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ACCURACY OF CYTOPATHOLOGY IN DIAGNOSIS THYROID NEOPLASMS: A CORRELATION STUDY WITH HISTOPATHOLOGICAL OUTCOMES IN SINDH, PAKISTAN

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Abstract

Objectives: *Thyroid neoplasms found serious issues mostly in females, for the sac of treatment un-necessary practice of Thyroidectomy or lobectomy carried out in hospitals, which can be reduce by proper treatment by evaluating cytological diagnosis and correlate with histopathology of Thyroid Neoplasms.* ***Method***: *The 151 patients studies within 12 months, at Tertiary care hospitals of Jamshoro, Sindh, Pakistan. During study Different parameters like age, gender, hormonal analysis, along with cytological and Histopathological correlation were observed.* ***Results:*** *The findings shows higher frequency of female 134 (88.7%), while male were 17 (11.3%). The mean age and std 33.67 ±10.727 was observed. The hormonal results show mean & std of (T3)1.49 ± 0.619, (T4) 8.176 ± 3.512, while in (TSH) 3.291 ± 8.874. The histopathological findings and the biochemical analysis showed a negligible connection (p =.155) while The cytopathological results revealed 93.4% cases were benign,probable malignancy of 3.3%, follicular lesion or atypia of unknown significance were 2.6%, and Only 0.7%, diagnosed as a cystic swelling. The Histopathological diagnosis clarify that majority of (109 cases) were benign, 16 cases of benign nodular hyperplasia with lymphocytic thyroiditis, and 15 cases diagnosed as papillary carcinoma of the thyroid. Additionally, there were 8 cases of Hashimoto's thyroiditis, while follicular carcinoma was diagnosed in 3 cases. The results show a significant correlation (p = .001) between the Histopathological findings and FNAC results. The majority of the 141 cases–109 were benign, 8 were Hashimoto's thyroiditis, and 15 were benign nodular hyperplasia with lymphocytic thyroiditis. Furthermore, only two cases of follicular carcinoma and seven cases of papillary thyroid cancer were found.* ***Conclusions:*** *The results conclude that with accuracy of cytopathology can resolve problem of benign thyroid neoplasms which can be treated via medication, in case of malignant tumor lobectomies or thyroidectomies may be performed which treated through chemotherapy or radiation.*

INTRODUCTION

Thyroid neoplasms or thyroid diseases may benign or malignant clinical appear solitary, diffuse, cold nodule, or multinodular goiter. The solitary nodule mostly resulted as benign while the cold nodule

increase the chances of malignancy .The thyroid neoplasms found in all age group but the highest ratio found in adult age The female are found in 1st line of affected in most of the studies.. [1]. Cytopathology recognized and primary diagnostic procedure for assessing diffuse thyroid lesions. It reduces unnecessary procedures by bridging the gap between clinical and surgical pathological diagnosis [2]. This is only true, though, if a skilled doctor performs the Fine Needle Aspiration (FNA) and a skilled pathologist examines the cytology [3]. The gold standard for diagnosing thyroid lesions is FNAC since it is less invasive, efficient in terms of time and money, and has a comparatively high accuracy rate [4]. In the event that the lesion proves to be malignant, FNAC is the recommended diagnostic method since it reduces the need for needless thyroidectomies. (FNAC) is a minimally invasive, easy, accessible, and dependable treatment [5]. The first, most fundamental, and most significant diagnostic technique for thyroid neoplasms is cytopathology, according to a variety of books and articles published over the past 50 years [6]. It can be used to diagnose pathological lesions in a variety of organs, including the thyroid, breast, and lymph nodes. The thyroid is the perfect organ for FNAC since it is superficial and easily accessible. Additionally, it exhibits a variety of abnormal characteristics. Before doing any surgery, the surgeon must be aware of the morphological characteristics of the lesion [7]. One other method of accurately identifying the pathology is to perform a histopathological analysis of thyroid enlargement that has been surgically removed. However, it necessitates planning and lengthy processes including anesthesia, hospital stays, and occasionally even excessive treatment[8]. FNAC's most useful information is whether a nodule has the potential to become cancerous by [9]. To rule out a diagnosis of cancer, important criteria should be followed[10]. In order to prevent the need for unnecessary surgery, cytopathology evaluates thyroid neoplasms to determine if they are benign or malignant. Various techniques, such as ultrasonography, CT scans, MRI studies, However, FNAC, an ultrasound guide, is utilized to improve sample collection, particularly for cystic lesions [11]. For thyroid FNA, Poller and associates suggest using a five-point working scheme: (THY1) inadequate; (THY2) benign; (THY3) indeterminate; (THY4) suspicious; (THY5) malignant [12]. Thyroid neoplasms can manifest as numerous, solitary, or widespread nodules, and their etiology might vary. Although thyroid lesions can occur at any age, they are most common in the adult age range. Thyroid neoplasms are primarily benign and manifest as a single nodule [13]. By doing it as an OPD-based operation, needless hospital stays can be avoided. Significant improvement in cystic and sub-centimetric thyroid lesions with USG-guided FNAC [14]. It not only provides a clear morphological image of thyroid lesions but also helps treat fluid-filled cystic lesions and relieve pressure-related symptoms [15]. Widely used, the Bethesda system for reporting thyroid cytopathology (TBSRTC) divides thyroid lesions into six levels, each of which has a calculated risk of becoming malignant after further surgery. Worldwide usage of TBSRTC enables a consistent and repeatable method for the cytological assessment and treatment of thyroid lesions. According to the Bethesda approach, the study demonstrates that thyroid cancers can be effectively classified and reported cytologically[16]. Thyroid (FNAC) aims to reduce the overall incidence of thyroidectomy in patients with benign illness and detect the nodules that need surgery [17]. Cells from the nodule are extracted and examined under a microscope as part of FNAC. Numerous studies have examined the diagnostic precision of histology and FNAC in identifying thyroid nodules. The overall sensitivity and specificity rates given by FNAC are 79–95% and 72–100%, respectively, in detecting thyroid malignancy. Conversely, histopathology has reported sensitivity and specificity rates of 80–100% and 97–99%, respectively [18]. Since FNAC just requires inserting a needle into the thyroid, it is a less intrusive option than histology[19]. FNAC has some restrictions. It might not produce the best results for patients with follicular neoplasms, thyroiditis, lesions smaller than 1 cm, or in situations where malignancy cannot be identified with certainty. On the other hand Histopathological diagnosis, , requires the removal of either the entire nodule or the afflicted thyroid gland, which is a more invasive and expensive process. Unfortunately, in order to aid in histopathological diagnosis, a significant portion of thyroid nodules may be surgically removed without need.

Additionally, histopathology usually takes longer than FNAC and is performed after surgery [20].

MATERIALS AND METHODS

Collection of Sample of the Thyroid FNAC

For the collection of FNAC sample, local anesthesia (zylocan) spray given externally infront of neck. Aspiration of diagnostic material performed by using 5cc disposable syringe using plunger (Fig.a). After that aspirated material spread on frosted slides and fix the smear in 100 % alcohol preparing for H&E stain (Fig.b). to diagnose the different thyroid neoplasms by comparing nuclear and cytoplasmic ratio and other morphological changes (Fig.c.).

Hematoxilin and Eosin Staining FNAC Procedure

Thyroid aspiration spreader alcohol fixed slides will be run from distil water 2 to 3 times in 1st step in 1st jar then, In second step of Staining method dip the Slides into Hematoxilin for 5 minutes which is nuclear stain. Before 3rd step run the slides in distil water 2 to 3 times.

In 3rd step, slides run in the alcohol in ascending series to process dehydration Slides run in 80% ,90% ,100% alcohol in 3rd,4th and 5th jarr. After one dip the slides in Eosin for cytoplasmic stain in 6th jar contain Eosin for 10 to 20 seconds. Proceed the slides into 7th ,8th jar contain 100% alcohol. After that Xylene in used in 9th, 10th and 11 jar to remove alcohol and give clearance to diagnostic material. Finally after mount with DPX using cover slip. Prepared Slides will be examine microscopically with Bethesda System of Different Thyroid Neoplasm.

MICROSCOPIC EXAMINATION

Cytology and H&E stained slides were examined under the microscope by pathologist for morphological evaluation and Histopathological diagnosis of thyroid neoplasms.

DATA ANALYSIS METHOD

The data was analyzed by microsoft excel and SPSS V.22

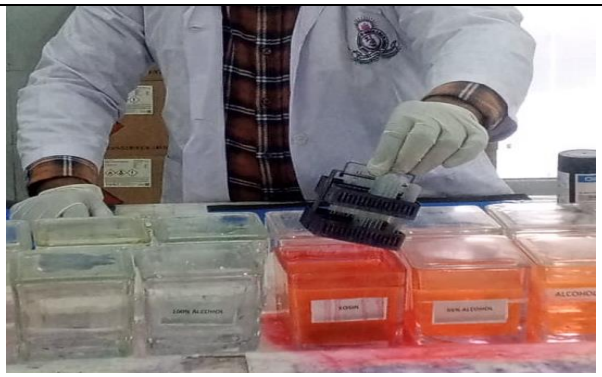
The 2017 Bethesda system for reporting thyroid cytopathology
Implied risk of malignancy and recommended clinical management (simplified)

Diagnostic category	Risk of malignancy		Usual management
	NIFTP ≠ cancer	*NIFTP = cancer*	
I. **Nondiagnostic**	5–10%	5–10%	Repeat FNA with ultrasound guidance
II. **Benign**	0–3%	0–3%	Clinical and sonographic follow–up
III. **AUS/FLUS**	6–18%	≈ 10–30%	Repeat FNA, molecular testing, or lobectomy
IV. **FN/SFN**	10–40%	25–40%	Molecular testing, lobectomy
V. **Suspicious for malignancy**	45–60%	50–75%	Near–total thyroidectomy or lobectomy
VI. **Malignant**	94–96%	97–99%	Near–total thyroidectomy or lobectomy


a

b


c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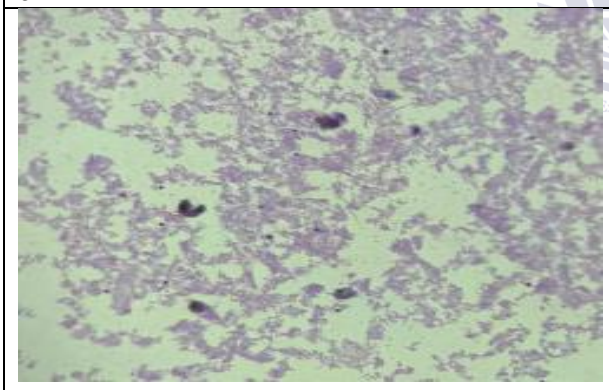
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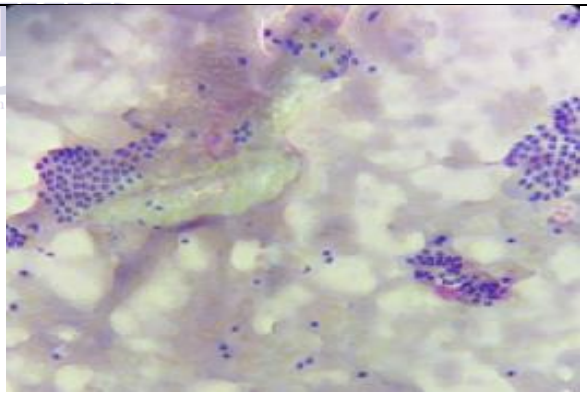
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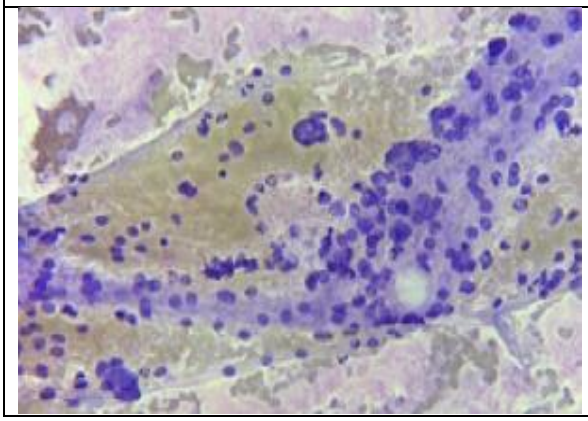

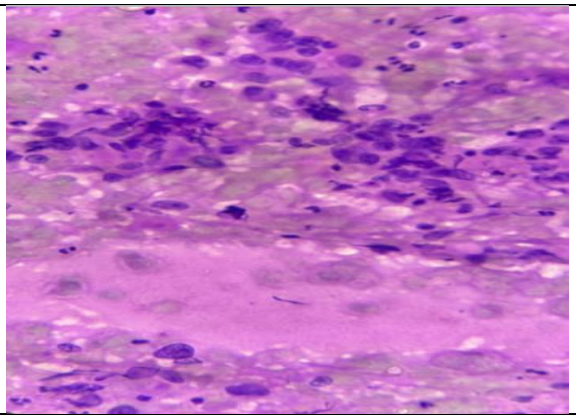

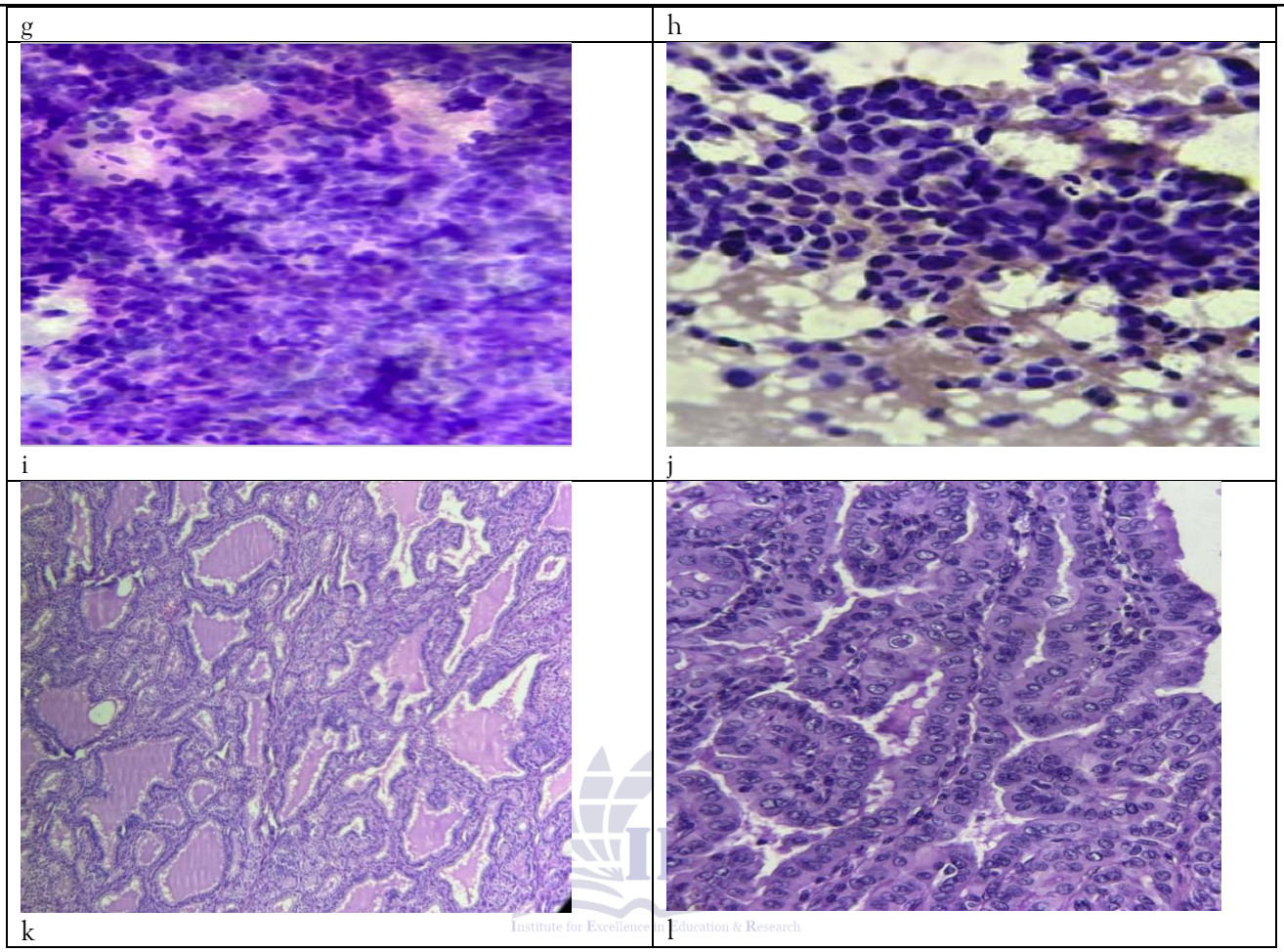

Fig.1 Explanations (a) Aspiration of FNAC diagnostic material using adjusted 5cc disposable syringe (b) Collected FNAC smear spread on labeled frosted slides for fixation of smear perform stain (c)Hematoxilin staining for nuclear stain (d) Eosin staining for cytoplasmic stain (e) Cytological microscopic examination of Nondiagnostic / Cystic swelling (f) Cytological microscopic examination of benign follicular nodule thy II betheda 2 (g) Cytological microscopic examination of suspicious for malignancy (h) Cytological microscopic examination of atypia of undetermined significant / follicular lesion: (suspicious for medullary carcinoma) (i) Cytological microscopic examination of follicular neoplasm / suspicious for neoplasm (j) Cytological microscopic examination of malignant (k) Histopathological microscopic examination of Follicular Adenoma (l) Histopathological microscopic examination of Papillary carcinoma of thyroid

RESULTS

This study performed on 151 indoor patient of surgical wards at Tertiary care hospitals LUMHS, Jamshoro, Sindh, Pakistan. The duration was one year from 13/12/2022 to 13 /12/ 2023. The data of patients was classified into seven different age groups. Various parameters were noted throughout the study including age, gender, and iodine intake. Clinical, Biochemical Analysis, mostly focus on diagnosis and evaluaton the Cytological Finding and its correlation with Histopathological Diagnosis were analyzed. According to the results of the significant correlation (P=.001), out of 121 cases diagnosed as benign goiter, the same ratio was found in FNAC as 121 cases, similar to that of 8 cases found in diffuse swelling, 7 cases in the condition of solitary nodule, and only 1 case in the condition of cold nodule. Out of 14 cases, 5 were found to be suspicious for malignancy, 4 were diagnosed as Atypia Of Undetermined

Significant/Follicular Lesion, and 5 results obtained were benign goiter in the FNAC diagnosis. The findings indicate a significant (P. value=.001) association between the FNAC and histopathological results in the majority of the 151 instances, with 142 of those cases being benign. Benign Nodular Hyperplasia with Lymphocytic Thyroiditis, Hashimoto Thyroiditis, and Thyroid Lesion are all regarded as benign, however only two instances had follicular carcinoma and seven cases had thyroid papillary carcinoma. The findings indicate a significant (p.value=.001) correlation between the FNAC and histopathological results. Of the 141 benign cases, 109,8,15 were benign thyroid lesions, Hashimoto thyroiditis, and benign nodular hyperplasia with lymphocytic thyroiditis, all of which were regarded as benign. Seven cases were thyroid papillary carcinoma, and only two were follicular carcinoma.

Table1. shows correlation of Histopathological Results and FNAC Diagnostic

		FNAC Results				
		Cystic Swelling	Benign	Atypia Of Undetermined Significant/ Follicular Lesion	Suspicious For Malignancy	Total
Histopathological Results	Benign Thyroid Lesion	0	109	0	0	109
	Hashimoto Thyroiditis	0	8	0	0	8
	Benign Nodular Hyperplasia With Lymphocytic Thyroiditis	1	15	0	0	16
	Papillary Carcinoma Of Thyroid	0	7	3	5	15
	Follicular Carcinoma	0	2	1	0	3
Total		1	141	4	5	151

DISCUSSION

This aim of this study to compared and evaluate the relationship between thyroid cytological findings and the histopathological categories of thyroid neoplasms. Numerous factors were examined in this context, including age, gender, iodine intake, clinical identification, hormonal analysis, and, most importantly, the evaluation of the cytological findings and histopathological results. The findings showed that among the 151 patients with thyroid neoplasm complaints, a larger ratio of 134 (88.7%) were found in females compared to roughly 17 (11.3%) in males. The thyroid neoplasm patients in this study were split into seven age groups, A, B, C, D, E, F, and G, according to their ages: 0–10, 11–20, 21–30, 31–40, 41–50, 51–60, and 61–70. According to the study's findings, the D group had a larger ratio of thyroid neoplasms in patients aged 31 to 40, the A group had the fewest patients aged 0 to 10, and the G group had the fewest patients aged 61 to 70. According to a study on FNAC diagnosis, a greater percentage of cases—93.4%—were benign, 3.3% were suspected of being malignant, 2.6% were diagnosed as Atypia Of Undetermined Significant/Follicular Lesion, and only 0.7% had a single case of cystic swelling. The findings indicate that there were approximately 125 females with benign goiter and 4,5 cases of Suspicious For Malignancy and Atypia Of Undetermined Significant / Follicular Lesion in females, while there were approximately 17 males with 16 cases of benign goiter and only 1 case of cystic swelling, with none of the males having Suspicious For Malignancy or Atypia Of Undetermined Significant / Follicular Lesion in the case that was observed. According to the study's findings, FNAC results and histopathological diagnoses are correlated. The results of the fine needle aspiration cytology (FNAC) and the histopathological diagnosis were examined. The findings indicate that, of the 151 cases, 141 were classified as benign, 109, 8, and 15 as benign thyroid lesions, Hashimoto thyroiditis, and benign nodular hyperplasia with lymphocytic thyroiditis, respectively, which were also classified as benign. Seven cases were classified as papillary thyroid cancer, and only two were classified as follicular cancer. The correlation between the FNAC and histopathological data is significant (p. value =.001).

[23] at Tamil Nadu, India observed that, FNAC is recognized as the most economical, minimally invasive method with a very low rate of complications for diagnosing the majority of thyroid lesions. Separating patients with solitary thyroid nodules (STN) between groups that have surgery and those that do not is another advantage of this method. The study's objective was to evaluate the FNAC's sensitivity, specificity, positive predictive value, and negative predictive value in relation to histopathology for the diagnosis of thyroid edema.

An analysis of FNAC correlation According to Sirry et al. aspirates, 22 (22%) had malignant lesions, 14 (14%) had worrisome lesions, andWhen compared to histology, the study's objective was to ascertain how accurate FNAC was in diagnosing thyroid enlargement in terms of sensitivity, specificity, positive predictive value, and negative predictive value. Histopathological analysis of the last postoperative cases showed 75 (75%) benign instances: Five (5%) cysts, twelve (13%) colloid nodules, six (6%) adenomas, twenty-two (22%) simple MNG, and twenty-nine (29%) toxic MNG. Of the instances, 25 (25%) were malignant: Three (3%) anaplastic carcinomas, two (2%) medullary carcinomas, five (5%) follicular carcinomas, and fifteen (15%) papillary carcinomas were found. Overall, surgery was used to treat 97 (97%) of the cases: 82 (84.5%) thyroidectomies, including 15 (15.5%) hemi thyroidectomies. Three (3%) instances (cases with anaplastic carcinoma) did not get surgical therapy, while seven (7.2%) malignant cases had their necks dissected. According to histology, out of 25 patients with thyroid cancer, 21 had total thyroidectomies, one had a hemi-thyroidectomy for follicular carcinoma, which necessitated a completion thyroidectomy, and three had no surgical intervention for anaplastic carcinoma. In 17 (17%) of the cases, adjuvant therapy was administered; 15 patients received radioactive iodine, one patient received external irradiation, and one patient received chemotherapy irradiation [21].

The likely investigation on the relationship between histopathological and FNAC diagnostics was conducted by Mohammed A. in 2018, and it closely resembles our work.

According to Mishra H's 2023 research, cytopathology offers a precise and accurate diagnosis for determining thyroid disorders. The purpose of this study was to assess the diagnostic accuracy of FNAC by analyzing thyroid lesion cytology smears using the Bethesda way of reporting thyroid cytology and comparing the cytological results with histopathological diagnosis. Researchers conducted the prospective cross-sectional study. The Bethesda system for reporting thyroid cytopathology was used to assess and report the FNAC of thyroid lesions in 203 patients. The histopathological results of 33 of these individuals who had surgery were compared and linked to the corresponding cytopathological diagnoses. Data analysis was conducted using IBM SPSS (Statistical Package for the Social Sciences) software version 27.The histopathological results of 33 of these individuals who had surgery were compared and linked to the corresponding cytopathological diagnoses. Out of the 203 cases that were evaluated, 11 were classified as non-diagnostic (Category I), 171 as benign (Category II), 4 as atypia of unknown significance (Category III), 7 as suspicious for follicular neoplasm (Category IV), 2 as suspicious for malignancy (Category V), and 8 as malignant (Category VI). Only 33 patients out of 203 had surgery; of these, 26 (78.79%) had benign histopathology and 7 (21.21%) had malignant histopathology. The FNAC's related diagnostic precision, sensitivity, and specificity were 71.42%, 100%, and 93.93%, respectively. The associated positive and negative predictive values were found to be 100% and 92.85%. The study concludes that using the Bethesda approach, thyroid cancers can be correctly classified and reported cytologically[22].

According on the study's findings, technical methodology, reporting system, and methodology, Mishra H's 2023 research closely resembles this one.

According to Ankita Sen et al. in eastern India on November 2, 2022, FNAC is a crucial test for thyroid nodule triage. The Bethesda System for Reporting Thyroid Cytopathology (TBS) was recently published as a result of the 2007 National Cancer Institute Thyroid FNA State-of-the-Science Conference. This study aimed to assess the experience of a single institution in order to ascertain whether sub-classification (neoplasm versus lesion) helps identify patients who are more likely to develop cancer. Additionally, an attempt has been made to assess the regional and global variations in the significance of adopting the Bethesda categorization. All patients

with thyroid lesions were assessed for FNAC association with the surgical diagnosis during the 2018–2021 research. There were 1763 thyroid FNACs recorded throughout this time. Data on the results of histopathological examinations (HPEs) were available in 444 instances (25.2%). According to the findings, the rate of diagnostic difference between cytology and histology was 11.5%. For the diagnosis of cancer, thyroid FNA has a 71.4% sensitivity and a 49.5% specificity. The majority of cases (84.5%) were benign. Our study's various categories' malignancy risk, as determined by follow-up HPE, has a strong correlation with the Bethesda System. The findings showed that thyroid cancer can be accurately diagnosed with FNAC. The categorization is closely linked to the likelihood of cancer in each group, which aids in precise clinical treatment of that group [23]. A few more relevant studies like [24-26].

CONCLUSIONS

The FNAC is the quickest, most accurate, least costly, and least painful diagnostic method for diagnosing different types of thyroid neoplasms. Approximately 93.4% of thyroid problem cases were found to be benign based on the FNAC results. 2.6% of the cases were classified as Atypia of Undetermined Significance/Follicular Lesion, while 3.3% were suspected of being malignant. Only one case, or 0.7% of the total, was identified as a cystic swelling. According to the histopathological diagnosis, benign goiters accounted for the bulk of thyroid neoplasms (109 cases), followed by benign nodular hyperplasia with lymphocytic thyroiditis (16 cases) and thyroid papillary carcinoma (15 cases). Furthermore, three cases of follicular carcinoma and eight cases of Hashimoto's thyroiditis were identified. The findings indicate that the FNAC results and the histopathological findings have a substantial connection (p =.001). The majority of the 141 cases—109 of which were benign thyroid lesions, 8 of which were Hashimoto's thyroiditis, and 15 of which were benign nodular hyperplasia with lymphocytic thyroiditis—were benign. Furthermore, only two cases of follicular carcinoma and seven cases of papillary thyroid cancer were found. It was determined that the majority of benign thyroid nodules can be diagnosed using clinical correlation with cytopathologically accurate diagnostic procedures. These nodules can then be treated with hormone therapy, medication, or maintenance of iodine intake, which lowers the highest percentage of needless thyroid surgeries. However, lobectomies or thyroidectomies may be performed in cases of atypia of unknown significant or atypical cells or in the diagnosis of thyroid cancers. Depending on the final histopathological results, treatment options may include chemotherapy or radiation therapy.

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