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**ORIGINAL ARTICLE**

# Papillary Carcinoma in a Patient with a Thyroid Nodule: Role of Ultrasonography and its Diagnostic Accuracy

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## ABSTRACT

**Introduction:** While it can be difficult to categorize thyroid lesions, employing ultrasound may enable correct diagnosis, classification, and therapy of thyroid nodules, particularly papillary carcinoma of the thyroid, and assist save unneeded biopsy.
**Objective:** Taking histopathology as the gold standard, assessing the diagnostic precision of ultrasound in the identification of papillary cancer in thyroid nodule patients.
**Study design:** Cross sectional study
**Study Settings:** Department of ENT & Surgery, Jinnah Teaching Hospital, Peshawar
**Study Duration:** This study was conducted from 1st August 2021 till 30th June 2022.
**Materials and Methods:** Patients of both gender who sought assessment for a thyroid nodule were included. On ultrasonography, papillary carcinoma was detected. The gold standard for diagnosing cancers, histology, was used to confirm papillary carcinoma. Using a 2×2 table, diagnostic accuracy was assessed in terms of sensitivity, specificity, PPV, and NPV.
**Results:** Overall 241 participants recruited. The patients were between the ages of 18 and 75. The patients' mean age was 57.80 + 9.245 years. The ratio of men to women was 1.2:1. The ultrasound's sensitivity, specificity, PPV, NPV, and diagnostic accuracy for the diagnosis of papillary thyroid cancer were, respectively, 85.1%, 97.5%, 88.8%, 96.5%, and 95.1%.
**Conclusion:** With clinically significant diagnostic accuracy for the early diagnosis of thyroid papillary carcinoma, ultrasound is a cost-effective, non-invasive diagnostic method that may lessen the need for invasive diagnostic methods like thyroid biopsy.
**Keywords:** Papillary Carcinoma of Thyroid, Ultrasound, Diagnostic Accuracy

## INTRODUCTION

Goitrogenesis begins as a diffuse condition and progresses through time to become nodular as well as to grow.[1] These nodules can be single or multinodular, and several palpable thyroid nodules that are commonly mistaken for being single are actually a multinodular thyroid gland. 4–7% of elderly patients with thyroid lump, and up to 50% of those over 40 have thyroid mass that can be seen with high resolution ultrasonography.[2] These nodules are more common as people age, have low iodine levels, have had radiation exposure in the past, and consume foods that are goitrogenic.[3] Childhood radiation exposure alters thyroid endocrine function and raises the danger of benign and malignant thyroid nodules.[4] All age groups are predisposed to developing thyroid nodules, although females are more likely than men to do so (6.4%), and male thyroid nodules are far more likely to be malignant than female thyroid nodules (1.5%).[2] Although these nodules are relatively prevalent in people between the ages of 30 and 60,individuals younger than 30 or older than 60 have a higher risk of developing malignancy.[5] Papillary thyroid carcinoma, the most prevalent thyroid cancer, accounting for more than 75% of thyroid malignant tumours, making it the most frequent endocrine malignancy.[6, 7]

The first-line diagnostic method for identifying and describing nodular thyroid disease is thyroid ultrasonography. With a sensitivity of 88.9% and 91.8%, micro calcification is the most significant ultrasonographic indication of papillary thyroid cancer.[8, 9]

As we typically do ultrasonography on every patient who has a thyroid nodule, our institution hasn't before undertaken research on this topic in the recent past. Therefore, purpose of this study was to determine the value of ultrasonography in the diagnosis of papillary thyroid cancer. We believe that ultrasonography has a significant sensitivity and specificity in detecting papillary thyroid carcinoma because it is affordable, less time-consuming, noninvasive, and the expertise is readily available in our hospital.

## MATERIAL AND METHODS

**Study Design and Setting:** This cross sectional study was conducted at Department of Otorhinolaryngology, Head & Neck Surgery & Surgery, Jinnah Teaching Hospital, Peshawar, from 1st August 2021 till 30th June 2022 after taking approval from the research review committee of the hospital.
**Sampling:** A total of 241 participants were registered through non-probability consecutive sampling technique. Sample size was calculate using WHO sample size formula. Participants of either gender, in the age range of 18 to 75 years, presenting for evaluation of thyroid nodule were included. Patients with known thyroid disease (confirmed by previous record), head and neck abscess were excluded.
**Data Collection:** Informed consent was taken from the enrolled participants. Baseline information including age, gender, BMI, duration of complaints were recorded. Detailed history and physical examination was performed focusing the site, size, shape and tenderness. Baseline lab tests included blood counts, renal and liver function tests and thyroid function tests. A detailed and dedicated ultrasound neck was performed for evaluation thyroid nodule. The ultrasound was performed by consultant radiologist with 05 years' experience. The radiologist was blinded to clinical information of the patients. The presence of a solid heterogeneous mass with irregular margins and micro-calcifications as reported by the radiologist were noted which were considered indicative of malignancy (papillary carcinoma). After surgical excision of the thyroid nodule by an expert ENT, Head & Neck Surgeon, the specimen will be sent in formalin for histopathalogical examination. The specimen was evaluated by experienced pathologist. Moreover, the pathologist was blinded to clinical and ultrasound findings. Presence of papillary carcinoma on histopathological examination was noted. Data was recorded on especially designed proforma.
**Data Analysis:** The collected data was entered in SPSS version 25 and analyzed. Mean + standard deviation were computed for numerical data. Categorical data was presented as frequencies and percentages. Diagnostic accuracy was recorded as sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) using 2x2 table, using the following equations: Sensitivity = (a /a + c) x 100 Specificity = (d / b + d) x 100 Positive predictive value (PPV) = (a / a + c) x 100, Negative predictive value (NPV) = (d / d +c) x 100 Accuracy= (d + a) /overall patients Whereas a = True positive, b = False positive, c = False negative, d = True negative

## RESULTS

In this study, age of the patients ranged from 20 to 75 years. Mean age was 57.80 ± 9.245 years, mean weight 75.22 ± 7.101 kg and mean BMI was 24.40 ± 3.722 kg/m$^2$. 131 patients (54.4%) were

male. Majority of the patients (60.2%) had age more than 50 years. The frequencies and percentages of true positive, false positive, false negative and true negative were 40 (88.8%), 05 (11.2%), 07 (3.6%) and 189 (96.4%) respectively. The sensitivity, specificity, positive predictive value and negative predictive of ultrasound recorded were 85.1%, 97.5%, 88.8% and 96.5%respectively.

Table 1: Mean ± SD of patients according to Age, Weight and BMI

| Demographics and Baseline Charactersitics | Mean ± std. Deviation |
|---|---|
| Patient age (years) | 57.80 ± 9.245 |
| Patient weight (kg) | 75.22 ± 7.101 |
| BMI (Kg/m$^2$) | 24.40 ± 3.722 |

Table 2: Diagnostic accuracy of ultrasound

| U/S * Histopathology | | | | | |
|---|---|---|---|---|---|
| | | Histopathology | | Total | Sensitivity = 85.1%<br>Specificity = 97.5% |
| | | Positive | Negative | | |
| U/S | Positive | 40 (88.8%) | 5 (11.2%) | 45 (100.0%) | PPV= 88.8%<br>NPV= 96.5% |
| | Negative | 07 (3.6%) | 189 (96.4%) | 196 (100.0%) | Accuracy = 95.1% |
| Total | | 47 (19.5%) | 194 (80.5%) | 241 (100.0%) | |

## DISCUSSION

We took into consideration a number of significant ultrasound features stated in the literature for the current investigation since the existing literature on the diagnostic accuracy of ultrasound characteristics in predicting thyroid malignancies lacks solid evidence.

The possibility of misclassification bias is minimised in the study since knowledgeable consultants in the relevant domains independently analysed the results of the index test and the reference standard based on specific, unambiguous rules. Additionally, there was no inter-observer bias in the data collection because the interpretation of the ultrasound imaging and cytology were done independently by a single expert. There was no possibility of bias in the interpretation of the reference standard test because the patholgist was blinded to the outcomes of the ultrasound scan findings of the subjects. The gold standard diagnosis for thyroid cancers, histopathological diagnosis, was employed as the reference standard in the current investigation, which used ultrasonic scanning as the index test.

The most critical features to be employed in evaluating the diagnostic accuracy of ultrasonography were identified by this study, which was crucial in addressing the possible confounding influence of ultrasound characteristics on one another. Three important ultrasonic characteristics—microcalcifications, hypoechogenicity, and internal vascularity—have been identified by the investigation. These results are in line with the majority of the literature already in existence, as several studies have demonstrated good indications of the diagnostic accuracy of microcalcification,[10, 11] hypoechogenicity,[12] and internal vascularity in predicting thyroid cancer.[13]

A positive ultrasonography feature is related with an LR+ of 10.4 (95% CI 4.6-23.7) for the presence of microcalcifications, which means that the chance of having thyroid cancer has increased by around ten times. The poor sensitivity of 36.4% for this trait, meanwhile, is comparable with low sensitivity (26.1-59.1%) values reported in the literature.[11] Contrarily, this ultrasonography characteristic's specificity was extremely high (96.5%), which is similar with previously reported values of 90.8% and 87.8%.[14] Since microcalcifications correlate pathologically to the calcified "psammoma bodies" that are characteristic of papillary carcinoma, there is a significant correlation between them and thyroid malignancies.[15, 16] Contrarily, macrocalcifications or coarse calcifications are linked to fibrosis and degeneration, while benign nodules that have been present for a long time are mostly linked to coarse calcifications.[17]

According to our findings, ultrasonography has a sensitivity of 85.1% and a specificity of 97.5%. These results are better than preceding studies, where a meta-analysis revealed the sensitivity to be 62.7%.[14] However according to the published research, the sensitivity levels fall between 26.5% to 87.2%.[10] In a similar vein, the results range from 58.5% to as high as 94.3% even though analysis of the previous research show a specificity of 62.3%. Moreover, the LR+ found in this study is comparable to that found in the meta-analysis.[14]

Our investigation demonstrated that the two most important factors in suggest thyroid cancers, which are components of TI-RADS system, are the presence of microcalcifications and hypoechogenicity. In our work, internal vascularity has also demonstrated a statistically significant connection in addition to the parameters of TIRAD system. Hence, more research is required to determine how vascularity affects the prognosis of thyroid cancer.

## CONCLUSION

Several sonographic characteristics, such as calcifications, margins, vascularity, and echogenicity, can be used to identify thyroid nodules with a propensity for malignancy. This strategy is essential to foresee the possibility of cancer in nodules, which can assist prevent invasive diagnostic procedures like FNAC and biopsy. The current study reveals that the US criteria offer significant assistance on the necessity of biopsy, and as a result, the authors advise include these criteria in radiologists' reporting systems. It is necessary to conduct more prospective studies using bigger cohorts to verify the results of this investigation.

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