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ASSESMENT OF CONCORDANCE BETWEEN THYROID RADIOLOGY REPORTING AND DATA SYSTEM AND BETHESDA SYSTEM FOR REPORTING THYROID CY TO PATHOLOGY

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ABSTRACT

Thyroid Nodules are common, with a predominance of 3-8 % and the occurrence of thyroid carcinoma is expanding around the world. TIRADS has been proposed for risk delineation of thyroid nodules to work on their management according to categories. Fine needle yearning cytology because of BETHESDA framework for revealing thyroid cytology (BSRTC) assumes a key part in the assessment of thyroid knobs microscopically. Both TIRADS and BSRTC are generally suggested and practiced all around the world, and their concordance is significant for the evaluation of the risk of Carcinoma and its management.

OBJECTIVES: This study aims to assess the concordance of TIRADS and BETHESDA in different categories of thyroid lesions to assess the risk of malignancy.

MATERIAL AND METHODS: It was a cross-sectional review conducted over 2 years in patients aged 18 or older with having single thyroid nodule. A total of 265 patients fulfilling the inclusion criteria and after informed consent, were classified utilizing both TIRADS and BETHESDA, and their concordance was surveyed and communicated as Kappa Worth.

RESULTS: Most of the participants, 86/265 (32.5 %) were between ages 40-50 years with female predominance206/265(77.7%). Most nodules 141/265(53.2%) were having size<25mm. There were114/265(43.01%) in category 1 to 3 in TIRADS as compared to 187/265 (70.56%) in category 1 to 3 in BETHESDA. Fair concordance (67 %) was observed between TIRADS and BETHESDA Systems in evaluation of thyroid nodules.

CONCLUSION: The TIRADS system has fair concordance with BETHESDA in evaluation of thyroid nodules. The radiological findings are aligned with cytological findings in investigating them. This radio cytological interpretation of thyroid nodules helps the clinicians to avoid unnecessary invasive procedures in identifying and managing patients having high risk of thyroid carcinomas.

INTRODUCTION:

Thyroid nodules are common and their predominance relies up on the detection strategies used[1]. On Palpation alone, there is 3-8% detection rate of thyroid nodules, while imaging modalities like ultrasound increases detection rate to 20-76% and most of the nodules are harmless, but a small but significant percentage turns out to be cancerous[1]. The prevalence of thyroid carcinoma is increasing, accounting for 1.5 % of all tumors reported in the United States, and its occurrence is on the rise worldwide as well. [2,3]

A thyroid nodule can be defined as a discrete lesion within the thyroid gland that is radiologically distinct from the surrounding parenchyma. It may be cystic, solid, solitary, or multiple[1,2].

Ultrasonography has considerably increased the number of diagnosed cases, and Papillary carcinoma of the thyroid is the most common subtype and needs to be carefully differentiated from benign entities. [4]

TI-RADS (Thyroid Imaging Reporting and Data Systems) is an ultrasound-directed risk stratification system for thyroid nodules. It is a 5-point scoring system based on shape, margins, composition, echogenicity, and echogenic foci of lesions on ultrasound for thyroid nodules, which was developed in 2012 by the American College of Radiology (also named as ACR-TIRADS)[6]. TI-RADS utilizes ultrasound imaging elements to sort nodules in view of their probability of malignancy as benign, minimally suspicious, moderately suspicious, or highly suspicious for malignant lesion and has helped in a significant reduction in unnecessary thyroid nodule fine needle aspiration cytology biopsies (FNAB) and to help in further management and treatment[5,6]. Recently, a revised Thyroid Imaging Reporting and Data System (R-TI-RADS) has been developed, which has added another subcategory and has successfully reduced the rate of unnecessary FNAB in the management of thyroid nodules[7]

The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) has developed a reporting system in 2016 and revised in 2017 with reduced number of different categories for FNAB for thyroid nodules which has been widely used in America and also approved by American Thyroid Association. This system has six categories: a nondiagnostic, benign, follicular lesion of undetermined significance, follicular neoplasm, suspicious for malignancy, and malignant neoplasm. Each of these Bethesda categories defines risk of malignancy as0-3% for benign and up to 100% for malignant lesions, and it can be linked to evidence-based management of patients [8]

A significant concordance has been observed between TI-RADS and the Bethesda systems for the diagnosis of Thyroid carcinomas. Thyroid Cancer is one of the most common endocrine neoplasms, accounting for 1.0-1.5% of all new cancers in America, and there is a need for its accurate diagnosis for reducing morbidity and mortality associated with it.[9] Due to the increasing prevalence of thyroid nodules in our country, there is a need to establish and evaluate the concordance between radiology and cytology. The purpose of this study is to reaffirm and compare the radiological and cytological concordance of the thyroid nodules in our population.

ETHICAL APPROVAL AND CONSENT TO PARTICIPATE: Approval from the Institutional Review Board of the Shukat Khanum Memorial Cancer Hospital (IRB No EX-09-05-22-01) was obtained before the start of the study. All demographic and clinical information was kept confidential, and privacy and ethical standards were maintained in keeping with the Helsinki Declaration.

MATERIALS AND METHODS: In this retrospective cross-sectional review, A total of

600 cases, from January 2019 to Dec 2021, were recovered from the Hospital Information System (HIS) of the Shaukat Khanam Memorial Cancer Hospital and Research Centre, of patients whose ultrasound-guided fine needle aspiration cytopathology, TIRADS, and BETHESDA were available. 265 cases out of 600 were selected for the review utilizing purposive non-probability sampling, as others had missing records or incomplete data. Ultrasound was performed utilizing the Canon Aplio i800 USG MACHINE. Before US-guided FNAC, informed consent was obtained. Mostly 20-27G needles were utilized for FNA with a 10-20 ml syringe. On-site adequacy was done by a cytopathologist by evaluating the slides stained with Diff-Quick stain. Final evaluation was done by evaluating not only the Diff-Quick slides (company name) but also slides stained by Papanicolaou's stain (company name). Cell block material was also obtained in all the cases where it was required. All smears were reviewed by an experienced pathologist as per the BETHESDA framework.

Inclusion Criteria: Male and female patients aged 18 years and older, and patients with complete radiological and pathological information who gave consent.

Exclusion Criteria:

Patients less than 18 years

Patients with incomplete information

History of previous thyroid surgery for thyroid cancer or lobectomy.

Patients who didn't give consent.

DATA ANALYSIS: Data collected was entered and analyzed through SPSS version 24. Simple frequencies and percentages were calculated and presented in the form of tables and figures. The weighted kappa statistics with a 95% confidence interval were used along with Z-test statistics to assess the concordance between TIRADS and BETHESDA systems. For this analysis 5 categories of TIRADS and 6 categories of BETHESDA were combined to observe the radio pathological correlation for assessing thyroid knobs.

RESULTS: This study, conducted on 265 patients with solitary nontoxic nodules, concluded that out of 265, most of the participants, 86(32.5%), were of ages between 40-50 years showing a mean age of 47.12 years with a standard deviation of 13.014. It was revealed in this study that out of 265 participants, 206(77.7%) were females, showing a female predominance of thyroid nodules in patients coming to the Shaukat Khanum Cancer Hospital and research centre. This cross-sectional review showed predominance of thyroid nodules in the Right lobe, 143/265 (54%), and out of 265 participants, 141(53.2%) had a size less than 25mm. It was found that out of 265 subjects, 104(39.2%) had a solid nodule.

The TIRADS system out of 265 cases classified 114(43%) cases with normal to probably benign on ultrasound as category 1 to 3, 115(43.3%) cases with low suspicious aspect on ultrasound as category 4, 36 (13.6%) cases with high suspicious aspect on ultrasound as category 5 and 6.

Meanwhile, the Bethesda system classified 187(70%) cases reported as unsatisfactory, benign, atypia of undetermined significance or follicular lesion of undetermined significance in category I to III, 10(3.7%) cases reported as follicular neoplasm or suspicious for follicular neoplasm in category IV, 64(24.1%)cases reported as suspicious for malignancy or malignant in category V& VI.

Regarding TIRADS categories. Out of 265 subjects, most 115(43.4 %) were in category 4 and 86 (32.5%) fell in category 3. As far as BETHESDA categories are concerned, out of 265 patients with solitary non-toxic thyroid nodules, 146(55.1%) were in category 2, and then 52(19.6%) in category 4.

The frequency in TIRADS 2 was 20/265 as compared to category 2 of BETHESDA 146/265. Whereas frequency in TIRADS4

was 115/265 as compared to category 4 of BETHESDA, 12/265.

TI-RADS * Bethesda Cross tabulation

	Tirads						Total
	1	2	3	4	5	6	
I	0	1	7	8	0	1	17
II	4	16	52	57	14	3	146
III	2	3	13	8	2	0	28
IV	0	0	1	7	2	0	10
V	1	0	0	7	3	1	12
VI	1	0	13	28	10	0	52
Total	8	20	86	115	31	5	265

Variables	Categories	Frequency	Percent
Age	20 to 30 years	26	9.8
	30 to 40 years	63	23.8
	40 to 50 years	86	32.5
	50 to 60 years	60	22.6
	60 to 70 years	23	8.7
	70 to 80 years	7	2.6
Gender	Male Patients	59	22.3
	Female Patients	206	77.7
Site	I	6	2.3
	L	116	43.8
	R	143	54.0
Size	25 mm or Less	141	53.2
	26 to 50 mm	90	34.0
	51 to 75 mm	19	7.2
	76 to 100 mm	3	1.1
	Missing	12	4.5
S/C	C	22	8.3
	S	104	39.2
	S/C	42	15.8
	Missing	97	36.6
TI-RADS	1	8	3.0
	2	20	7.5
	3	86	32.5
	4	115	43.4
	5	31	11.7
	6	5	1.9

Bethesda	I	17	6.4
	II	146	55.1
	III	28	10.6
	IV	10	3.8
	V	12	4.5
	VI	52	19.6
Total	---	265	100.0

Regarding concordance of TIRADS with BETHESDA, A fair concordance (67 %) with a Z score of 2.842 and p value 0.004 was observed between both systems, showing substantial cytopathological correlation in the diagnosis of thyroid nodules

Symmetric Measurements

	Value	Std.Error	Zscore	Approx.Sig.	% agreement
Measure Of Agreement	0.34	0.018	2.842	0.004	67%
Kappa					
No of valid Cases	265				

DISCUSSION:

Thyroid nodules are normal, and their discovery techniques influence their prevalence rates. The principal concern is the risk of cancers that enormously changes among different methods. The normal pace of harming thyroid nodules identified through invasive procedures is between4-6.5% globally[2,7,8]. This cross-sectional review directed to find concordance among TIRADS and BETHESDA frameworks for conclusion of thyroid knobs showed that most patients with single non-toxic knobs were between ages 40-50 with mean age of 47 years. These outcomes were almost like an investigation of Colombia, where the mean age of patients was 57 years. These findings were similar to a study conducted in Iran where mean age of patients having thyroid knobs was 49,46 years[9].

This study concluded female predominance in patients with thyroid nodules, similar to a study of Colombia, where mostly females had thyroid nodules[3]. These findings were consistent with a study of Iran, where mostly females, 151/172, presented with thyroid nodules[9]. It was revealed in this cross-sectional study that thyroid knobs were common in right lobe, nearly similar to findings in study in Iran where right lobe predominance was observed in more than 50% of cases[9]. Regarding the frequency of different categories in TIRADS and BETHESDA, this study showed that TIRADS2 had 20/265 as compared to BETHESDA 2, where 146/265 frequency was observed. The TIRADS4 had 115/265 as compared to BETHESDA IV, which showed 12/265 patients. These results were consistent with study of Colombia where TIRADS 2 were 45/180 as compared to BETHESDA II i.e., 65/180.[3] in diagnosing thyroid knobs. This was also very similar to the study of Iran, where 53.5% of the patients had TIRADS 4 and more than 50% fell in the BETHESDA II

category. This study concluded a fair concordance 67 % between TIRADS and BETHESDA systems in diagnosing thyroid knobs very similar to study of Colombia where good Concordance 83% was observed between the 2 systems[3] showing that the findings of Ultrasound are aligned with the cytology results. Also, these results were the same as the study of Iran, which also showed substantial concordance between TIRADS and BETHESDA systems [9] and also consistent with findings of a study in America, where high concordance 84.1 %[10] was observed between Bethesda 4 and TIR 4 categories, and in Saudi Arabia[13] where maximum concordance (TIRADS 3versus BETHESDA II) between the 2 systems was found. Concordance found in our study was also nearly same as found in study in America where overall concordance of 63.6 %[11]was observed between TIRADS and BETHESDA showing radio cytological concordance in diagnosing thyroid knobs as well as assessing risk of malignancy for better management of these patients.

Results of this study are also in accordance to findings of a study in a tertiary care centre in India where there was a significant correlation between TI-RADS and TBSRTC with a p value of 0.000 and a kappa agreement of 0.688 and both systems help in categorization of thyroid nodules and hence improve overall management and increasing survival in patients with thyroid malignancies[14]. Our study concluded 67% concordance between TIRADS and Bethesda which is coinciding to study in England where fair correlation was observed between these diagnostic modalities in assessment of thyroid nodules and its management.[15] and also similar to study conducted in, where a significant correlation between TI-RADS and Bethesda cytopathological findings was found and thus they can be used for predicting the results of FNAB and for making accurate diagnosis both at biopsy and surgical intervention during management of thyroid nodules, therefore reducing the burden of disease in community.[16]

CONCLUSION: The thyroid Ultrasonography reporting system TIRADS had a fair concordance with the BETHESDA system of cytology using FNA biopsy. There is cytopathological alignment in the diagnosis of thyroid non-toxic nodules in patients presenting to Shaukat Khanam Memorial Cancer Hospital and Research Centre, which helps clinicians to avoid unnecessary invasive procedures and thereby improves management of these cases and thereby improving their quality of life.

CONFLICT OF INTERESTS AND FUNDING: There was no conflict of interest, and the expenses were borne by the researchers themselves.

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