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*Original Article*

## Comparison of Findings of Fine Needle Aspiration Cytology and Histopathological Examination of Thyroid Swelling

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**Abstract:**

**Background:** Thyroid swellings are very common nowadays. To evaluate the nature of a thyroid disease FNAC is considered as the gold standard diagnostic tool. It plays a key role in determining the treatment plan and its cost-effectiveness makes it more popular. An accurate result in a short period makes FNAC more reliable.

**Objectives:** The purpose of this study is to compare the FNAC results with the final histopathological diagnosis to determine the accuracy of the diagnosis of thyroid neoplasm based on FNAC results.

**Methods:** In this study, a total of 100 patients presenting with thyroid swelling or nodules underwent FNAC with subsequent surgery from January 2022 to December 2022 at Green Life Hospital. Cytological diagnosis was classified according to the Bethesda classification. Final histopathological results were compared to find out the accuracy of FNAC.

**Results:** Of 100 patients with a thyroid nodule or swelling, 74 (74%) were women and 26 (26%) were men between 21 to 70 years of age. On FNAC, we found 70 cases of benign and 30 cases of malignant. After Histopathological examination, we found 58

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cases of benign and 42 cases of malignant. The sensitivity and specificity are 64.28% and 94.82%. The accuracy of FNAC in the diagnosis of benign or malignant thyroid lesions was 82%.

**Conclusions:** FNAC is very popular, safe, simple, rapid, and cost-effective. It is a minimally invasive procedure. An accurate and reliable cytology report may help to reduce unnecessary surgery in patients with benign thyroid.

**Keywords:** Fine needle aspiration cytology, thyroid nodule, microcarcinoma, Papillary thyroid cancer.

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### Introduction:

The thyroid gland is the largest of the discrete endocrine organs. It presents in the anterior neck region which has two lobes connected by a central isthmus. Worldwide most common endocrine disorders are thyroid diseases.<sup>1</sup> The actual scenario of thyroid dysfunction in Bangladesh is known but surely it is dealing with the highest prevalence. Most of thyroid diseases are curable by medical and surgical management.<sup>2</sup>

To proceed with a diagnosis of thyroid disease one of the important tools is Fine needle aspiration cytology (FNAC). It is fast, reliable, minimally invasive, and cost-effective. It can be performed as an outpatient procedure which is considered as one of the major advantages of FNAC.<sup>3</sup> It can differentiate between benign and malignant lesions which makes it the single best screening test.

During FNAC cells were collected from the suspicious or nodular part of the thyroid gland and examined under a microscope. Several studies have compared the diagnostic accuracy of FNAC and histopathology in diagnosing thyroid diseases. Overall sensitivity and specificity rate of FNAC 79-95% and 72-100% respectively to detect thyroid malignancy. Whereas sensitivity and specificity rates of Histopathology are 80-100% and 97-99% respectively.<sup>4</sup>

At the same time, there are a few disadvantages with FNAC like inadequate specimen, suspicious diagnosis, and inter-observer variations. A standard reporting system may help to overcome some disadvantages. Sometimes it may give false negative or false positive reports too.<sup>5,6</sup> It may not give accurate results for patient with lesions smaller than 1cm and follicular neoplasm or where malignancy cannot be definitively determined.<sup>4</sup>

Conversely, histopathology is the gold standard for confirming diagnosis and further management. It can provide details about the character, nature, extension, and invasion of the tumor.

The purpose of this study is to compare the FNAC results with the final histopathological diagnosis to determine the accuracy of the diagnosis of thyroid neoplasm based on FNAC results. We will evaluate the potentiality of FNAC in differentiating benign and malignant thyroid lesions and also briefly discuss the sensitivity, specificity, false positive and negative results.

### Methods:

This cross-sectional study was carried out at Green Life Hospital. The duration of the study was January 2022 to December 2022. A total of 100 patients presenting with thyroid

swelling or nodules, 18 to 70 years of age, irrespective of gender were included in the study. Patients with fixed tumors with advanced disease or presented with nodal metastasis were excluded from the study. All the patients were sent to the pathology department from a private chamber for FNAC. Specimens for histopathology were sent to the same pathology department after surgery.

Most of the patients presented with the complaint of swelling in the neck which was either diffuse, multinodular, or solitary. Proper clinical examination of each patient done by an otolaryngologist and symptoms related to hypo functioning or hyper functioning of the thyroid gland was noted properly. Other symptoms like pain, cough, dysphagia, breathlessness, and change of voice, and other signs of compression were also noted. After taking a proper history and clinical examination, a thyroid function test and ultrasound of the thyroid gland were performed. The patient sent to the Department of pathology for FNAC. In the case of multiple nodules or diseases involved both lobes of thyroid gland, even if one nodule or one lobe was malignant and the other was benign, the case was reported as malignant in cytology.

Cytological diagnosis of the thyroid reported following “The Bethesda System for Reporting Thyroid Cytopathology”<sup>4</sup>

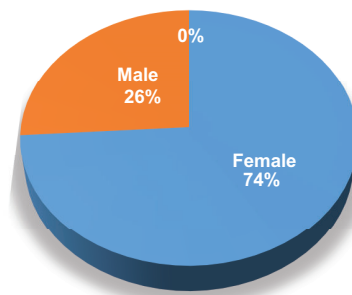
- I – Nondiagnostic or Unsatisfactory
- II – Benign
- III – Atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS)
- IV – Follicular neoplasm or suspicious for a follicular neoplasm
- V – Suspicious for malignancy
- VI - Malignant

A proper correlation of the history, clinical presentation, thyroid profile, ultrasound findings, and cytopathology report was compiled together and a proper diagnosis was

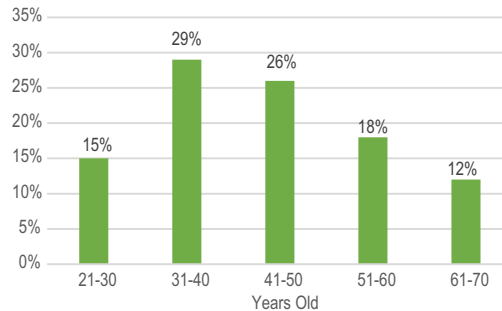
made. All the cases that needed surgery were planned for surgical management and a resected specimen of the thyroid gland was again sent to the same pathology department for histopathological examination.

A total of 100 cases with both cytology and histopathology reports were compared. The statistical analysis for false negative rate, false positive rate, sensitivity, specificity, and accuracy was done.

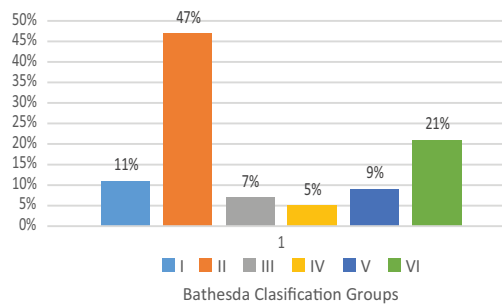
**Results:**



**Fig.-1: Sex distribution in the study group (n=100)**



**Fig.-2: Age distribution in the study group (n=100)**



**Fig.-3: Distribution of FNA diagnosis (n=100)**

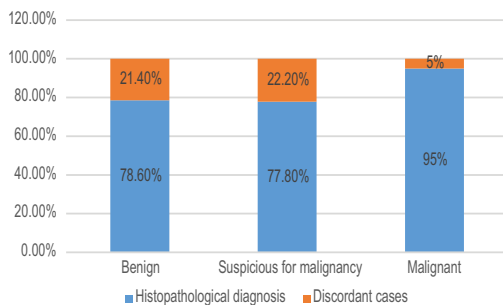
**Table II : Details of the discordant cases (n=100)**

Cytology according to Bethesda Classification Carcinoma	Number of cases	Benign	Histopathology			
			Papillary Carcinoma	Follicular Carcinoma	Medullary Carcinoma	Other
I	2 from 11 (18.2%)	-	2	-	-	-
II	9 from 47 (19.2%)	-	6	2	1	-
III	3 from 7 (42.9%)	-	2	1	-	-
IV	1 from 5 (20%)	-	1	-	-	-
V	2 from 9 (22.2%)	2	-	-	-	-
V	1 from 21 (4.76%)	1	-	-	-	-
Total from 100 cases	18 (18%)	3 (3%)	11 (11%)	3 (3%)	1 (1%)	0
% distribution of discordant cases	100%	16.7%	61.1%	16.7%	5.6%	0
Total 18 cases						

**Table III : Distributions of thyroid cancers (n=100)**

Cytology According to Bethesda Classification	Histopathology				
	Papillary Carcinoma	Follicular Carcinoma	Medullary Carcinoma	Anaplastic Carcinoma	Other Carcinoma
I	2	-	-	-	-
II	6	2	1	-	-
III	2	1	-	-	-
IV	1	-	-	-	-
V	5	2	-	-	-
VI	11	4	1	1	3
Total from 100 cases	27(27%)	9(9%)	2(2%)	1(1%)	3(3%)
% Distribution total number of cancers = 42	64.3%	21.4%	4.8%	2.4%	7.1%

For statistical analysis, all suspicious cases were put in the malignant category (Figure 4).



**Fig.-4:** Cyto-histopathological correlation (n=100)

Now to observe the value of FNAC to detect malignancy in thyroid diseases few statistical analysis was done.

- Sensitivity = True positive/ (True positive + False negative) = 27/(27+15) = 64.28%
- Specificity = True negative/ (True negative + False positive) = 55/(55+2+1) = 94.82%
- False positive rate = False positive/ (False positive + True negative) = 2+1/(2+1+55) = 5.17%
- False negative rate = False negative/ (False negative + True positive) = 15/(15+27) = 35.71%

- Accuracy = True positive + True negative/  
Total number of cases = 27+55/100 = 82%

So, the sensitivity and specificity were 64.28% and 94.82% respectively. False positive rate is 5.17% and the false negative rate is 35.71%. Finally, the accuracy of FNAC in the diagnosis of benign or malignant thyroid lesions was 82%.

#### Discussion:

In case of thyroid disease or thyroid nodules, FNAC is the best diagnostic tool to find out whether it's benign or malignant. Most of the time treatment of a patient with thyroid disease is based on the FNAC findings along with clinical examination. In many cases thyroid nodules are non-neoplastic and require no surgical intervention. An accurate FNAC report is very important as can establish a diagnosis based on cytological characteristics.<sup>5</sup> According to many kinds of literature false negative cytology and to detection of microcarcinomas either due to inadequate sampling or interpretation error are two main drawbacks.<sup>6</sup>

The sex distribution in this research was 74 (74%) women and 26 (26%) were men (female/ male ratio 2.8:1) which correlates with the phenomenon that thyroid cancer is more common among women.<sup>7,8,9,10</sup> It may be explained by the gender specificity of the disease, females more frequently visit hospitals with medical follow-up and few hormonal changes occur during different periods of life.<sup>11,12</sup>

The age range in our study was between 21 to 70 years of age (average 45.5 years old) where the youngest female patient had benign a case of papillary carcinoma and the oldest female patient with anaplastic carcinoma. Most of the cases were found in the age group of 31-40 years (29%) followed by the age group 41-50 years (26%) and 51-60 years (18%). The distribution of age of the patients

is very similar to other studies<sup>13</sup>. However, some studies show the peak age of incidence was in the 4<sup>th</sup> and 5<sup>th</sup> decade of life<sup>14</sup>.

In this study, cytological features of thyroid lesions were reported following the Bethesda system and correlated with histopathology to determine its diagnostic accuracy. In 100 FNACs, shows 11 (11%) nondiagnostic or unsatisfactory, 47 (47%) Benign, 7 (7%) atypia of undetermined significance (AUS) or follicular lesion of undetermined significance (FLUS), 5 (5%) Follicular neoplasm or suspicious for a follicular neoplasm, 9 (9%) Suspicious for malignancy and 21 (21%) – malignant. Our results are in the ranges reported by others except category VI – Malignant. We reported 21% of our cases as Malignant after doing cytology and it's much higher than other similar studies. In our observation it may be due to the increased number of malignant cases in recent periods and as the study hospital is one of the tertiary centers of Bangladesh, so most suspicious cases were referred from different parts of the whole country. Here the cases reported as suspicious on cytology were considered as malignancy because it led to surgical management.

The ratio of benign to malignant lesions is 1.4:1, but it may not reflect the actual scenario as we only include here those cases that required surgery after FNAC. There are also a large number of benign cases where we did not recommend surgery after doing FNAC because there was no such indication.

In our study, we found 70 benign cases of those were underwent surgery and 15 (15%) of them had malignancy on histopathological examination. Among 15 cases we got papillary carcinoma 11 (11%), follicular carcinoma 3 (3%), and medullary carcinoma 1 (1%). Here most false negative cases found papillary carcinoma with cystic changes which were misdiagnosed. On the other hand,

from 30 cytology-proven malignant cases, we found 3 cases benign. Among these 3 cases, 2 were suspicious for malignancy and 1 case was malignant in FNAC. After histopathology, we found all 3 cases as Multinodular Goitre. We have 58 cases (58%) benign in histopathology, among those cases colloid goiter was the most common lesion.

In this study, we found that 30% (9 cases suspicious for malignancy and 21 cases of malignancy) of the cases were suspected as malignant in FNAC. But previous studies like M. Ewa et al reported 15.3% malignancy from 1262 cases and Chetna S. et al reported 12.3% of 724 cases which is much lower than our reported cases. This is because in both of the studies they consider a large sample size.

According to histopathology, 58% were found as benign cases and 42% of cases were malignant. Here papillary carcinoma 27 cases (64.3%) which was the most common, followed by follicular cancer 9 cases (21.4%), medullary cancer 2 cases (4.8%), anaplastic cancer 1 case (2.4%), and another 3 cases (7.1%). We found a similarity between our statistics with other studies regarding the histopathological finding of malignant thyroid lesions.<sup>3</sup>

Among 100 cases of thyroid, we performed FNAC that subsequently underwent surgery and histopathological examination, 82 cases showed a positive correlation between FNAC and histopathology results. A total of 18 cases differed from the FNAC report. So the diagnostic accuracy of FNAC regarding thyroid swelling in our study is 82%. In other studies, accuracy ranged from 83.6% to 93.6%.

In this study sensitivity of thyroid FNAC was 64.28% and the specificity 94.82% which means that the ability of FNAC to detect the malignancy in thyroid lesions was moderate.

Musani MA et al did a study with 105 patients where sensitivity was reported at 61.53% and Machala E et al with 1262 patients got a sensitivity of 60.28%, both study results are similar to our study. There are also some studies with low sensitivity like 55.3%. The cause of low sensitivity may be due to less number of cases, classification of suspicious lesions, operator variability, and diagnosis difficulty with FNAC in certain thyroid diseases.

Reading false negative we have got 35.71% cases which is much higher than other studies but Machala E et al found 39.72% cases with false negative results in FNAC. According to the authors, it may be due to the limited ability of FNAC to accurately diagnose follicular pattern lesions, papillary microcarcinoma, and thyroid with cystic changes. However, the true rate of false positives may not be possible to find because many cases with benign cytology reports are then sent for observation with periodic follow-ups. In our study, false positive was 5.17% which was a little low. The false positive rate in the literature ranges from 6% to 8%. This may be due to the presence of features of papillary cancer in some benign thyroid disease conditions.

### Conclusion:

Worldwide FNAC is a highly accepted diagnostic tool that is very popular because it's safe, simple, rapid, and cost-effective. It is a minimally invasive procedure, with no need for anesthesia, and time-consuming. However, it requires a sufficient amount of sample, proper identification of the lesion, and good pathological interpretation. In this study, the effectiveness of FNAC was identified and correlated with post-operative histopathological diagnosis. We found FNAC moderately reliable with an accuracy of 82% for the diagnosis of any thyroid lesion. This

indicates some special tools may need use like USG guidance to increase the accuracy as well as reliability of FNAC. On the other hand, our sample size is small which may not reflect the original scenario in all aspects. An accurate and reliable cytology report may help to reduce unnecessary surgery in patients with benign thyroid lesions, which will improve the quality of life of patients with thyroid disease.

#### Conflict of interest:

The authors declare that they have no conflict of interest.

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