reporting and Data System and Bethesda System of Reporting of Thyroid Cytopathology of Thyroid Nodule: A Single Center Experience. J Cytol. 2020 Oct-Dec;37(4):193-199.

23. Periakaruppan G, Seshadri KG, Vignesh Krishna GM, Mandava R, Sai VPM, Rajendiran S. Correlation between Ultrasound-based TIRADS and Bethesda System for Reporting Thyroid-cytopathology: 2-year Experience at a Tertiary Care Center in India. Indian J Endocrinol Metab. 2018 Sep-Oct;22(5):651-655.

24. Dhar L, Singh M, Jain SL, Rana D, Kumar J, Meher R, Khurana N, Verma N, Mohammed A, Chellani G. Correlation of ultrasound-based TIRADS and the Bethesda system for reporting of thyroid cytopathology: A study in a tertiary care centre. Cytopathology. 2023 Nov;34(6):590-596.

International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 12, No. 4, Oct-Dec 2023   OnlineISSN:2250-3137
                                                                                        Print ISSN: 2977-0122

1139