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Original Research Paper

Radio-Diagnosis

ULTRASONOGRAPHIC CATEGORIZATION OF THYROID LESIONS AS PER TIRADS AMONG PATIENTS IN TERTIARY CARE HOSPITAL IN ROHILKHAND REGION

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ABSTRACT **Introduction And Background:** Sonographic imaging may detect thyroid mass, nodule or diffuse enlargement that may or may not be palpable. When used in conjunction with clinical assessment, FNAC and USG reduce thyroidectomies by approximately 50%, double the surgical detection rate of carcinoma and save the overall medical care costs by around 25%. **Aims And Objectives:** This prospective hospital based observational study was done over a period of 1.5 years and included 70 patients with following objectives i) USG categorization of thyroid lesions as per TIRADS ii) Comparison of USG findings with cytohistological findings. **Results:** On USG TR3 lesions were most prevalent (34.3%), followed by TR1 and TR2 lesions (27.1% each), TR4 lesions(8.6%) and least common being TR5 lesions (2.9%). Cytohistological correlation showed USG had sensitivity of 80% and specificity of 96.92% with PPV of 66.67% and NPV of 98.44%. **Conclusion:** USG ACR TIRADS categorizations were in agreement with FNAC/ histopathological findings. This study highlights the importance of USG in assessment of thyroid lesions and directing further management.

KEYWORDS : USG, Thyroid lesions, ACR TIRADS, FNAC, Histopathology

INTRODUCTION

The thyroid gland functions as a largest endocrine gland and its superficial placement facilitates optimal viewing and aids in the assessment of its typical structure, variations in structure, and abnormal situations using high-resolution real-time grey-scale ultrasonography.[1] High-resolution grey-scale ultrasonography with colour Doppler study can provide clear visualization of both normal thyroid architecture and pathological abnormalities. The USG can effectively indicate normal thyroid gland anatomy and pathology, including its size, margin, and number of nodules. The palpation method is unable to detect the majority of thyroid nodules. Research indicates that palpation can detect nodules in only 5% of cases. Ultrasonography (USG), being more responsive than palpation, has the ability to detect nodules in as many as 67% of the overall population.[2] The nodules on the USG thyroid are assessed to distinguish between both benign and malignant nodules, various characteristics of the nodule, including its size, echotexture, location within the thyroid gland, margins, vascularity, presence of a halo, calcification and the contents of the nodule.[3]

Thyroid nodules are prevalent, occurring in around 8.5% of the population. They have a higher prevalence among women. A recent investigation indicates that the occurrence of a detectable thyroid nodule in the Indian population is approximately 12.2%.[4] The most typical clinical presentation is hypothyroidism; however, goiter is also common, and hyperthyroidism is less frequently observed. The most prevalent disease observed in 40% of the cases was multinodular goiter. Female individuals were predominantly afflicted by multinodular goiter, accounting for 90% of all goiter case[5]. Similarly, the occurrence of colloid cysts was more prevalent in females, accounting for 20% of all instances of colloid cysts. Moreover, 87 percent of cases of diffuse thyroid hyperplasia were in females. High frequency ultrasound makes it possible to identify lesions as small as those that are imperceptible to the human touch. Specific ultrasonography features of nodules, such as reduced echogenicity, presence of microcalcifications, and indistinct and irregular borders, are linked to the presence of cancer. Thyroid illnesses exhibit a higher prevalence in females compared to males.[6] The diagnostic procedures encompass clinical examination of gland, thyroid function test (TFT), ultrasound (USG), fine needle aspiration cytology (FNAC), and histological investigation. In order to accomplish definitive diagnosis, it is crucial to conduct either fine-needle aspiration cytology (FNAC) or histological testing.[7] This research explored the crucial field of thyroid health by contrasting the classification of thyroid lesions using ultrasonography in patients treated in the Rohilkhand region, in a tertiary care facility. Our knowledge of thyroid pathology could be improved by this research, opening the door to more precise and knowledgeable clinical judgments in the quest for the best possible patient outcomes.

Objectives

i) USG categorization of thyroid lesions as per TIRADS
ii) Comparison of USG findings with cytohistological findings.

MATERIAL AND METHODS

This hospital based observational study was conducted in the department of Radio diagnosis in a tertiary care teaching hospital in Rohilkhand region of western Uttar Pradesh for period of one year after institutional ethical committee clearance and cluded total seventy patients. **Inclusion Criteria:** Patients with clinically suspected thyroid lesions, thyroid lesions detected on ultrasonography and patient giving informed written consent to participate in the study. **Exclusion Criteria:** Patients without cytopathological correlation and previously diagnosed/treated cases of thyroid lesions.

Data Collection:

USG evaluation of lesions was done using Siemens Acuson Juniper, S2000, NX3 Elite, Sequoia ultrasound equipment with ACR TIRADS categorization done based onsize, composition, echogenicity, margins, taller than wider shape, microcalcification, macrocalcification, intranodular vascularity and abnormal cervical lymphadenopathyand scored accordingly as: (1) normal thyroid gland, (2) benign lesions, (3) probably benign lesions, (4) suspicious lesions, (5) probably malignant lesions. The FNAC or histological findings of all the above patients were noted from the records and correlated with ACR TIRADS categorization.

RESULTS:

Table 1 shows age-wise distribution of patients in the study indicates a mixed representation across different age groups. Most of the patients were between the ages of 36 and 45, comprising 31.4% of the total sample. The distribution gradually decreases in the older age group, with only a small proportion of patients aged 66-75 years (2.9%) and 76-85 years (1.4%).

Table 1: Age Wise Distribution Of Patients

Age group	Frequency	Percent
16-25	9	12.9
26-35	13	18.6
36-45	22	31.4
46-55	10	14.3
56-65	13	18.6
66-75	2	2.9
76-85	1	1.4
Total	70	100.0

Table1. shows the distribution of ACR TIRADS categories among the total sample of 70 patients. The most frequently assigned categories are TR1 and TR2, each representing 27.1% of cases. TR3 accounts for 32.9% of cases, indicating lesions with intermediate suspicion. TR4 and TR5, representing higher levels of suspicion for malignancy, are less common, comprising 10.0% and 2.9% of cases, respectively.

Table 2. Showing Distribution Of Patients As Per ACR TIRADS Category

ACR TIRADS CATEGORY	NO. of patients(%)
TR1	19(27%)
TR2	19(27%)
TR3	24(34%)
TR4	6(9%)
TR5	2(3%)

Table 3. shows the ACR TIRADS categorization and corresponding FNAC/ histopathology findings for each patient.

Table 3: ACR TIRADS Categories And FNAC/Histopathology Diagnoses Of Thyroid Lesions

ACR TIRADS Category	FNAC/ Histopathology Diagnosis		Total	p value
	Benign	*Malignant*		
TR1	19	0	19	0.000
	29.2%	0.0%	27.1%	
TR2	19	0	19	
	29.2%	0.0%	27.1%	
TR3	23	1	24	
	35.4%	20.0%	34.3%	
TR4	4	2	6	
	6.2%	40.0%	8.6%	
TR5	0	2	2	
	0.0%	40.0%	2.9%	
Total	65	5	70	
	100.0%	100.0%	100.0%	

Table 4: Diagnostic Performance of Ultrasound Diagnosis Compared to FNAC/Histopathology

Statistics	Value	95% CI
Sensitivity (S_n)	80.00%	28.36% to 99.49%
Specificity (S_p)	96.92%	89.32% to 99.63%
Positive Predictive Value (PPV)	66.67%	32.30% to 89.34%
Negative Predictive Value (NPV)	98.44%	91.60% to 99.73%
Accuracy	95.71%	87.98% to 99.11%

DISCUSSION

The present study provides a comprehensive evaluation of thyroid nodules using ACR TIRADS classification and correlates these findings with cytological and histopathological diagnoses in a North Indian tertiary care population. Our findings are consistent with, and in some instances distinct from, other regional and international studies, particularly regarding demographic characteristics, TIRADS category distribution, and diagnostic accuracy.The age-wise distribution in our study showed the highest prevalence of thyroid lesions in the 36–45 age group (31.4%). This finding aligns closely with Thattarakkal et al.[8], where the 31–60 age group accounted for 76.4% of patients, reflecting a mid-life peak in thyroid pathology. Similarly, Chandramohan et al.[9] reported a mean patient age of 42.7 years, reinforcing the mid-life predilection.Female predominance was a consistent finding across all studies. Our study showed a notable female majority, comparable to a female: male ratio of 4.6:1 in Thattarakkal et al.[8] and 60 out of 69 patients being female in the study by Chandramohan et al.[9]Moifo et al.[10]and Singaporewalla et al.[11]also reported a similar female skew, underscoring the gender-specific prevalence likely influenced by hormonal and genetic factors.In our study, TR3 was the most common category (34.3%), followed by TR1 and TR2 (each 27.1%), TR4 (8.6%), and TR5 (2.9%). These results are partially consistent with the study by Moifo et al.[10], which reported TR3 as the most frequent category (52.6%), and Thattarakkal et al.[8], who observed the majority in TR2 (56.5%) and TR3 (17.6%). Singaporewalla et al.[11] similarly recorded a large portion in the benign to probably benign range (TIRADS 2 and 3) across 74% of cases, reinforcing the general trend that most thyroid nodules detected on ultrasound fall into low-suspicion categories.However, variations do exist. For instance, the study by Srinivas et al.[12] showed a more nuanced distribution, subclassifying TR4 into 4A, 4B, and 4C, with malignancy risks of 4.76%, 66.67%, and 83.33% respectively. These detailed subcategories may offer finer stratification for malignancy risk, which our broader TR4 categorization (without subgroups) may obscure.Our study found that TR1 and TR2 lesions were entirely benign, while malignancy rates increased with higher TIRADS categories: TR3 (4.2%), TR4 (33.3%), and TR5 (100%). These trends are broadly supported by findings from other studies. Moifo et al.[10] reported malignancy rates of 0% (TR2), 2.2% (TR3), 5.9% (TR4A), 57.9% (TR4B), and 100% (TR5), indicating an escalating malignancy risk. Thattarakkal et al.[8] showed malignancy rates of 4.2% (TR2), 13.3% (TR3), 57.9% (TR4), and 100% (TR5), nearly mirroring our results in TR4 and TR5.Diagnostic performance metrics in our study were favourable: sensitivity 80%, specificity 96.92%, PPV 66.67%, and NPV 98.44%. These values were comparable with those from Thattarakkal et al.[8] (sensitivity 77.8%, specificity 89.6%, PPV 66.6%, NPV 93.8%) and Singaporewalla et al.[11] (sensitivity 70.6%, specificity 90.4%, NPV 93.8%). Chandramohan et al.[9] emphasized a strong PPV of 91% for TR5 and substantial interobserver agreement (= 0.721), reinforcing the reliability of ACR TIRADS in experienced hands.These findings collectively support the utility of the ACR TIRADS system as a robust non-invasive tool for stratifying thyroid nodules and guiding the need for FNAC. Especially in resource-limited settings, this approach helps minimize unnecessary biopsies without compromising malignancy detection, as also noted by Srinivas et al.[12], who reported a 43.83–86.3% potential reduction in avoidable FNACs.

CONCLUSION

USG ACR TIRADS categorizations were in agreement with FNAC/ histopathological findings in the current study. This study highlights the importance of USG in assessment of thyroid lesions and directing further management. These results add to our understanding of thyroid research and could direct future studies in this area and reinforce the role of ultrasound as a frontline modality in thyroid nodule assessment, with TIRADS enhancing its clinical impact.

Conflicts Of Interest- nil

Acknowledgement- nil

Funding- nil

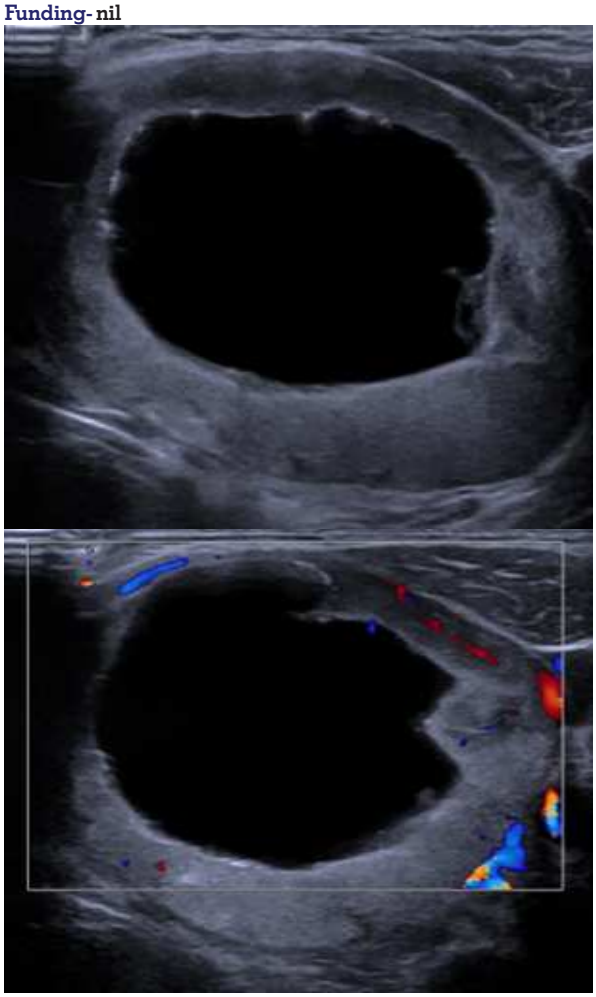


Fig 1(a) and (b) showing a well-defined round to oval wider than taller anechoic cystic lesion showing no uptake of vascularity on CDFI noted in left thyroid lobe (TIRADS 1).Cytohistological Diagnosis- Colloid cyst

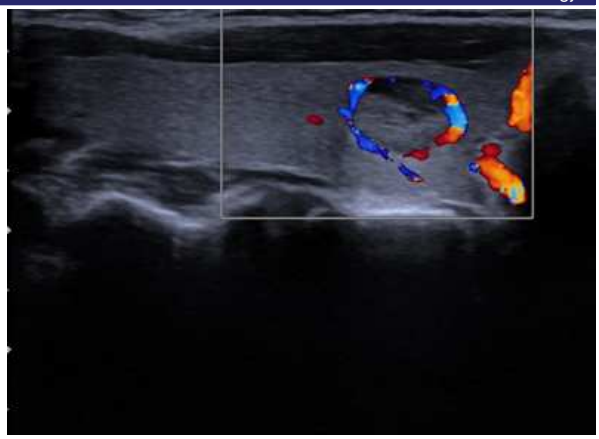


Fig. 2(a) and (b) showing a well-defined round to oval homogenous isoechoic to hyperechoic lesion showing peripheral uptake of vascularity on CDFI in right lobe of thyroid (TIRADS 2).Cytohistological Diagnosis- Follicular adenoma

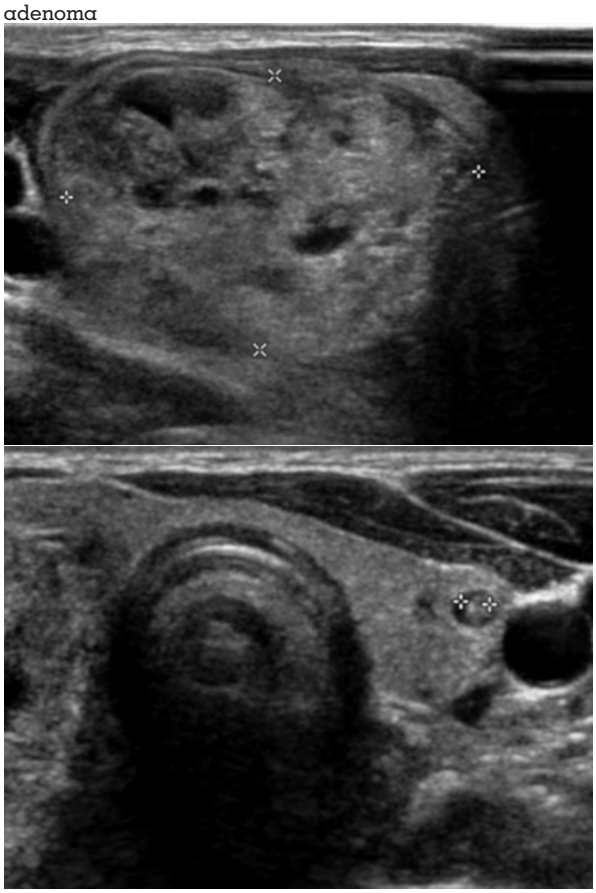
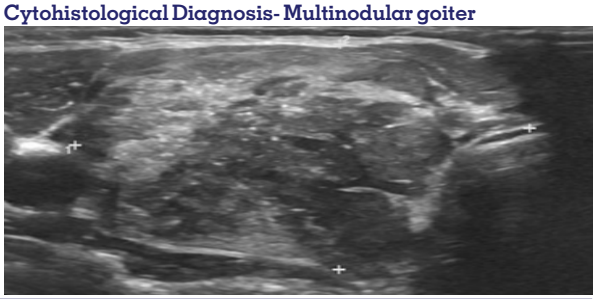


Fig. 3(a) and (b) show multiple well defined heterogeneously isoechoic to hyperechoic nodules with few of them showing cystic changes within and mild vascularity on CDFI in right and left thyroid lobes (TIRADS 2).

Cytohistological Diagnosis- Multinodular goiter



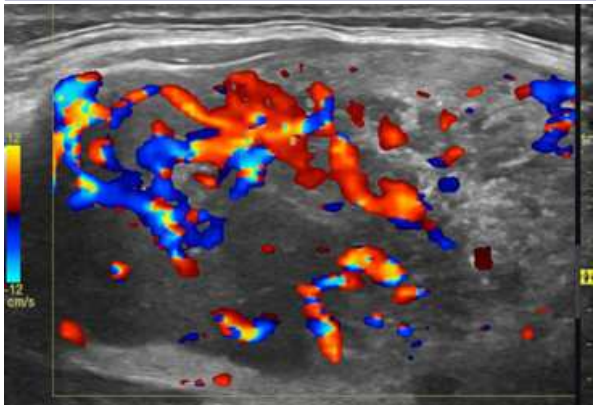


Fig. 4(a) and (b) showing a large heterogenous wider than taller lesion with isoechoic as well as hypoechoic area without cystic changes showing multiple tiny echogenic foci (tiny calcifications). There is no hypoechoic halo around the lesion and no capsular breach. There are significant flow signals in the lesion on CDFI (TIRADS 4).Cytohistological Diagnosis- Papillary carcinoma thyroid.

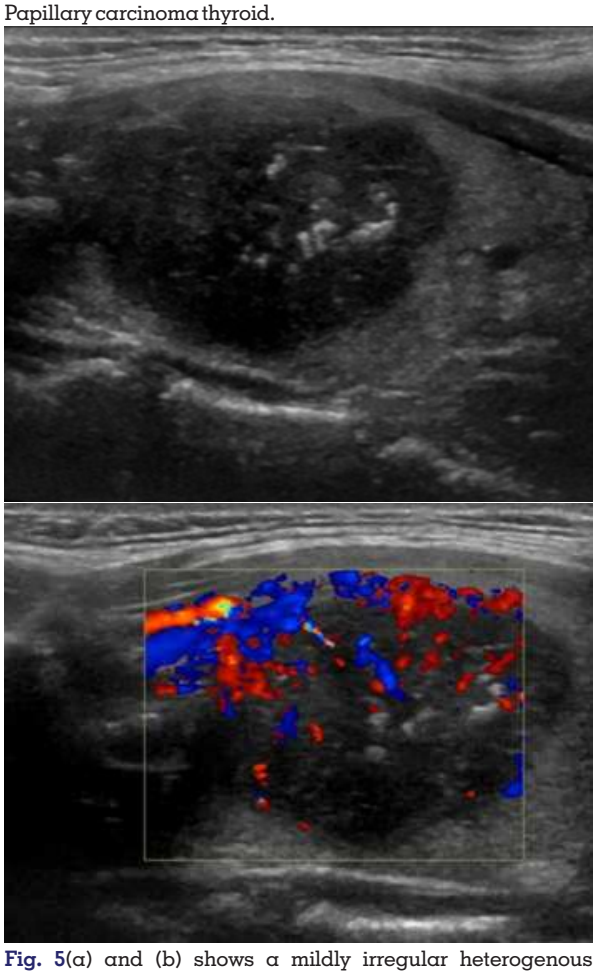


Fig. 5(a) and (b) shows a mildly irregular heterogenous hypoechoic mass within the left lobe of the thyroid gland with multiple echogenic foci within (calcifications). The lesion shows uptake of vascularity on CDFI (TIRADS 5).Cytohistological Diagnosis- Medullary carcinoma thyroid.

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