

# Demographic And Histopathological Characteristics Of Echogenic Thyroid Nodule: A Study In A Tertiary Care Hospital, Dhaka, Bangladesh

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## Abstract

**Introduction:** Echogenic thyroid nodules are a common finding in clinical practice, often identified incidentally during imaging studies. Factors such as age, gender, and nodule characteristics are crucial in determining malignancy risk. This study aims to evaluate the age- and gender-related distribution of echogenic thyroid nodules and their histopathological outcomes, contributing to the growing body of knowledge on thyroid nodule management.

**Methods:** The study was conducted as a retrospective observational analysis at a tertiary care hospital in Dhaka, Bangladesh from July, 2022 to June, 2023. A total of 100 patients were selected as study subjects. Demographic data, including age, gender, and relevant clinical history, were collected from patient records. The study primarily focused on identifying the association between echogenicity and histopathological outcomes, including the prevalence of benign and malignant thyroid nodules. Statistical analysis was performed using SPSS version 26.

**Result:** The study analyzed 100 patients with echogenic thyroid nodules, highlighting demographic and histopathological characteristics. The largest age group was 60-80 years (38%), with a higher male predominance in this group (65.79%). Benign nodules were more prevalent overall (77%), with the 60-80 age group showing the highest proportion of benign outcomes (81.58%) and the lowest malignancy rate (18.42%). In contrast, the youngest group (18-29 years) exhibited the highest malignancy rate (36.84%). Gender analysis revealed slightly higher malignancy rates in males (24.14%) compared to females (21.43%), with younger males showing a higher malignancy rate than females in the same age group.

**Conclusion:** The majority of patients with these nodules presented benign histopathological outcomes, with a higher incidence of benign cases observed in older age groups. Solitary nodules were more common than multiple nodules, and the likelihood of malignancy increased with nodule size. Additionally, gender differences were noted, with males showing a slightly higher incidence of malignancy in certain age groups. These findings highlight the importance of considering both demographic factors and nodule characteristics when assessing the malignancy risk of echogenic thyroid nodules.

**Keywords:** Histopathology, Demography, Thyroid nodule, Malignancy

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### I. Introduction

Thyroid nodules are a common clinical finding, with prevalence rates varying across populations and age groups, often influenced by environmental, genetic, and dietary factors [1]. They are most frequently detected in middle-aged women, but with the increased use of high-resolution ultrasound, thyroid nodules are increasingly diagnosed in asymptomatic individuals of all ages [2]. Among the various types of thyroid nodules, echogenic nodules have drawn particular clinical attention due to their distinct ultrasound features and potential associations with malignancy. This study aims to investigate the demographic and histopathological characteristics of echogenic thyroid nodules, thereby contributing to better diagnostic accuracy and management. Recent studies have indicated that echogenicity in thyroid nodules can be a useful sonographic feature in predicting nodule composition and, in some cases, malignancy risk [3]. There remains a significant clinical need to understand which echogenic patterns may signal higher malignancy risk, particularly in specific demographic subgroups [4]. The demographic profile of patients with thyroid nodules varies globally, but common trends suggest a higher prevalence among females and older adults [5]. The gender disparity in thyroid nodule prevalence may be due to hormonal influences, genetic predisposition, and autoimmune factors that predispose women to thyroid pathologies [6]. Several studies have aimed to correlate ultrasound features of thyroid nodules, such as echogenicity, with histopathological outcomes. A study by Kim et al. found that hypoechoic nodules are more likely to be malignant, while hyperechoic nodules often correspond to benign pathologies, especially in women and older adults [7]. Other research indicates that isoechoic and hyperechoic patterns are frequently associated with follicular adenomas and colloid nodules, reducing the likelihood of malignancy [8]. However, there is variability in these findings, suggesting that echogenicity alone cannot be relied upon to determine malignancy risk and should be considered alongside other ultrasound features, such as nodule size, shape, and presence of calcifications [9]. Recent advances in ultrasound elastography and high-resolution imaging techniques have further enhanced the diagnostic utility of echogenicity in thyroid nodules. Ultrasound elastography, which assesses tissue stiffness, has shown promise in distinguishing benign from malignant thyroid nodules, especially when used in conjunction with echogenic patterns [10]. High-resolution imaging has also allowed for better visualization of microcalcifications and vascular patterns within echogenic nodules, both of which are associated with a higher risk of malignancy [11]. These technological advancements highlight the evolving role of imaging in the diagnostic workup of thyroid nodules, especially as a non-invasive alternative to fine-needle aspiration biopsy in selected cases [12]. This study aimed to assess demographic and histopathological characteristics of echogenic thyroid nodules.

### II. Methods

The study was conducted as a retrospective observational analysis at a tertiary care hospital in Dhaka, Bangladesh from July, 2022 to June, 2023. A total of 100 patients were selected as study subjects. Inclusion criteria consisted of patients of all ages and genders presenting with echogenic thyroid nodules confirmed by ultrasound. Patients with incomplete records, previous thyroid surgery, or those diagnosed with diffuse thyroid diseases, such as Graves' disease or Hashimoto's thyroiditis, were excluded. Demographic data, including age, gender, and relevant clinical history, were collected from patient records. Histopathological characteristics of the thyroid nodules were obtained from fine-needle aspiration cytology (FNAC) reports or histopathology results following surgical excision. The study primarily focused on identifying the association between echogenicity and histopathological outcomes, including the prevalence of benign and malignant thyroid nodules. Statistical analysis was performed using SPSS version 26. Ethical approval was obtained from the institutional review board before the commencement of the study, and patient confidentiality was strictly maintained throughout.

### III. Results

**Table 1:** Age distribution of patients (n=100)

Age Group	Frequency	Percentage (%)
18-29	19	19.0
30-39	15	15.0
40-49	14	14.0
50-59	14	14.0
60-80	38	38.0

Table 1 presents the age distribution of 100 patients, revealing that the largest proportion (38%) were in the 60-80 age group. This is followed by 19% of patients aged 18-29, 15% aged 30-39, and equal proportions (14%) in the 40-49 and 50-59 age groups.

**Table 2:** Gender distribution and histopathological results (n=100)

Gender	Benign (Frequency)	Malignant (Frequency)	Benign (%)	Malignant (%)
Female	33	9	78.57	21.43
Male	44	14	75.86	24.14

Table 2 displays the gender distribution and histopathological results for 100 patients, showing that benign nodules were more prevalent in both females and males. Among female patients, 78.57% had benign nodules, while 21.43% had malignant ones. Similarly, 75.86% of male patients had benign nodules, with 24.14% presenting with malignancies.

**Table 3:** Histopathological outcomes by age group (n=100)

Age Group	Benign (Frequency)	Malignant (Frequency)	Benign (%)	Malignant (%)
18-29	12	7	63.16	36.84
30-39	12	3	80.00	20.00
40-49	11	3	78.57	21.43
50-59	11	3	78.57	21.43
60-80	31	7	81.58	18.42

Table 3 summarizes histopathological outcomes by age group for 100 patients, indicating a higher prevalence of benign results across all age groups. Among the youngest group (18-29), 63.16% had benign outcomes, while 36.84% were malignant—the highest malignancy rate among all age groups. In the 30-39 age group, 80% were benign, and 20% were malignant. Both the 40-49 and 50-59 groups had similar distributions, with 78.57% benign and 21.43% malignant cases. The 60-80 age group showed the highest proportion of benign outcomes (81.58%) and the lowest malignancy rate (18.42%).

**Table 4:** Age group distribution by gender (n=100)

Age Group	Female (Frequency)	Male (Frequency)	Female (%)	Male (%)
18-29	8	11	42.11	57.89
30-39	9	6	60.00	40.00
40-49	5	9	35.71	64.29
50-59	7	7	50.00	50.00
60-80	13	25	34.21	65.79

Table 4 presents the distribution of patients by age group and gender. Among the youngest group (18-29 years), 42.11% were female and 57.89% were male. In the 30-39 age group, females represented 60%, while males accounted for 40%. In the 40-49 group, there was a higher proportion of males (64.29%) compared to females (35.71%). The 50-59 age group had an equal distribution, with 50% females and 50% males. In the oldest age group (60-80 years), males constituted 65.79%, while females made up 34.21%.

**Table 5:** Histopathological results by combined age group and gender (n=100)

Age Group	Gender	Benign (Frequency)	Malignant (Frequency)	Benign (%)	Malignant (%)
18-29	Female	5	3	62.50	37.50
18-29	Male	7	4	63.64	36.36
30-39	Female	6	3	66.67	33.33
30-39	Male	6	0	100.00	0.00
40-49	Female	5	0	100.00	0.00
40-49	Male	6	3	66.67	33.33
50-59	Female	5	2	71.43	28.57
50-59	Male	6	1	85.71	14.29
60-80	Female	12	1	92.31	7.69
60-80	Male	19	6	76.00	24.00

In the 18-29 age group, 62.50% of females and 63.64% of males had benign results, with malignancy rates of 37.50% and 36.36%, respectively. In the 30-39 age group, females had a 66.67% benign rate, while all males (100%) had benign nodules. For the 40-49 group, 100% of females had benign nodules, whereas 66.67%

of males were benign, with 33.33% malignant. In the 50-59 age group, benign results were more common in both genders, with 71.43% of females and 85.71% of males having benign nodules. The 60-80 age group showed the highest percentage of benign results for females (92.31%), compared to 76% in males, with malignancy rates of 7.69% and 24%, respectively.

**Table 6:** Distribution of Nodules (Solitary vs. Multiple)

Nodule Type	Frequency	Percentage (%)
Solitary	68	68.0
Multiple	32	32.0

Table 6 shows that solitary nodules were more common, accounting for 68% of cases, while multiple nodules were present in 32% of patients. This indicates that solitary nodules were more common in the cohort compared to multiple nodules.

**Table 7:** Indication for Neck Ultrasound (USG)

Indication	Frequency	Percentage (%)
Palpable Neck Mass	45	45.0
Routine Screening	20	20.0
Symptoms (e.g., Dysphagia)	25	25.0
Post-Surgery Follow-Up	10	10.0

Table 7 lists the reasons for neck ultrasound (USG). The most common indication was a palpable neck mass (45%), followed by symptomatic patients (25%) and routine screening (20%). Post-surgical follow-up accounted for 10% of cases.

**Table 8:** Nodule Size and Malignancy Correlation

Nodule Size (cm)	Benign (Frequency)	Malignant (Frequency)	Benign (%)	Malignant (%)
<1.0	20	5	80.0	20.0
1.0-2.0	30	10	75.0	25.0
2.1-3.0	25	15	62.5	37.5
>3.0	12	10	54.5	45.5

Table 8 presents the correlation between nodule size and malignancy. For nodules smaller than 1.0 cm, 80.0% were benign, and 20.0% were malignant. As the nodule size increased, the proportion of malignant cases also increased. For nodules in the 1.0–2.0 cm range, 75.0% were benign and 25.0% were malignant. In the 2.1–3.0 cm range, the percentage of malignant nodules rose to 37.5%, while benign nodules accounted for 62.5%. For nodules larger than 3.0 cm, 54.5% were benign and 45.5% were malignant.

#### IV. Discussion

This study demonstrates that the largest proportion of patients (38%) were in the 60-80 years age group, aligning with existing literature that reports a higher incidence of thyroid and other nodular conditions in older populations. This could be attributed to the cumulative exposure to environmental risk factors and age-related hormonal changes. Studies have shown that nodular diseases, including thyroid nodules, are more prevalent in older individuals, with malignancy risk slightly increasing with age but predominantly remaining benign in this cohort [13]. The youngest group (18-29) comprised 19% of the cohort, reflecting the lower prevalence of nodular conditions in younger populations as previously documented [14]. However, this age group exhibited the highest malignancy rate (36.84%), suggesting a more aggressive disease course or delayed diagnosis, as highlighted in earlier research on malignancy patterns in younger patients [15]. Gender-based analysis revealed a higher proportion of males (44) compared to females (33) in the cohort, contrary to typical findings in thyroid-related studies where females usually outnumber males due to higher hormonal susceptibility [16]. The histopathological outcomes by gender and age group further support these observations. For instance, females in the 18-29 group showed a slightly higher malignancy rate (37.50%) than males (36.36%). This finding may indicate a need for closer surveillance in younger female patients, aligning with studies suggesting that certain subtypes of malignancies, like papillary thyroid carcinoma, are more aggressive in this demographic [17]. Similarly, in the 60-80 group, females had a significantly higher benign rate (92.31%) than males (76%), a pattern supported by research that highlights gender-specific biological differences influencing tumor behavior [18]. Across all age groups, benign nodules dominated (63.16%-81.58%), highlighting the generally non-cancerous nature of nodular diseases. However, the malignancy rate was highest in the 18-29 group (36.84%) and lowest in the 60-80 group (18.42%). This paradoxical trend may reflect the interplay of age-related changes in tumor biology and immune surveillance mechanisms. Similar studies have

identified aggressive tumor subtypes in younger individuals, while older patients often present with slower-growing malignancies [19]. Moreover, in the 40-49 and 50-59 age groups, the benign-to-malignant ratio was identical (78.57% vs. 21.43%), emphasizing consistent patterns of disease behavior across middle-aged populations. This observation is supported by earlier research indicating a plateau in malignancy risk during middle adulthood [20]. This study highlights important age-gender interactions in disease outcomes. For instance, in the 30-39 group, all male patients exhibited benign nodules (100%), whereas 33.33% of females had malignancies. Such disparities might result from hormonal or genetic differences influencing tumorigenesis. The literature also suggests that women, particularly during reproductive years, experience higher estrogen-related cellular proliferation, potentially contributing to malignancy risk. Similarly, in the 60-80 group, females had a significantly lower malignancy rate (7.69%) compared to males (24%). This finding corroborates earlier studies reporting a gender-related decline in malignancy risk with advancing age, particularly in postmenopausal women [21]. The present findings align with prior studies emphasizing the predominance of benign outcomes in thyroid nodules across diverse populations. For instance, a large-scale analysis by Haugen et al. noted a benign rate of approximately 80% in most demographic groups [22]. Furthermore, the slightly higher male malignancy risk observed in our study is consistent with prior reports from Xing et al., which highlighted genetic mutations like BRAF in male patients as potential risk factors for malignancy [23].

### **Limitations of The Study**

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

### **V. Conclusion**

The majority of patients with these nodules presented benign histopathological outcomes, with a higher incidence of benign cases observed in older age groups. Solitary nodules were more common than multiple nodules, and the likelihood of malignancy increased with nodule size. Additionally, gender differences were noted, with males showing a slightly higher incidence of malignancy in certain age groups. These findings highlight the importance of considering both demographic factors and nodule characteristics when assessing the malignancy risk of echogenic thyroid nodules.

### **VI. Recommendation**

It is recommended that younger patients (18–29 years) and male patients with echogenic thyroid nodules undergo more rigorous diagnostic evaluations, such as fine-needle aspiration biopsy and advanced imaging techniques, given their higher malignancy rates. Tailored follow-up protocols should be implemented to ensure early detection and treatment, especially for high-risk groups. Additionally, integrating molecular testing and genetic profiling in routine diagnostic workflows could enhance risk stratification and guide individualized treatment plans. Future studies with larger, multicenter cohorts are encouraged to validate these findings and explore underlying biological mechanisms influencing age- and gender-related variations in thyroid nodule outcomes.

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