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Comparative study of preoperative FNAC and postoperative histopathology in the diagnosis of thyroid swelling

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Abstract
Introduction: Fine-needle aspiration cytology is recommended as the first and most decisive diagnostic step in the workup of patients with thyroid swelling. Thyroid swelling is a common clinical presentation in ENT practice and it carries significant morbidity and even mortality if not managed properly. They are endemic in mountainous region of the world, where the soil, water & food supply contain little iodine. Fine Needle Aspiration Cytology (FNAC) is important for pre-operative and pre-treatment diagnosis of benign and malignant thyroid lesions, thus decreasing the incidence of unwanted surgeries.
Objectives: To find out the Correlation of FNAC with postoperative histopathology in diagnosis of thyroid nodule.
Methods: A cross-sectional observational study was carried out in the Department of ENT and Head Neck-Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh from December 2021 to May 2023. Patients with thyroid swelling were included from the study. Sampling technique was purposive sampling. Detail history was taken. Thorough ENT examination and related systemic examinations were done. Diagnosis of thyroid nodule was confirmed by ultrasonography of thyroid. Prior to surgery relevant investigations were done and informed written consent were taken from all patients. Each patient was assessed before surgery by FNAC and post operatively by histopathology.
Results: In the present study, age of the patients ranged from 10 to 70 years. The highest number of patients (39.3%) were in the 31-40 years of age group, followed by 16 (26.2%) in the 41-50 years age group. Mean age of study subjects was 37.5±8.2 year. In our study most of the respondents were female. Pie chart showing that 51(83.61%) of the respondents were female and 10(19.39%) were male. In the present study, USG guided FNAC of thyroid lesion result was interpreted as per Bethesda system. Most of the respondents was diagnosed as Bethesda class II in USG guided FNAC. In our study Bethesda Class II Benign (38/61, 62.2%), class III Follicular Neoplasm or Suspicious for a Follicular Neoplasm (5/61, 8.19%), class IV Atypia of Undetermined Significance or Follicular lesion of Undetermined Significance (8/61, 13.1%), class V Suspicious for Malignancy (7/61, 11.4%) and class VI Malignant (3/61, 4.91%). Histopathology findings revealed that among 61 patients, benign lesion was 42(68.9%). Malignant causes were 19(31.1%). The p-value is 0.021. This result is significant at $p<.05$. So FNAC finding is significant in evaluation of thyroid swelling. There were 6 false positive cases from correct diagnosis and only 2 smears were false negative when compared with histopathology biopsy. True positive was 17 cases & true negatives was 36 cases. Pearson's correlation coefficient was 0.85 which is very strong for positive relationship.
Conclusions: It is important to recognize the range of malignancy among thyroid swelling in this region because of different treatment modality and emotional burden on the patient. FNAC greatly facilitates the precise and adequate sampling of tissues from thyroid lesions thus enabling an accurate diagnosis. This may lead to the elimination of potential morbidity of unnecessary surgery. Ultrasound guidance helps in the selection of the most suspicious focus within the nodule especially with a background of multi-nodularity. It has very strong positive relationship with post-operative histopathology.

Keywords: Preoperative FNAC, histopathology, thyroid swelling

Introduction
Thyroid diseases are one of the most prevalent endocrinopathies across the world and global burden of disease. Increases of thyroid cancer were noted in recent years. Almost half (41.73% for incidence, 50.92% for deaths, and 54.39% for DALYs) of

the thyroid cancer burden was noted in Southern and Eastern Asia. In addition, females accounted for most of the thyroid disease (70.22% for incidence, 58.39% for deaths, and 58.68% for DALYs). The most common age at onset of thyroid cancer worldwide was 15 to 49 years in female individuals compared with 50 to 69 years in male individuals [1]. Iodine deficiency is the main cause of thyroid swelling. Others cause may be familial, inflammatory, neoplastic. The prevalence may be as high as 70% or more if sensitive imaging such as ultrasonography is used. Most of these thyroid swellings are benign lesions. To avoid unnecessary surgery, a thyroid scan, ultrasonography, and fine-needle aspiration cytology (FNAC) is being used as diagnostic tools to differentiate a malignant nodule from a benign lesion. The suspected nodule seen by ultrasonography may be aspirated with a fine needle. Large thyroid nodules over 0.5 cm can be detected by the experienced physician using palpation, but deep-seated thyroid nodules are more difficult to locate by physical examination [2]. Prevalence of thyroid swelling depends on various factors like age, sex, diet, iodine deficiency, endemic areas, fluorosis belt and radiation exposure. High fluoride levels in drinking water and ground waters are known to interfere with iodine uptake by the thyroid gland and causes clinical hypothyroidism and nodule formation in thyroid gland [3]. Common types of benign thyroid swelling are colloid goiter (42.2%), colloid goiter with Cystic degeneration (13.2%) Hashimoto's thyroiditis, Follicular adenoma, etc. [4]. The most common thyroid disease in the community is simple (diffuse) physiological goitre. Ultrasonography has been used in epidemiological studies to assess thyroid size, leading to much higher estimates of goitre prevalence than in studies in which goitre size was assessed by physical examination [5]. In cross-sectional surveys, the prevalence of diffuse goitre declines with age, the greatest prevalence is in pre-menopausal women, and the ratio of women to men is at least 4:1 [6]. This is in contrast to the increase in frequency of thyroid nodules and thyroid antibodies with age. In a study of 5234 subjects aged >60 years in Framingham, clinically apparent thyroid nodules were present in 6.4% of women and 1.5% of men[5]. The prevalence of single thyroid nodules was 3% and multinodular goitre was 1%. Proper evaluation and early detection reduced the burden of thyroid swelling. In patients with nodular disease, fine-needle aspiration cytology of the thyroid gland (FNAC-t) is widely recommended as an initial and crucial test to select those patients who require excision of the lesion for subsequent histologic diagnosis. To achieve this, FNAC-t must score high on test characteristics. This can be achieved by USG guided aspiration [7]. Historically, the diagnostic criteria and reporting nomenclature employed internationally have varied somewhat though these have ultimately evolved to broad consensus, aimed at national standardization, stratified for risk of malignancy with corresponding evidence-based recommendations for further patient management. Numerical categories increase accuracy, aid local audit, allow comparison with other centers including internationally, and can guide discussion on further management [8]. The procedure was carried out under ultrasound guidance so that the needle position can be controlled and samples can be regarded as representative, even within very small nodules. The aim of this study was to identify the correlation of FNAC with postoperative histopathology in thyroid swelling. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of FNAC was also evaluated after the surgical removal and histopathological diagnosis of thyroid swelling.

Materials & Methods

- **Study Design:** This study was designed as cross-sectional observational study.
- **Place of Study:** The study was carried out in the Department of ENT and Head Neck Surgery, Dhaka Medical College Hospital, Dhaka, Bangladesh.
- **Study Periods:** This study was conducted from December 2021 to May 2023.
- **Study Population:** All samples of thyroid swelling admitted into Department of ENT & Head Neck Surgery, Dhaka Medical College Hospital, Dhaka.
- **Sample size:** Sample size was calculated by using following formula

$$\mathbf{n}= \frac{z^2 pq}{d^2}$$

So, total 61 sample were enrolled for study.

Selection Criteria

Inclusion Criteria

- Patients with thyroid swelling.
- All age.
- Both genders.
- Patients given consent for surgery.

Exclusion criteria

- Patients not fit for surgery.
- Patients with already diagnosed thyroid lesions by histopathology.
- All toxic goiters confirmed by clinical evaluation.
- Patient not giving consent for study.
- Previously operated patient.

Study Procedure: The study was conducted in the Department of ENT & Head-Neck Surgery, Dhaka Medical College Hospital, Dhaka from December 2021 to May 2023. Study population were patients and who present with thyroid swelling fulfilling the inclusion and exclusion criteria and will who undergo surgical management from study population sample were enrolled by consecutive purposive sampling. Thorough ENT examination and related systemic examinations were done. Diagnosis of thyroid swelling was done by clinical examination, USG of thyroid and FNAC of thyroid. A written "informed consent" was taken from patients before performing Fine needle aspiration Cytology. Experienced Pathologist performed a fine needle aspiration with the use of 10 ml disposable syringe with 23-gauge needle by using a perpendicular puncture. After placing needle tip in the appropriate area of the target nodule, sampling collection was commenced. After obtaining a sample, the specimen will be mounted immediately onto a glass slide. Specimens will be fixed with 95% ethanol and send for cytological evaluation. Reporting will be done by "the Bethesda system for reporting Thyroid Cytopathology" (TBS- RTC). Then all other relevant investigations done & Informed written consent were taken from all patients for surgery except Bethesda class I. Patients with non-neoplastic FNAC diagnoses undergoing surgery because of pressure symptoms or unwillingness to carry out follow-up. All patient, reported as Bethesda class II-VI operated under general anaesthesia. Then postoperative histopathological report was obtained & correlation was done with preoperative FNAC and Bethesda class I kept in follow up. Data were collected by interview and by laboratory investigation using structured data collection sheet. Patients' data and postoperative outcome etc. were noted. This questionnaire was used for collection of information by interviewing patients. All the collected data were checked very carefully to identify errors in collecting data. Data processing work consisted of registration of schedules, editing, coding and computerization, preparation of dummy tables, analysis and matching data. The technical matters of editing, encoding and computerization looked by researcher. The results were analyzed by standard statistical method and presented in tables and graphs. Then the results were compared with the literature of the other series.

Data Analysis: Computer based statistical analysis were carried out with appropriate techniques and systems. All data were recorded systematically in preformed data collection form (questionnaire) and quantitative data were expressed as mean and standard deviation and qualitative data were expressed as frequency distribution and percentage. Statistical analysis was performed by using window-based computer software devised with Statistical Packages for Social Sciences (SPSS-20) (SPSS Inc, Chicago, IL, USA). 95% confidence limit was taken. Chi-square test was done to see the association between categorical data and unpaired t test was done to see the association between numerical data. All statistical tests were considered significant at a level of $p<0.05$. The summarized data was interpreted accordingly and was then presented in the form of tables.

Results

Total 61 samples were selected, and results are as follows:

Table 1: Age distribution of the patients (n=61)

Age	Frequency	Percentage (%)	Mean±SD
0-10	0	0	
11-20	1	1.63	
21-30	7	11.47	
31-40	24	39.3	37.5±8.2
41-50	16	26.2	
51-60	8	13.1	
61-70	5	8.1	

The patients were of different age groups of thyroid swelling. The highest number of patients (39.3%) were in the 31-40 years of age group. Mean age of study subjects was 37.5±8.2 year.

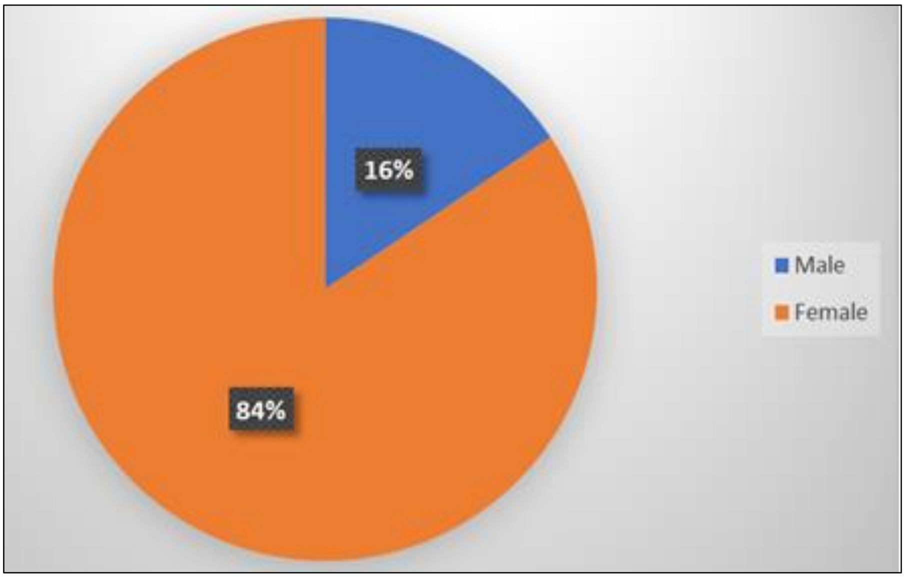

Fig 1: Distribution of patients according to sex (n=61)

Figure shows the distribution of patients according to sex. Most of the respondents were female. Pie chart showing that 51(83.61%) of the respondents were female and 10(19.39%) were male. Male to female ratio was 1**:** 5.1

Table 2: Distribution of patients according to residence (n=61)

Residence	Frequency	Percentage
Urban	45	73.7
Rural	16	26.2

Table showed area of residence of the patients. Majority respondents 45(73.7%) came from urban area.

Table 3: Distribution of the patients according to occupation category (n=61)

Occupation	Frequency	Percentage
Service holder	9	14.7
Business	6	9.83
Daily worker	15	24.5
Homemaker	31	50.8

Table shows the occupation category of respondents. Large number of respondents were homemaker 31(50.8%).

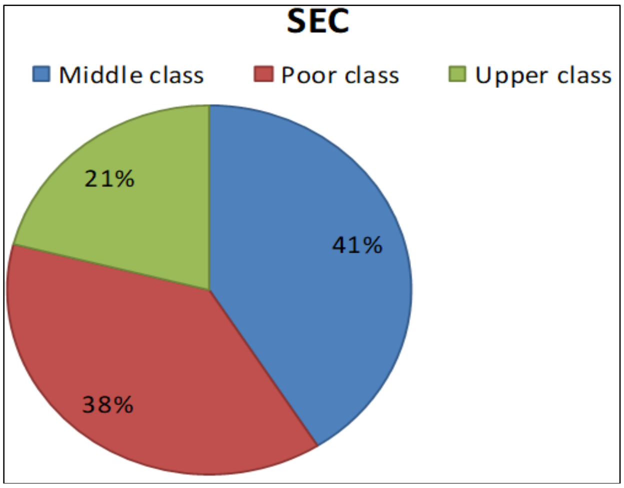

Fig 2: Socioeconomic status of the study population (n=61)

Among the patients the middle class comprising the major percentage (41%) of the patients.

Table 4: Distribution of subject according to Bethesda system (FNAC Finding) (n=61)

Bethesda system	Frequency	Percentage
Class I	0	0
Class II	38	62.2
Class III	5	8.19
Class IV	8	13.1
Class V	7	11.4
Class VI	3	4.91

Most of the respondents were diagnosed as Bethesda class II in FNAC. In FNAC results, 38 (62.2%) were benign (class II), 5 (8.19%) were atypia of undetermined significance or follicular lesion of undetermined significance (class III), 8 (13.1%) were follicular neoplasm or suspicious for a follicular neoplasm (class IV), 7 (11.4%) were suspicious for malignancy (class V) and 3 (4.91%) were malignant (class VI).

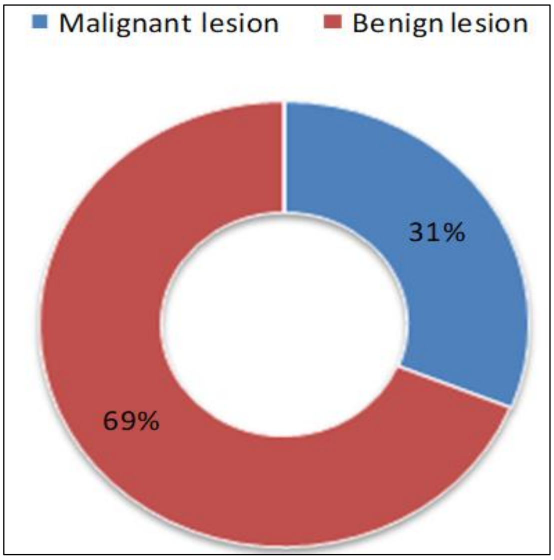

Fig 3: Type of lesion according to histopathology findings (n=61)

Histopathology findings revealed that among 61 patients, benign lesion was 42(68.9%). Malignant causes were 19(31.1%).

Table 5: Distribution of cases according to FNAC findings and comparison with histopathology results (n=61)

Bethesda system	Findings	USG guided FNAC	Histopathology	
			Benign	Malignant
Class I	Non-diagnostic or unsatisfactory	0	0	0
Class II	Benign	38 (62.2%)	36 (59.0%)	2 (3.27%)
Class III	Atypia of undetermined significance or follicular lesion of undetermined significance	5 (8.19%)	2 (3.27%)	3 (4.91%)
Class IV	Follicular neoplasm or suspicious for a follicular neoplasm	8 (13.1%)	3 (4.91%)	5 (8.19%)
Class V	Suspicious for malignancy	7 (11.4%)	1 (1.63%)	6 (9.83%)
Class VI	Malignant	3 (4.91%)	0	3 (4.91%)

The table shows histopathological diagnosis of thyroid swelling and its correlation with FNAC findings. Histopathologically 42(68.9%) were benign lesion and 19(31.1%) were malignant pathology. Among 42 benign lesions, 36 (59.0%) cases correlated with FNAC findings as negative for malignancy. [Remaining 6 cases were as follows: 2 (3.27%) atypia of undetermined significance or follicular lesion of undetermined significance (class III), 3 (4.91%) follicular neoplasm or suspicious for a follicular neoplasm (class IV), 1 (1.63%) were suspicious for malignancy (class V)]. Among 19 malignant pathology, 17 (59.0%) cases correlated with FNAC findings as positive for malignancy.

Table 6: Comparison of FNAC with Histopathology (n=61)

FNAC findings	Histopathology findings		P value
	Malignant	Benign	
FNAC positive for malignant, (n=23)	17	6	
FNAC negative for malignant, (n=38)	2	36	0.021
Total	19	42	

Result shows that FNAC proven 17 cases of positive malignant cases were correlated with histopathological findings of malignancy. Similarly, 35 cases of FNAC negative for malignancy were proven as benign in histopathology findings. The p-value is 0.021. This result is significant at $p<.05$

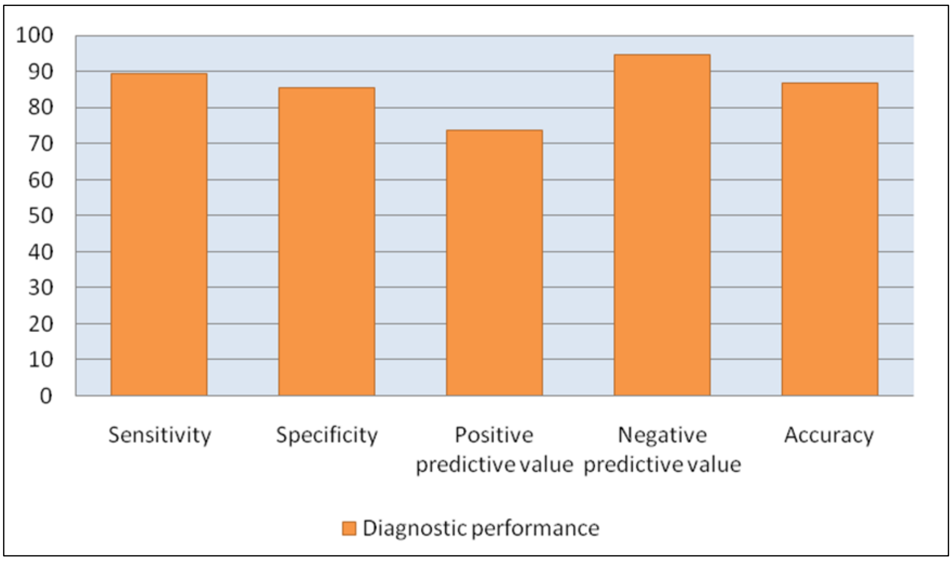

Fig 4: Diagnostic performance of FNAC (n=61)

On cytohistologic correlation, the sensitivity 89.4%, specificity 85.7%, positive predictive value 73.9%, negative predictive value 94.7%, accuracy 86.8%. Pearson's correlation Coefficient obtained from above table is 0.85. Which reflects FNAC has positive relationship with post-operative histopathology.

Table 7: Distribution of malignant lesion in histopathology (n=19)

Malignant lesions (n=19)	Histopathology	FNAC (Bethesda classification)
Papillary carcinoma	10 (52.6%)	Suspicious for malignancy = 6 (Class-V) Malignant = 2 (Class=IV) Benign = 2 (Class=II)
Follicular carcinoma	7 (36.8%)	Follicular neoplasm = 4 (Class=III) Atypia of undetermined significance = 3 (Class=III)
Medullary carcinoma	2 (10.5%)	Malignant = 1(Class=VI) Follicular neoplasm = 1(Class=III)

On histopathological examination of these smears, there were 19/61 (31.1%) cases with malignant thyroid lesions; 10 (52.6%) cases were papillary carcinomas among these 10 cases 6 were suspicious for malignancy, 2 were malignant and 2 were benign in FNAC. 7 (36.8%) cases were follicular carcinomas among them 4 were follicular neoplasm and 3 were atypia of undetermined significance in FNAC. 2 (10.5%) cases were medullary carcinoma which was reported as malignant and follicular neoplasm in FNAC.

Table 8: Distribution of benign lesion in histopathology (n=42)

Benign lesions (n=42)	Histopathology	FNAC (Bethesda classification)
Colloid goiter	34 (66.7%)	Benign (Consistent with a benign follicular nodule) = 34
Multinodular goiter	6 (14.2%)	
Follicular adenoma	5 (11.9%)	Atypia of undetermined significance = 1 Follicular neoplasm = 3 Suspicious for malignancy = 1
Hashimoto's thyroiditis	3 (7.14%)	Benign (Consistent with lymphocytic thyroiditis) = 2 Atypia of undetermined significance = 1

Of 42/61 (68.9%) benign specimens; there were 28 (66.7%) colloid goiter and 6 (14.2%) cases were multinodular goiter in histopathology both of these were reported as benign (consistent with a benign follicular nodule) in FNAC. 5 (11.9%) were found as follicular adenomas in histopathology 1 of which was reported as atypia of undetermined significance 3 were Follicular neoplasm and other 1 as follicular neoplasm in FNAC. 3 (7.14%) specimens were Hashimoto's thyroiditis in histopathology which 2 were reported as benign (consistent with lymphocytic thyroiditis) and other 1 as Atypia of undetermined significance in FNAC.

Discussion

Patients with thyroid swelling were enrolled for study to find out the Correlation of FNAC with postoperative histopathology in diagnosis of thyroid swelling. FNAC is least invasive, most simple and most accurate method to evaluate thyroid swelling. In the present study, age distribution of the patients ranged from 0 to 70 years. The highest number of patients (39.3%) were in the 31-40 years of age group, followed by 16 (26.2%) in the 41-50 years age group. Mean age of study subjects was 37.5±8.2 year. These findings are in conformity with Irfan *et al.* 2014 [9]. That reported mean age 33.35±11.77 years with most respondents from 21-40 years of age group. These findings may be due to the fact that prevalence of endemic goiter is more in younger age group. In our study most of the respondents were female. Pie chart showing that 51(83.61%) of the respondents were female and 10(19.39%) were male. This finding is similar to the finding of Singh *et al*. (2021) [10] where age distribution of patients was between 19 and 75 years. Mean±SD of the study population was 38.99±11.018 with a range of 19-75 years. Among a total of 70 patients, 81.4%, i.e. 57 patients, were females and 18.6%, i.e. 13 patients, were males. Another study in Bangladesh reported that age range of the patients were 11 years to 70 years. Out of 80 patients of thyroid swelling, the most of the patients 28(35%) were 31-40 years of age groups. Out of 80 patients of thyroid swelling, 26(26.25%) were male and 59(73.75%) were female and male female ratio was1:2.81 [11]. In another study out of total 100 cases, 96 cases were females & 4 cases were males [12]. We found that occupation of the most of the respondents were homemaker 31(50.8%) followed by daily worker 15(24.5%). This finding has concordance with Kocak *et al.* 2013 [13] where Goiter prevalence was highest in agricultural workers (35.3%) and homemaker (32.2%), and lowest in the unemployed (3.5%). They concluded that there was significant difference between occupational groups and goiter prevalence. Most of our respondents were female and goiter is more common in female. This may explain why goiter is common among homemakers. In our study large numbers of respondents 45(73.7%) came from urban area, it accordance from study of Irfan *et al.* 2014 [9] where 68.75% respondents were from urban area and 31.25% respondents were from rural area. Awareness of urban patient causes early detection of goiter. In the present study, FNAC of thyroid lesion result was interpreted as per Bethesda system. Most of the respondents was diagnosed as Bethesda class II in FNAC. Which is similar to a meta-analysis on The Bethesda System for Reporting Thyroid Cytopathology (TBS RTC) of Massimo *et al.* 2012 [14] where 59.3% of 25445 patients reported as Bethesda class II. Bethesda class II is benign lesion, most of thyroid lesions are benign. In our study Bethesda Class II Benign (62.2%), class III Follicular Neoplasm or Suspicious for a Follicular Neoplasm (8.19%), class IV Atypia of Undetermined Significance or Follicular lesion of Undetermined Significance (13.1%), class V Suspicious for Malignancy (11.4%) and class VI Malignant (4.91%), which is in concordance with a meta-analysis of Massimo *et al.* 2012 [14] where class I-12.9%, class II-59.3%, class III 9.6%, class IV 10.1%, class V 2.7%, class VI 5.4%. In class I & class V it is different from our study. This difference may be due to their inclusion of free hand as well as USG guided FNAC. Kumar *et al*. (2017) [12] demonstrated that Fine Needle Aspiration Cytology (FNAC) is important for pre-operative and pre-treatment diagnosis of benign and malignant thyroid lesions, thus decreasing the incidence of unwanted surgeries. FNAC of thyroid swellings is a simple, rapid, patient friendly and inexpensive procedure, which can be repeated in cases of inadequate samples. It has the best predictive value of all currently available diagnostic procedures. In our study among the 23 FNAC positive malignant cases, 17 patients consistent with histopathology findings. Among 38 FNAC benign cases, 36 cases consistent with histopathology result. The chi-square statistic is 5.34. The p-value is 0.021. This result is significant at $p<.05$. So FNAC finding is significant in evaluation of thyroid swelling. There were 6 false positive cases from correct diagnosis and only 2 smears were false negative when compared with histopathology. True positive was 17 cases & true negatives was 36 cases. Singh *et al*. (2021) [10] demonstrated that, sixty patients out of 70 had benign lesions on FNAC. Among them, 46 (65.9%) had colloid nodule, 17.1% had colloid goiter with cystic change, and 1.4% had lymphocytic thyroiditis and adenomatous goiter each. FNAC was suspicious of follicular neoplasm in 1 patient (1.4%). Out of the 70 patients, 9 had malignant lesions which included papillary carcinoma - 10% and medullary carcinoma - 2.9% (Singh *et al*, 2021) [10]. Al Sindi *et al.* 2013 [15] reported that all of their false positive cases were follicular adenoma. Though false positive cases are much lower in. Mustafa *et al.* 2006 reported 33.3% false positive cases in palpation guided or free hand FNAC where as in USG guidance FNAC it was much lower (25%). This finding is due to the fact that FNAC has a limitation to differentiate follicular hyperplasia from follicular neoplasm. The accuracy of FNAC depends crucially on the technique, operator performing the aspiration and the cytopathologist analyzing it. In this study cytohistologic correlation showed, the sensitivity 89.4%, specificity 85.7%, positive predictive value 73.9%, negative predictive value 94.7%, accuracy 86.8%. The false negative specimen was papillary thyroid carcinoma which was improperly aspirated from targeted nodules and was diagnosed as benign lesion. Pearson's correlation Coefficient obtained from above table is 0.85. Which reflects FNAC has very strong positive relationship with post-operative histopathology. Singh *et al*. (2021) [10] demonstrated that diagnosis on FNAC correlated with histopathology. Statistical analysis showed FNAC had a sensitivity of 83.3%, specificity of 100%, positive predictive value of 100%, negative predictive value of 96.7%. However, the overall accuracy in this study was determined to be 95.71%. Results were found to be statistically significant ($P<0.05$). Therefore, diagnostic role of FNAC in thyroid lesions is of utmost importance in making preoperative diagnosis. FNAC was found to be highly sensitive and specific for diagnosing thyroid lesions but the final HPE is considered as a gold standard (Singh *et al*, 2021). [10] In another study out of total 100 cases, 53 patients (53%) had colloid goitre, 8 patients (8%) were suspicious for follicular neoplasms, 15 patients (15%) had Hashimotos and 11patients (11%) had Papillary carcinoma, 10(10%) were Atypia of undetermined significance and inadequate. Cyto-histopathological correlation of 100 cases was done. Sensitivity and specificity of the results were 100%, 86.7% and 81.8%, 66.67% respectively.[12] A review of studies that evaluated the role of US-FNAC in the detection of thyroid cancer revealed a sensitivity of 76%-98%, specificity of 71%-100%, false-negative rate of 0%-5%, false-positive rate of 0-5.7%, and overall accuracy of 69%-97%. [10] In our study most of the malignant lesion papillary carcinoma, rest are follicular carcinoma and medullary carcinoma. On histopathological examination of these smears, there were 19/61 (31.1%) cases with malignant thyroid lesions; 10 (52.6%) cases were papillary carcinomas, 7 (36.8%) cases were follicular carcinomas and 2 (10.5%) cases were medullary carcinoma which is similar to the Pannersalvam *et al.* 2013 where papillary carcinoma was 61.5%. Daniele *et al.* 1998 reported papillary carcinoma 71.7%, follicular carcinoma 7.6% and medullary carcinoma 1.9%. Al Sindi *et al.* 2013 [15] reported 4/15 cases were follicular carcinomas among them 2 were follicular neoplasm and 2 was atypia of undetermined significance in FNAC; in our study 1/16 case was of medullary carcinoma which was reported as malignant (MTC) in FNAC which is similar to Al Sindi *et al.* 2013. [15] In our study most of the benign lesion histopathology was colloid goiter. Of 42/61 (68.9%) benign specimens; there were 28 (66.7%) colloid goiter and 6 (14.2%) cases were multinodular goiter, 5 (11.9%) were found as follicular adenomas, 3 (7.14%) specimens were Hashimoto's thyroiditis. Which is in consistent with Irfan *et al.* 2014 [9] where most of benign lesion reported as colloid goiter (51%). Another study reported that common types of thyroid swelling are colloid goiter (42.2%), colloid goiter with Cystic degeneration (13.2%) Hashimoto's thyroiditis, Follicular adenoma, etc (Rout *et al,* 2011). [16] Study in Bangladesh reported that, on FNAC 64(80%) were non-neoplastic and 16(20%) were neoplastic. Out of 64(80%) of non-neoplastic lesions, 62(77.50%) were nodular goitre and 2(2.5%) were lymphocytic thyroiditis and out of 16(20%) neoplastic thyroid swelling, 2(2.50%) were follicular lesion, 12(15%) were papillary carcinoma, 1(1.25%) was follicular carcinoma and 1(1.25%) was suspicious for malignancy. On histopathology, out of 80 patients of thyroid swelling 60(75%) were non-neoplastic and 20(25%) were neoplastic. out of 60(75%) non-neoplastic, 59 (73.75%) were nodular, 1(1.25%) was Lymphocytic thyroiditis and out of 20(25%) neoplastic lesions, 3(3.75%) were follicular adenoma,13(16.25%) were papillary carcinoma, 3(3.75%) were follicular variant of papillary carcinoma and 1(1.25%) was follicular carcinoma. It is concluded that FNAC is essential diagnostic tool for thyroid swelling but final diagnosis to rule out thyroid cancer is surgical excision and histopathology (Rahman *et al,* 2023). [11] Ultrasound (US) is useful to guide the needle for fine needle aspiration of a thyroid nodule; it improves the quality of diagnosis in pre-operative assessment of thyroid nodules and to appropriately select patients for thyroidectomy. We categorized cytological results into six classes according to Bethesda description for thyroid cytology. The optimal diagnostic strategy is aiming to avoid surgery in patients with benign thyroid disease, which is very common in the adult population, while at the same time performing prompt surgical treatment of patients with thyroid carcinoma. To achieve this, FNAC-t must score high on test characteristics. This can be achieved by USG guided aspiration.[7] Lin *et al.* 1997 [17] has reported that the sensitivity was 79.8%. The specificity was 98.7%. Positive predictive value was 96.3%. Negative predictive value was 91.7%. False negative index was 20.2%. The diagnostic accuracy was 92.9%. Kim *et al.* 2012 reported, sensitivity, specificity, positive predictive value, negative predictive value, accuracy, false-negative rate, and false-positive rate of FNACs were 94.3%, 91.9%, 96.2%, 88.3%, 93.6%, 3.9%, and 2.6%, respectively.

Conclusion: Present study concluded that FNAC is as effective as histopathology in diagnosis of thyroid swelling. Although limitations are encountered while predicting specific lesions, this study has shown that FNAC has a high sensitivity, specificity and diagnostic accuracy in diagnosis Thyroid Swelling. We found a good concordance between FNAC and final histopathology. So preoperative FNAC should be considered as one of the first line of investigations in the evaluation of Thyroid swelling.

Limitation

This study was not without limitation. The limitations of the studies were as follows:

FNAC and histopathology were done by different pathologists with different level of skill.

- Sample size was small, so may not sufficient to find out optimum results.
- The study was done in limited time span.
- As the samples were taken purposively, so there may be a chance of bias which can influence the results.
- USG guided FNAC should be recommended to reduced false negativity.

Recommendation

- Small (≤0.5 cm) & Suspicious thyroid nodule on USG should have USG guided FNAC.

- Representative smears from free hand FNAC and multinodular goiter yielded accurate result by USG guided FNAC

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