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Original Article

The Sensitivity and Specificity of Fine Needle Aspiration Cytology (FNAC) and Histopathology for the Diagnosis of Thyroid Nodule

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ABSTRACT

Background: *FNAC is a minimal invasive, quick tool for diagnosis of thyroid nodule with excellent patient's compliance. But its diagnostic is still debatable.* ***Objective:*** *To evaluate the sensitivity and specificity of fine needle aspiration cytology (FNAC) and histopathology for the diagnosis of thyroid nodule.* ***Materials and Methods:*** *This study was conducted on ENT patients at Dhaka Medical College from July to December 2017. This study was cross-sectional. Subsequently, a sample size of 73 was determined based on the established eligibility criteria. A pre-designed, peer-reviewed data collection form was created for conducting interviews. Data were compiled, managed, and presented in tables and figures. FNAC's sensitivity, specificity, and predictive values were determined using histodiagnosis as the gold standard.* ***Results:*** *21 out of 73 patients (28.76%) were aged between 30 and 39. 67.13% of the sample (n=73) were female and 32.87% were male. The male-to-female ratio was 1:2. The majority of the patients (75.34%) belonged to the middle class, while 20.54% were from the poor class. Among the patients, 39.72% were housewives, 35.61% were employed, and 19.17% were students. The FNAC exhibited high sensitivity (94.73%), specificity (100%), positive predictive value (100%), negative predictive value (98.18%), and low positive and negative likelihood ratios (0*

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and 0.052, respectively). All 55 benign FNAC findings were accurate and consistent with the histodiagnosis, except for one case where malignancy was detected upon histology.
Conclusion: *This research suggests using FNAC as a standard diagnostic technique for all thyroid nodule patients. For more accurate findings, longer-term research with a large number of study participants may be conducted.*

Keyword: *FNAC, Nodule, Sensitivity, Thyroid*

INTRODUCTION

Any abnormal development that forms a mass in the thyroid is referred to as a thyroid nodule[1]. which is more prevalent in older women, individuals who lack iodine, people who have been exposed to radiation, and those who have a family history of thyroid illness [2]. High goitrogenic diets increase the likelihood of developing thyroid noduless [3]. 4% to 7% of the adult population has thyroid nodules [4]. Less than 5% of adult thyroid nodules are cancerous, nevertheless [5]. The district of Jamalpur Rangpur has Bangladesh's highest thyroid nodule incidence, which ranges from 21-30% [6]. Diffuse goiter is less frequent than nodular thyroid disease. 32.67% of all thyroid patients had solitary nodules, according to a data from the thyroid clinic at BSMMU in Dhaka. Swelling, pressure feelings, or indicators of toxicity are the typical presentations of thyroid illness [7]. Pain sensations in the inferior and anterior neck area, cough or dyspnea, dysphasia, or odynophagia are present in the presence of malignancy and invasion to neighboring organs such the trachea, larynx, oesophagus, and recurrent laryngeal nerve [8]. Less than 5% of adult thyroid tumors are malignant, nonetheless [9]. However, a number of clinical indicators might provide light on the thyroid nodule's etiology. Nodules that absorb radioactive iodine during imaging investigations (hot nodules) are more likely to be malignant than those that do not, and a history of radiation therapy to the head and neck region is associated with an increased prevalence of thyroid malignancy. It is more common for a single nodule to be malignant than for there to be several. As with older people, nodules in younger patients have a higher cancer risk. Most of these nodules are benign nodules or non-neoplastic lesions. In order to prevent needless surgery, hypoparathyroidism, and thyroid hormone dependency in individuals with benign thyroid nodules, it is preferable to only operate on those patients in whom there is a suspicion of malignancy. However, based only on the clinical appearance, it is impossible to accurately distinguish between these benign lesions and a malignant nodule [10-12]. Currently available techniques for identifying the type of thyroid nodule include thyroid function tests, thyroid antibody titers, isotope scans, ultrasonography, and fine-needle aspiration cytology (FNAC) [13]. FNAC is a crucial component of managing some patients, although it only makes up a small portion of the entire assessment [14]. Both the radio-nucleotide scan and the ultrasound examination were utilized to assess the thyroid nodule, however none provided a definitive diagnosis of cancer. Finally, the operation was deemed acceptable after the FNAC test was performed with these particular needles [15]. FNAC is regarded as the "gold standard" diagnostic test for the examination of thyroid nodules since it may reveal the type

of the lesion before surgery [16,17]. The abbreviation SAFE, which stands for Simple, Accurate, Fast, Economic, and Indeed Safe, sums up the additional benefits of FNAC administered on an outpatient basis. The best safety record for a histopathological diagnosis is with this method. Contrarily, a surgical biopsy has the potential dangers of anesthesia, surgery, and the extra recovery time.[18] There are not many restrictions with this approach. With FNAC, it is quite challenging to detect different forms of thyroid pathology. The limited quantity of cellular material accessible for investigation and the loss via aspiration are the main causes of the interpretation issues.[19] Due to this, FNAC is now often used as the primary study when evaluating patients who have thyroid nodules. With the exception of surgical resection, it is capable of delivering crucial information that can be obtained by other studies. Due to the availability of FNAC, ultrasonography and isotope scanning are no longer necessary. There are considerable monetary savings. A minimally invasive treatment called FNAC is used to evaluate thyroid nodule patients before surgery. In addition to having good diagnostic accuracy when assessing other thyroid abnormalities, FNAC offers great sensitivity for detecting thyroid cancer. The goal of the current research was to compare FNAC and histology in the identification of thyroid nodules.

OBJECTIVE

To evaluate the sensitivity and specificity of fine needle aspiration cytology (FNAC) and histopathology for the diagnosis of thyroid nodule.

MATERIALS & METHODS

This cross-sectional study was carried out between July 2017 and December 2017 at the Dhaka Medical College Hospital's ENT and Head-Neck Surgery Department. After establishing eligibility criteria, a sample size of 73 was decided upon. Samples are selected at random. After obtaining informed agreement, the study will cover all consecutive patients hospitalized with a thyroid nodule to the Department of ENT and Head-Neck Surgery at Dhaka Medical College Hospital during the six-month study period. A standardized questionnaire will be used to record the patient's demographic information (name, age, sex), medical history, and the results of a clinical examination.

Inclusion Criteria: Clinically diagnosed thyroid nodule, Both Male and Female of any age group.

Exclusion Criteria: Patients who refuse to be included in this study.

Ethical issues: The study obtained ethical clearance from the institutional Review Board and DMCH authority. Ethical clearance was obtained from the relevant department prior to the recruitment of study participants. Participants received comprehensive information about the study's nature, purpose, and implications, as well as its potential benefits and risks. Subjects' interests were protected without compromising their rights and health. Participants were guaranteed appropriate treatment for any complications related to the study. All information provided by participants was kept anonymous, and they were allowed to stop participating at any time. The study obtained voluntary and non-coerced written consent from all participants without exploiting their vulnerabilities.

Study Procedure: Clinical examination, thyroid profile, standard investigations, and neck ultrasound were performed after a pre-tested questionnaire was utilized to gather patient information. Dhaka Medical College's Pathology department used a 21-24 gauge hypodermic needle to do fine needle aspiration cytology. Vocal cord paralysis was diagnosed using indirect laryngoscopy, which was also performed for legal and medical reasons. The Department of ENT and Head-Neck Surgery at Dhaka Medical College Hospital in Dhaka will perform any necessary surgical procedures and collect any necessary samples once a diagnosis has been made. Histopathology will be performed on the resected material at the Dhaka Medical College in Dhaka, and the results will be compared to those obtained post-operatively. Age, gender ratio, and symptom presentation will also be taken into account.

Presentation of data: After compilation of data they were arranged and presented in simple ways in tablets, graphs and figures.

Statistical Analysis: Data were analyzed with help of SPSS-22 for windows.

RESULTS

Table I showed that out of 73 patients 28.76 % patients were from 30-39 years age group whereas 5.47% patients were from above 60 years.

Table I: Distribution of patients according to age

Age group (in years)	Frequency (%)
< 20	12 (16.43 %)
20-29	17 (23.28 %)
30-39	21 (28.76 %)
40-49	14 (19.17 %)
50-59	5 (6.84 %)
≥ 60	4 (5.47%)

Figure 1 Shows that out of 73 patients 49(67.12%) were female and rest 24(32.87%) were male. The male to female ratio was 1:2.04

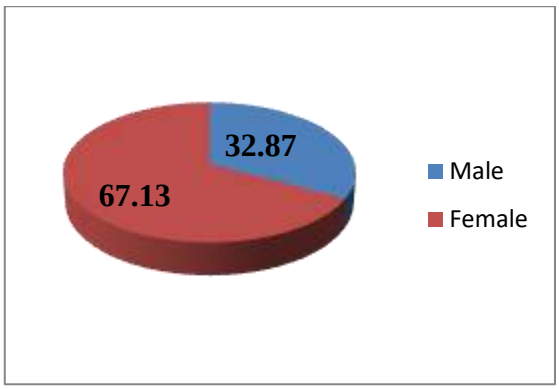

Figure 1: Distribution of patients according to sex

Figure 2 showed that out of 73 patients 29(39.72%) patients were house wife, 26 (35.61%) patients were service holder followed by students 14(19.17%) in numbers.

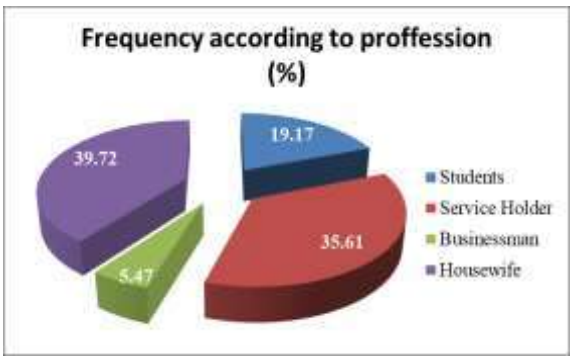

Figure 2: Frequency according profession

Figure 3 showed the overall cytology of the sample population. Nearly half (43.83%) of the patient had Multi-nodular goiter,

Followed by colloid goiter (16.43%). Only 18 patients (24.66%) were diagnosed as carcinoma.

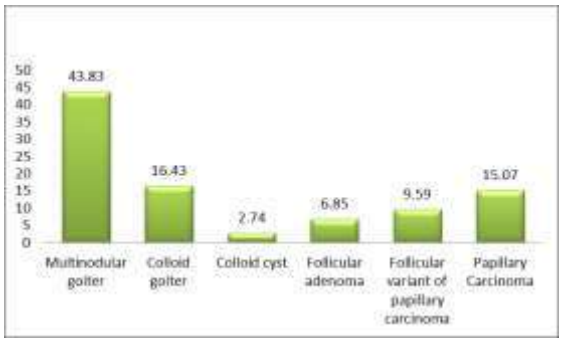

Figure 3: Distribution of patients according to FNAC diagnosis

Table II showed that out of 55 benign finding of FNAC only 1 was turned into malignancy after histopathology, otherwise all results of FNAC were accurate as like as histo-diagnosis.

Table II: Relationship of FNAC and histo-pathological diagnosis

Diagnosis	FNAC finding (n=73)	Histopathology diagnosis	
		Benign	Malignant
Benign	55	54	1
Malignant	18	00	18
Total	73	54	19

Table III showed the efficacy of FNAC of diagnostic tool of solitary thyroid nodule where the sensitivity, specificity, PPV, NPV, PLR, NLR of FNAC were 94.73%, 100%, 100%, 98.18%, 0 and 0.052 respectively. Here non-malignant cases includes benign, suspicious etc.

Table III: Distribution of efficacy of FNAC (n=73)

		Malignancy	Non- malignant	Total
FNAC	Malignancy	18 (True positive)	0 (False positive)	18
	Non-malignant	1 (False negative)	54 (True negative)	55
Total		19	54	73`

DISCUSSION

A thyroid surgeon must assess thyroid nodules, which are frequent entities. Physical examination or imaging techniques used accidentally for other purposes might find nodules. Most thyroid nodules are noncancerous, but surgical removal is recommended if they cause symptoms or if there is suspicion of malignancy. The thyroid gland is mostly studied using ultrasound technology.The gold standard first test for the diagnosis of thyroid swellings is fine needle aspiration cytology [21]. The approach aids in preoperative patient selection for surgery since it is rapid, easy, and safe with a low complication rate. The most prevalent malignancy of the endocrine system is thyroid cancer, which accounts for 0.6% and 1.6% of all instances of malignant neoplasm in men and women, respectively. The patients in the current research had

ages ranging from 19 to 65, with a mean of 35.36 11.86. Comparing this age range and mean incidence to earlier research, they are somewhat lower [22]. In contrast to the research by Dorairajan and Jayashree, where 44% of the patients were in their third decade of life, we discovered that the majority of patients in our study (48%) were in their third to fourth decade. Out of 73 patients in this research, 49 (67.13%) were female and the remaining 24 (32.87%) were male. The minimum age requirement was 18, while the maximum age was 60. There were 26 men (28.88%) and 64 women (71.12%). Female representing male 1:2.46.6 Thus, the findings of the earlier studies supported those of ours. In a related research conducted in Bihar, 178 patients with thyroid enlargement underwent FNAC, and in 75.84% of instances, colloid goitre and 8.43% of cases, thyroiditis, respectively, were discovered [23]. In contrast, multinodular and colloid goiter were discovered in 60.265 and 5.5% of the population, respectively, in our analysis, which is virtually identical to their result. One further FNAC investigation of thyroid goiter in a large study group over five years reveals that malignancy was only discovered in 128 instances out of 1488 patients, or 7.8% of the total. Our investigation revealed 24.66% malignancy, which is far more than what they discovered. In our study, histological testing validated all FNAC-detected cancers, giving FNAC a sensitivity of 94.73% and a specificity of 100%. According to Alta Villa et al., the FNAC's sensitivity and specificity were 71.43% and 100%, respectively; 78% and 100%, respectively; Al-rikabi et al [25]; and 98% and 99%, respectively, according to Goellner et al. According to a prior research by Chin-En Tseng et al., the following parameters are 81% sensitive, 98.7% specific, 94.4% positive, and 95% negative. Our study's sensitivity, specificity, and negative predictive value are all higher than those of the prior study's, making the latter's findings marginally less accurate than those of the former. According to Gupta et al. In a previous study, the sensitivity, specificity, accuracy, false positive rate, false negative rate, positive predictive value, and negative predictive value of FNAC were 80%, 95%, 92%, 5%, 205, 80%, and 95%. However, the sensitivity, specificity, positive predictive value, and negative predictive value in our research were all 94.73%, 100%, and 98.18% respectively; as a consequence, the outcome of the prior study is likewise somewhat inferior to that of our investigation. Sharma et al. journal of the Egyptian National Cancer Institute found sensitivity of 49.5%, specificity of 96% (slightly lower than our study), sensitivity of 84.6% (slightly lower than our study), positive predictive value of 84.6% (slightly lower than our study), and negative predictive value of 98.6% (similar to our study). Al-Rakabi et al. previously reported a sensitivity of 78.1% and a negative predictive value of 93%, while achieving a specificity and positive predictive value of 100%, which is consistent with our results. This vast range of sensitivity and specificity is the result of several factors. It relies on the quality of the samples, the sampling method, the pathologist's skill reading the smears, and if some benign and malignant thyroid lesions have overlapping cytological characteristics. The overall accuracy rate for FNAC in the identification of thyroid cancer is between 90% and 100% [27]. 2545In contrast to earlier studies, where FNAC accuracy ranged from 79% to 98%

depending on the expertise of the FNAC performer and the cytologist evaluating the results of the cytology, our study's accuracy of FNAC was 99% [24].

CONCLUSION

The study aimed to assess the diagnostic precision of FNAC in detecting thyroid nodules. The study revealed that this minimal invasive procedure had the highest level of specificity which is 100%. The hypothesis of the study was that FNAC is the most useful preoperative diagnostic tool in thyroid nodule diagnosis. In this study sensitivity of FNAC was found to be 94.73%. Thus we can suggest that in maximum cases the diagnosis is accurate.From the above discussion we can assumed that FNAC is the most useful preoperative diagnostic tool for thyroid nodule diagnosis. This study has some limitation such as Small Sample size, Short duration of study, Purposive sampling. This study recommend FNAC as a routine diagnostic tool for each & every patient with thyroid nodule. Further long time study with large number of study subjects may be carried out for more precise results.

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