

Comparison between Pre-Operative Fine Needle Aspiration Cytology and Post-Operative Histopathology Report of Solitary Thyroid Nodule

Ibrahim Tufail Chaudhry, Khalid Mahmood, Usman Bin Ali, Amna Tufail*, Rohan Qamar, Asif Younas**

Department of General Surgery, Combined Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan,

*Department of Paediatrics, Allied Hospital, Faisalabad Pakistan,

**Department of Pathology, Combined Military Hospital/National University of Medical Sciences (NUMS), Rawalpindi Pakistan

ABSTRACT

Objective: To compare preoperative fine needle aspiration cytology (FNAC) with postoperative histopathology report of solitary thyroid nodules.

Place and Duration of Study: Department of General Surgery, Combined Military Hospital, Rawalpindi Pakistan, from Aug, 2020 to Mar, 2021.

Methodology: In this study, total 42 patients including male and female were enrolled. Thyroid functioning tests of every patient was performed and all of them were found to be euthyroid. Patients were divided into different categories of age groups. Fine needle aspiration cytology and ultrasonography were used as a tools preoperatively to determine the procedure that was to be performed and it was followed by post-operative histopathological examination.

Results: Thyroid lesions were found to be more common in females than males; 35(83.81%) females and 7(16.7%) males. FNAC report depicted 36(85.71%) benign lesions and 7(14.28%) malignant lesions. Histopathological sampling was performed in which 33(78.57%) benign lesions and 9(21.42%) malignant lesions were diagnosed.

Conclusion: For diagnosis of thyroid nodules FNAC is considered as safe and simple but false negativity was observed so histopathological examination was considered as confirmatory tool for diagnosis.

Keywords: Fine Needle Aspiration Cytology (FNAC) Diagnosis, Histopathological Diagnosis, Thyroid Nodules.

How to Cite This Article: Chaudhry IT, Mahmood K, Ali UB, Tufail A, Qamar R, Younas A. Comparison between Pre-Operative Fine Needle Aspiration Cytology and Post-Operative Histopathology Report of Solitary Thyroid Nodule. Pak Armed Forces Med J 2026; 76(Suppl-3): S619-S619. DOI: <https://doi.org/10.51253/pafmj.v76iSUPPL-3.9244>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Thyroid nodular lesions are considered as a common problem prevailing in the world. Rate of thyroid disorders are higher in women and in regions of iodine deficiency. Exposure of ionizing radiation in adolescence and childhood enhanced the risk of thyroid carcinoma and solitary thyroid nodule.¹

Prevalence of thyroid swelling in adult's ranges from 4-10% and in children it ranges from 0.2-1.2%.² Diseases of thyroid gland can occur due to neoplastic and inflammatory causes. For evaluation of thyroid swellings several invasive and non-invasive diagnostic tests like thyroid nuclear scan, ultrasound and FNAC are used by clinicians. Hence there arises the need for a confirmatory diagnostic investigation that is the histopathological examination (HPE) of the specimen and is considered as the most authentic diagnostic test needed to evaluate the thyroid cases accurately.³⁻⁴

In spite of all these investigations, not a single investigation is totally accurate and the clinician must

be sensible in the use of different testing methods. FNAC has been implemented as the best test for screening globally as it distinguishes between malignant and benign lesions successfully. FNAC of thyroid enlargements is inexpensive, safe, easy and accurate with a sensitivity rate of 65-98%, a specificity of 72-100%, false positive and false negative rate of 1-8% and 1-11% respectively.⁵⁻⁶ Therefore, FNAC is highly sensitive as a screening test. It is based upon the skilled cytological interpretation and analysis. There are few drawbacks with FNAC like inadequate samplings, suspicious diagnosis and interobserver disparities. The accuracy of FNAC depends upon several important contributing factors including experience of aspirator, skilful interpretation of cytology and a rational examination based upon the clinical and cytological information in the case of every individual patient.⁷

FNAC diagnosis is simple, readily repeated, easy, and cost effective technique. Important aspects for the suitable test contains the descriptive sample from nodule and qualified clinician to detect findings. It is commonly used as initial screening method for identification of thyroid nodules.⁸ There are also some

Correspondence: Dr Ibrahim Tufail Chaudhry, Department of General Surgery, Combined Military Hospital, Rawalpindi Pakistan

Received: 05 Sep 2022; revision received: 12 May 2022; accepted: 02 Apr 2026

limitations of FNAC as its accuracy is less in follicular neoplasms and suspicious cytological findings. Mainly the purpose of FNAC is to detect nodules that need surgery and also identify benign nodules and decreases the overall ratio of thyroidectomy in patients with benign pathologies. Despite of all above it also provides false negative results so the histopathological diagnosis is the gold standard investigation for identification and management of thyroid disorders. It is therefore important to have a clear diagnostic methodology to ensure that patients of thyroid swellings are managed and treated properly.

METHODOLOGY

This cross-sectional comparative study was conducted at Department of General Surgery, Combined Military Hospital, Rawalpindi Pakistan, from August, 2020 to March, 2021 after receiving clearance from the hospital board of ethics (IRB CMH Rawalpindi number 183/07/2021).

Inclusion Criteria: Patients (males and females) presented with solitary thyroid nodule examined by ultrasonography and all were euthyroid.

Exclusion Criteria: Patients unfit for surgical procedure and presented with co-morbidities were excluded from the study.

Total 42 patients including males and females having thyroid nodules were included in this study. Comparison was performed between pre-op FNAC and post-op histopathology reports. Sample size was calculated by using WHO sample size calculator based upon a reference malignancy proportion of 15.3% reported by Gupta *et al.*, (2010), with a confidence level of 95% and a margin of error at 5%. Preoperative FNAC and post operative histopathology reports were compared.

Patients with thyroid swellings were clinically examined after taking the detailed history and written consent was signed by them. Patients were examined, ultrasonography of neck done and FNAC was performed. The findings were obtained and noted. Status of thyroid function was obtained by serum analysis of T3, T4 and TSH in patients. All euthyroid patients were advised pre-anaesthesia fitness and admitted for surgery. Postoperative specimen obtained and histopathological examination was performed. Histopathology reports were compared with FNAC findings to evaluate their specificity and sensitivity.

Data was entered and analysed using Statistical Package for the social sciences 26. Study variables included demographic data, FNAC categories and histopathological outcomes. Descriptive statistics were calculated as frequency and percentage. Sensitivity, specificity, positive and negative predictive values were calculated.

RESULTS

In this study, a total of 42 patients were enrolled, including both males and females. Thyroid lesions were more common in females, with 35(83.3%) females and 7(16.7%) males. Patients were categorized into different age groups. There were 5(11.9%) patients in the 21-30 years age group, 10(23.8%) in the 31-40 years group, 12(28.6%) in the 41-50 years group, and 15(35.7%) in the 51-60 years age group. In all age groups, the proportion of female patients remained higher compared to males, females constituted 4(9.5%) of those aged 21-30 years, 9(21.4%) in the 31-40 years group, 10(23.8%) in the 41-50 years group, and 12(28.6%) in the 51-60 years group. In comparison, males comprised 1(2.4%), 1(2.4%), 2(4.8%), and 3(7.1%) in these respective age groups.

The FNAC of patients was performed to diagnose the lesions. FNAC report depicted 85.71% benign lesions and 14.28% malignant lesions. In benign lesions, 34(80.95%) were colloid nodular, 1(2.38%) adenomatous goitre and 1(2.38%) colloid adenomatous hyperplasia. In malignant lesions, 5(11.90%) were papillary carcinoma and 1(2.38%) was follicular carcinoma undetermined as shown in Table-I.

Table-I: Pre-operative Fine Needle Aspiration Cytology (FNAC) Diagnosis (n=42)

Benign	n(%)
Colloid Nodular	34(80.95%)
Adenomatous Goitre	1(2.38%)
Colloid Adenomatous Hyperplasia	1(2.38%)
Malignant	n(%)
Papillary Carcinoma	5(11.90%)
Follicular undetermined	1(2.38%)

Histopathological Examination of patients was performed in which 78.57% benign lesions and 21.42% malignant lesions were diagnosed. In benign lesions, 27(64.28%) colloid goitre, 1(2.38%) adenomatous, 1(2.38%) colloid with papillary hyperplasia, 2(4.76%) colloid with adenomatous hyperplasia and 2(4.76%) were follicular adenoma. In malignant lesions, 1(2.38%) follicular carcinoma, 7(16.66%) papillary carcinoma and 1(2.38%) was follicular variant of papillary carcinoma as shown in Table-II.

Solitary Thyroid Nodule

Table-II: Post-Operative Histopathological Diagnosis (n=42)

Benign	n(%)
Colloid Goitre	27(64.28%)
Adenomatous	1(2.38%)
Colloid Adenomatous Hyperplasia	2(4.76%)
Colloid Papillary Hyperplasia	1(2.38%)
Follicular Adenoma	2(4.76%)
Malignant	n(%)
Follicular Carcinoma	1(2.38%)
Papillary Carcinoma	7(16.66%)
Follicular Variant	1(2.38%)

Table-III: Comparison of Fine Needle Aspiration Cytology (FNAC) and Histopathological diagnosis in Detecting Nature of Thyroid Nodule (n=42)

	Histopathology Positive	Histopathology Negative
Fine Needle Aspiration Cytology (FNAC) Positive	6(14.29%)	0(0%)
Fine Needle Aspiration Cytology (FNAC) Negative	3(7.14%)	33(78.57%)

Sensitivity = $TP/(TP+FN) = 6/(6+3) * 100 = 66.66\%$

Specificity = $TN/(TN+FP) = 33/(33+0) * 100 = 100\%$

Positive Predictive Value = $TP/(TP+FP) * 100 = 6/(6+0) = 100\%$

Negative Predictive Value = $TN/(TN+FN) * 100 = 33/(33+3) = 91.66\%$

Diagnostic Accuracy = $(TP+TN)/All\ patients * 100 = (6+33)/42 = 92.86\%$

DISCUSSION

Thyroid related disorders are considered as the common problem in different regions. In this study, total of 42 patients were diagnosed with thyroid swellings and were subjected to preoperative fine needle aspiration cytology and then the postoperative histopathological diagnosis was performed. After that the results of FNAC were compared with that of histopathological findings to reach the final diagnosis.

In our study, the ratio of female patients having thyroid issues were found to be high as compared to males. Thyroid lesions were more common in females than males, 83.81% females and 16.66% males were admitted in our study. Similarly, various other studies also depicted that solitary thyroid nodule cases were high in females.⁹ Study conducted by Dorairajan and Jayashree, depicted that thyroid lesions were 4-9 times high in females than males.¹⁰ A study conducted by Gupta *et al.*, also showed solitary thyroid nodule cases 11 times more in females.¹¹ Similar to our study, a research conducted by Kamal *et al.*, showed the high frequency of female patients as 86.5%.¹² Another research was conducted to observe the role of FNAC in diagnosis of thyroid lesions where the ratio of female patients was also found to be high as compared to males.¹³

Similar to our study, a research conducted by Rizvi *et al.*, showed that cases diagnosed on FNAC turn out to be other findings on histopathological

findings.¹⁴ In another study, the cases not diagnosed on FNAC were examined by histopathological examination as a standard test.¹⁵

On comparative analysis of FNAC and histopathology, the sensitivity and specificity in our study was 66.66% and 100% respectively. The positive predictive value and negative predictive value of our study was found to be 100% and 91.66% respectively as shown in Table-III. A study was conducted in which thyroid nodules were evaluated in 100 patients. FNAC diagnosis depicted sensitivity of 76.5% and specificity 95.9%, positive predictive value was 86.7% and negative predictive value was 92.2%.¹⁶

A research was conducted to interpret solitary thyroid nodule based on novel pattern analysis. The study showed sensitivity of 66.7% and specificity of 98.9%. Positive predictive value and negative predictive value was 88.9% and 96% respectively. Results of the study depicted applicability and feasibility of pattern analysis in examining thyroid problems by FNAC.¹⁷

Benign to malignant ratio of our study is similar to another study conducted by Sengupta *et al.*, that highlighted FNAC as first line diagnostic tool but not as a substitute of histopathological examination.¹⁸ The study conducted by Venkatachalapathy *et al.*, also showed similar results.¹⁹

In our study a variation was observed between FNAC diagnosis and histopathological examination of solitary thyroid nodules. The benign to malignant variation among total of 42 cases was observed and it was similar to another study that depicted that FNAC showed both false positive and negative results, so the histopathological diagnosis is an essential tool to distinguish benign and malignant lesions.²⁰

CONCLUSION

FNAC is safe, simple and cost effective for diagnosis of thyroid lesions but in some cases results found are not accurate so for confirmation histopathological examination is performed. FNAC is considered as an important tool in identification of thyroid nodules but cases suspected of malignant nodules preoperatively needs to be confirmed by histopathological examination. Histopathological examination is considered as gold standard technique for confirmatory evaluation of any type of nodule.

Conflict of Interest: None.

Funding Source: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

Solitary Thyroid Nodule

ITC & KM: Data acquisition, data analysis, critical review, approval of the final version to be published.

UBA & AT: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

RQ & AY: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Nggada HA, Musa AB, Gali BM, Khalil M. Fine needle aspiration cytology of thyroid nodule (s): a Nigerian tertiary hospital experience. *Internet J Pathol* 2006; 5(1): 1-4.
2. Burch HB, Burman KD, Reed HI, Bukner L. Fine needle aspiration of thyroid nodules determinants of insufficiency rate and malignancy yield at thyroidectomy. *Am J Surg* 1996; 40(2): 1176-1183. <http://doi.org/10.1159/000333977>
3. Narayanakar RP, Shetty DSG. A study of correlation of pre-operative fine needle aspiration cytology and ultrasonography with postoperative histopathology in thyroid swellings. *Int Surg J* 2020; 7(1): 1456-1460. <http://doi.org/10.18203/2349-2902.isj20201851>
4. American Association of Clinical Endocrinologists and medical guidelines for clinical practice for the diagnosis and management of thyroid nodules. *Endocr Pract* 2006; 12(3): 63-102. <http://doi.org/10.4158/ep.12.1.63>
5. Gharib H, Goellner JR. Fine-needle aspiration biopsy. *Adv Anat Pathol* 2007; 14: 141-142.
6. Carr S, Viswanathan V, Hossain T, Uppal S, Chengot P, Woodhead CJ. How good are we at fine needle aspiration cytology. *J Laryngol Otol* 2010; 124(5): 765-766.
7. Gritzmann N, Koischwitz D, Rettenbacher T. Sonography of the thyroid and parathyroid glands. *Radio Clin North Am* 2000; 38: 1131-1145. [http://doi.org/10.1016/S0033-8389\(05\)70225-6](http://doi.org/10.1016/S0033-8389(05)70225-6)
8. Oertel YC. Fine-needle aspiration and the diagnosis of thyroid cancer. *Endocrinol. Metab. Clin. North Am.* 1996; 25(3): 69-91.
9. Bouvet M, Feldman JI, Nahum AM, Robbins KT, Gill GN, Dillmann WH, Russack V. Surgical management of the thyroid nodule: patient selection based on the results of fine-needle aspiration cytology. *Laryngoscope* 1992; 102(1): 1353-1356. <http://doi.org/10.1288/00005537-199212000-00008>
10. Dorairajan N, Jayashree N. Solitary nodule of the thyroid and the role of fine needle aspiration cytology in diagnosis. *J Indian Med Assoc* 1996; 94: 50-52.
11. Gupta M, Gupta S, Gupta VB. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodule. *J Thyroid Res* 2010; 20(2): 9. <http://doi.org/10.4061/2010/379051>
12. Kamal MM, Arjune DG, Kulkarni HR. Comparative study of fine needle aspiration and fine needle capillary sampling of thyroid lesions. *Acta Cytol* 2002; 46(4): 30-34.
13. Afroz N, Kayani N, Hasan SH. Role of fine needle aspiration cytology in the diagnosis of palpable thyroid lesions. *Indian J Pathol Microbiol* 2002; 45(1): 241-246.
14. Rizvi SA, Husain M, Khan S, Mohsin M. A comparative study of fine needle aspiration cytology versus non-aspiration technique in thyroid lesions. *Surg* 2005; 3(2): 273-276.
15. Hirachand S, Maharjan M, Lakhey M, Thapa R, Kafle S. Accuracy of fine needle aspiration cytology in diagnosis of thyroid swelling. *J Pathol Nepal* 2013; 3(2): 433-436.
16. Agarwal A, Mishra SK. Completion total thyroidectomy in the management of differentiated thyroid carcinoma. *ANZ J Surg* 1996; 66: 358-360. <http://doi.org/10.1111/j.1445-2197.1996.tb01210.x>
17. Lngegowda JB, Muddegowda PH, Rajesh KN, Ramkumar KR. Application of pattern analysis in fine needle aspiration of solitary nodule of thyroid. *J Cytol* 2010; 27: 1. <http://doi.org/10.4103/0970-9371.71862>
18. Sengupta A, Pal R, Kar S, Zaman FA, Sengupta S, Pal S. Fine needle aspiration cytology as the primary diagnostic tool in thyroid enlargement. *J Nat Sci Biol Med* 2011; 2(1): 113. <http://doi.org/10.4103/0976-9668.82308>
19. Venkatachalapathy TS, Sreeramulu PN, Krishna MR. A prospective study of clinical, sonological and pathological evaluation of thyroid nodule. *J Thyroid Disord* 2012; 1: 2. <http://doi.org/10.4172/2167-7948.1000109>
20. Islam MS, Siddiquee BH, Akhtar N, Salam KS, Aktaruzzaman M. Comparative study of FNAC and histopathology in the diagnosis of thyroid swelling. *Bangladesh J. Otorhinolaryngol.* 2010; 16(3): 35-43. <http://doi.org/10.3329/bjo.v16i1.5779>