OPEN ACCESS

ORIGINAL ARTICLE *Volume 14 (Issue 4), 2025*

PAKISTAN JOURNAL OF MEDICINE & DENTISTRY

Comparison Between Histopathology and Fine Needle Aspiration Cytology in the Case of Breast Lumps

Anam Malik[1], Naveed Islam[2], Abeer[3], Maliha Asif[4], Imrana Shaukat[2], Madiha Iqbal[5]

[1]Department of Histopathology, Nishtar Medical University, Multan, [2]Department of Pathology, Nishtar Medical University, Multan, [3]Department of Pathology, Services Institute of Medical Sciences / Services Hospital, Lahore, [4]Department of Haematology, Rahbar Medical & Dental College, Lahore, [5]Department of Histopathology, Fatima Jinnah Medical University, Lahore, Pakistan.

ABSTRACT

Background: To determine the diagnostic accuracy of fine needle aspiration cytology in cases of breast lump, taking histopathology as gold standard.

Methods: This study was a comparative, observational study conducted at Multan Institute of Nuclear Medicine and Radiotherapy (MINAR), at Nishtar Medical University, Multan, from January 2024 to December 2024. This study evaluated the diagnostic accuracy of fine needle aspiration cytology (FNAC) in comparison to histopathology for the diagnosis of breast lumps. The results of FNAC and histopathology were recorded and compared. The statistical calculation was done using SPSS24 version. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy of FNAC were calculated using histopathology as the gold standard.

Results: The study of 51 women (mean age 45.94 ± 9.58 years) found fibroadenoma and malignancy more frequent in patients >40 years (71.4% and 70.6%), while benign phyllodes tumors were evenly distributed (50% each); associations with age were not significant for histopathology ($\chi^2 = 1.1$, $p = 0.577$) or FNAC ($\chi^2 = 1.14$, $p = 0.563$). FNAC showed high diagnostic accuracy, correctly identifying all fibroadenoma and benign phyllodes cases, but misclassified 11.8% of malignant cases, emphasizing the need for histopathological confirmation. FNAC and histopathology findings were strongly associated ($p < 0.001$), with high concordance across all diagnoses.

Conclusion: FNAC is a reliable and fast diagnostic method for breast lumps. It has an 88.2% diagnostic accuracy for malignant and 100% for benign phyllodes. It is accurate with manageable complications. The procedure is outpatient-based, reducing hospital stays. Its quick turnaround makes it useful for early diagnosis.

Keywords: FNAC, Histopathology. Breast lump, Diagnostic accuracy, Sensitivity.

***Corresponding Author:** Anam Malik,

Email: anaaamalick@gmail.com

How to cite: Malik A, Islam N, Abeer, Asif M, Shaukat I, Iqbal M. Comparison between histopathology and fine needle aspiration cytology in the case of breast lumps. Pak J Med Dent. 2025 September;14(4): A-B. Doi: https://doi.org/10.36283/ziun-pjmd14-4/027.

Received: Tue, June 17, 2025 **Accepted:** Sun, September 28, 2025**. Published:** Mon, September 29, 2025

INTRODUCTION

Breast lumps are a common clinical finding in women and can arise from a variety of benign and malignant conditions. Globally, breast cancer is the most frequently diagnosed cancer among women, with over 2.3 million new cases reported in 2020[1]. In Pakistan, breast cancer accounts for a significant proportion of cancer diagnoses among women. In 2020, there were approximately 25,928 reported cases of breast cancer, representing 14.5% of all cancer types in the country[2]. Notably, Pakistan has one of the highest breast cancer incidence rates in Asia, with estimates suggesting that one in nine Pakistani women will be diagnosed with breast cancer during their lifetime[3]. This high incidence rate underscores the critical need for awareness, early detection, and effective treatment strategies in the region.

Fine needle aspiration cytology (FNAC) examines breast lumps with high suspicion of malignancy by extracting cellular material for cytopathology evaluation. FNAC is popular for its quick results, affordability, and patient satisfaction[4]. FNAC is useful in capturing the essence of the lesion, whether it is a primary malignancy or a benign pathology in a neoplastic lesion deserving treatment[5]. Nevertheless, its precision is contingent on various conditions, such as the quantity and quality of the sample, as well as the qualifications of the pathologist. Of the many benefits of FNAC, there are some limitations, especially in cases where the intricacies of the FNAC results require further investigation[6].

Histopathological examination, on the other hand, remains an essential investigation for breast lumps. It is associated with highly detailed cellular inspection, tumor grade, and receptor status in case of malignancy[7]. It is even possible to make target diagnoses based on tissue procurement by core needle biopsy or direct surgical excision of the tumor. Although histology is undoubtedly more accurate in diagnosing most things, it is less favorable than FNAC because it is more uncomfortable and lengthier. Thus, identifying the advantages and disadvantages of FNAC and Histopathology is essential for the diagnosis and treatment planning of breast lumps[8].

Different research has been carried out around the diagnostic accuracy of FNAC and histopathology, each having unique sensitivity and specificity measures. FNAC has demonstrated accuracy in the diagnosis of underlying malignant lesions; however, benign and malignant lesions do occur, and thus, a further histopathological exam is required for all suspicious cases. FNAC methods are more affordable and valuable when making tough decisions where resources do not permit advanced histopathology options[9,10].

This research aims to explore the level of agreement in diagnostic accuracy, sensitivity, specificity, and predictive values between FNAC and histopathology in patients with breast lumps. By studying cases of 'diagnostic' agreement and 'diagnostic' disagreement, this analysis aims to evaluate the accuracy of FNAC as a primary tool for diagnosis and its accuracy when juxtaposed with histopathological diagnosis. Ensure a high level of care and improvement in patient outcomes through appropriate solutions to diagnose and manage breast lump problems within patients, which will be the aim of this research.

METHODS

This study was a cross-sectional type of investigation done to find out the efficacy of fine needle aspiration cytology (FNAC) as compared with histopathology's accuracy level in diagnosing breast lumps. This was done in the Multan Institute of Nuclear Medicine and Radiotherapy (MINAR) at Nishtar Medical University, Multan. The study was conducted for a duration of 1 year, starting from January 2024 to December 2024. It was obtained from the Institutional Review Board (IRB). All participants were provided with a participant information sheet before their selection for the research. As such, no one's identity was disclosed at any point in the study.

The examination was limited to patients with palpable breast lumps who had undergone FNAC and histopathological examination as well. Females 18 years and older with clinically detectable breast lumps who provided consent for FNAC with subsequent diagnostic biopsy or histopathological examination were included. Patients were excluded if they had recurrent breast lumps, previous history of breast malignancy, or if FNAC was obtained and samples were inadequate or non-diagnostic.

The target capture was defined by the sensitivity levels of FNAC, which ranged from 96.6%, and the study's power requirements were set to 80%. A sample population size was further provided for non-diagnostic and inadequate biopsy specimens. A systematic sampling method was adopted, where every patient who met the inclusion criteria was selected until the required sample was reached.

Under a sterile environment, the procedure was carried out using a 22 to 25-gauge needle attached to a 10 mL syringe. The specimen was sucked out, then smeared on a glass slide, which was afterward air dried, fixed by soaking in 95% ethanol, and stained through conventional methods using Giemsa or Papanicolaou. The cytopathologist then looked over the FNAC slides and, through previously determined cytological standards, marked the specimens as benign, suspicious, or malignant.

Patients have undergone either a core needle biopsy or an excisional biopsy for histopathology examination. The breast tissue specimens were processed by embedding them in paraffin, sectioning, and staining to be examined by a histopathologist, who diagnosed the slides.

All the results from FNAC and histopathology were documented and analyzed for any differences. The sensitivity and specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy of FNAC were calculated with the aid of histopathology as a standard comparison. The statistical calculation was done using SPSS 24 version or other similar packages, 2x2 contingency table was designed to calculate sensitivity, specificity, and diagnostic accuracy.

RESULTS

Histopathology and fine needle aspiration cytology (FNAC) were used for diagnosis. FNAC diagnosed 28 cases (100%) as fibroadenoma, and histopathology confirmed all 28 cases, but 2 cases (11.8%) initially classified as fibroadenoma were later found to be malignant. FNAC correctly identified 15 cases (88.2%) as malignant, with all confirmed by histopathology. FNAC also diagnosed 6 cases (100%) as benign phyllodes, and all were confirmed by histopathology. The results suggest FNAC has high accuracy in detecting fibroadenoma and benign phyllodes but shows an 11.8% misclassification rate for malignancy, highlighting the need for histopathological confirmation in uncertain cases. The results showed a significant association ($p<0.001$) between FNAC and histopathology findings. All fibroadenoma cases detected by FNAC were confirmed by histopathology, while malignancy cases had high agreement (88.2%). Benign phyllodes tumors were accurately identified in all cases. (**Figure 1**).

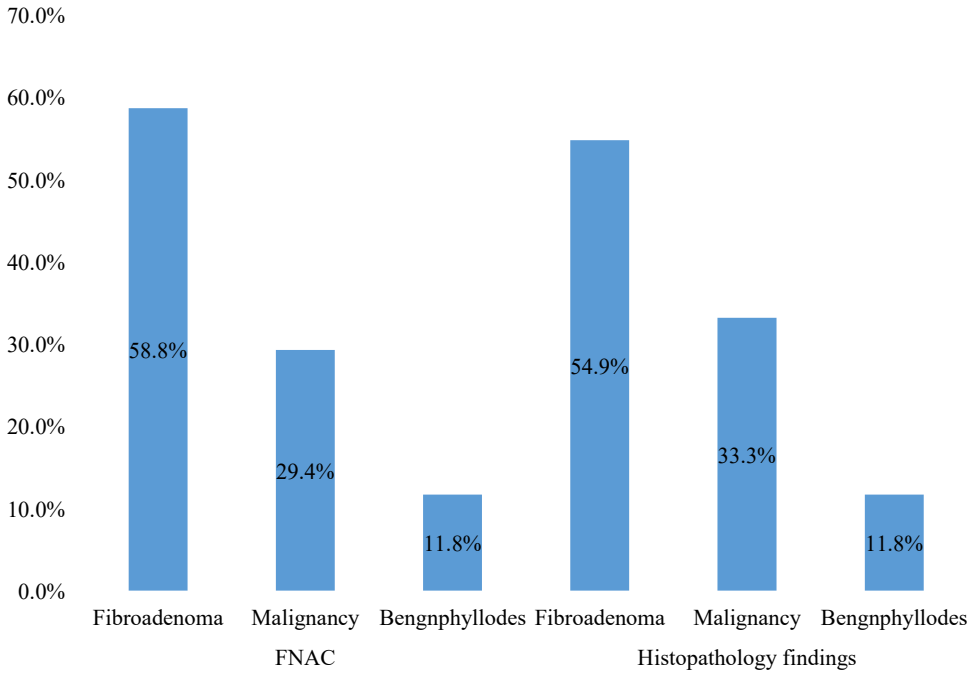

Figure 1: Presence of clinical examinations for histopathology and fine needle aspiration cytology

Table 1: Association of histopathology findings and patients' age groups

Age (years)	Histopathology findings			Test of sig.
	Fibroadenoma	Malignancy	Benign phyllodes	
≤40 years	8 (28.6)	5 (29.4)	3 (50.0)	χ^2=1.1, d.f=2, p<0.577
>40 years	20 (71.4)	12 (70.6)	3 (50.0)	
Total	28 (100.0)	17 (100.0)	6 (100.0)	

N (%) chi-square test of significance.

The study included 51 women with an average age of 45.94±9.58 years. The association between histopathology findings and patient age showed that fibroadenoma and malignancy were more frequently observed in patients above 40 years of age (71.4% and 70.6%, respectively), whereas benign phyllodes tumors were evenly distributed across both age groups (50.0% each). However, this difference was not statistically significant (χ^2 = 1.1, p = 0.577) (**Table 1**).

Table 2: Association of fine needle aspiration cytology and patients age groups

Age (years)	Fine needle aspiration cytology			Test of significance
	Fibroadenoma	Malignancy	Benign phyllodes	
≤40 years	9 (30.0)	4 (26.7)	3 (50.0)	χ^2=1.14, d.f=2, p<0.563
>40 years	21 (70.0)	11 (73.3)	3 (50.0)	
Total	30 (100.0)	15 (100.0)	6 (100.0)	

N (%) chi-square test of significance.

Similarly, the distribution of fine needle aspiration cytology (FNAC) findings across age groups revealed that fibroadenoma (70.0%) and malignancy (73.3%) were more common among patients aged >40 years, while benign phyllodes tumors remained equally distributed (50.0% in each group). No significant association was found between cytology results and age (χ^2 = 1.14, p = 0.563) (**Table 2**).

Table 3: Association of histopathology findings and fine needle aspiration cytology

FNAC	Histopathology findings			Test of significance
	Fibroadenoma	Malignancy	Benign phyllodes	
Fibroadenoma	28 (100.0%)	2 (11.8)	0 (0.0)	χ^2=93.0, d.f=4, p<0.001
Malignancy	0 (0.0)	15 (88.2)	0 (0.0)	
Benign phyllodes	0 (0.0)	0 (0.0)	6 (100.0)	
Total	28 (100.0)	17 (100.0)	6 (100.0)	

N (%) chi-square test of sig. FNAC=Fine Needle Aspiration Cytology

The FNAC findings showed a strong diagnostic concordance with histopathology: all fibroadenoma cases (100%) on FNAC were confirmed as fibroadenoma, 88.2% of FNAC-diagnosed malignancies were confirmed malignant, and all benign phyllodes tumors (100%) were accurately identified. This association was statistically significant (χ^2=93.0, d.f.=4, p<0.001) (**Table 3**).

DISCUSSION

Fine Needle Aspiration Cytology (FNAC) and histopathology are pivotal diagnostic tools in evaluating breast lumps. FNAC is minimally invasive, cost-effective, and provides rapid results, making it valuable for initial assessments[11,12]. Histopathology examines excised tissue and is considered the gold standard for definitive diagnosis.

Previous study reported a mean patient age of 39.33 years[13]. In an Indian study, also noted that the relatively early onset of breast cancer is a well-documented concern in India, and the findings of the present study further support this trend, highlighting younger age at diagnosis as a characteristic feature among our patients[14].

A study was conducted at the Federal Medical Centre Owo in Nigeria retrospectively analyzed 161 breast lump cases over five years to assess the efficacy of FNAC compared to histopathology[15]. The findings revealed that FNAC had a sensitivity of 99.4% and a specificity of 100%, accurately determining the final histologic diagnosis in 86.3% of cases. The study concluded that FNAC is a reliable diagnostic tool for breast lumps, offering the advantages of being fast, cost-effective, and reducing the need for open biopsies.

Another prospective study compared the FNAC and core needle biopsy (CNB) against final histopathological diagnoses in 42 patients with suspected breast cancer. The results indicated that FNAC had a sensitivity of 74.1%, specificity of 76.9%, and diagnostic accuracy of 75%[16]. In contrast, CNB demonstrated higher sensitivity (85.2%), specificity (92.8%), and diagnostic accuracy (87.8%). The combined assessment of FNAC and CNB yielded improved diagnostic accuracy (88.1%), suggesting that these techniques complement each other in the pathological evaluation of breast lesions.

In this study, FNAC diagnosed all 28 cases (100%) as fibroadenoma, and histopathology confirmed them. However, 2 cases (11.8%) were later found to be malignant. A similar study reported 5.6% benign breast disease, 64.2% fibroadenoma, and 7.5% suggestive of malignancy on FNAC[17]. Histopathology revealed 89.6% fibroadenoma, 3.6% fibrocystic disease, 3.8% duct ectasia, and 1.9% phyllodes.

This kind of study reported that on FNAC, 21.3% of cases were benign, 56.7% were fibroadenoma, 14.7% were suggestive of malignancy, and 7.3% were suspicious of malignancy[18]. Histopathology showed 74% fibroadenoma, 19.3% invasive ductal carcinoma, 2.7% phyllodes tumor, and 2.7% Paget's disease. Another study reported that 4% of benign lesions on FNAC were malignant on

histopathology[19]. The authors calculated the sensitivity and specificity of FNAC for breast lesions. FNAC sensitivity, the ability to correctly identify diseased cases, was 96.6%.

A study was conducted at Egypt to evaluate the efficacy of ultrasound-guided FNACs[20]. Similar to our study, they compared FNAC results with definitive histological outcomes. They also examined the role of core needle biopsy as a complementary tool for breast cancer diagnosis. The specificity of FNAC was 99.3%, and the sensitivity was 96.7%.

In this study, FNAC diagnosed all 28 cases (100%) of fibroadenoma correctly, which is higher than the 78.1% concordance for fibroadenoma sub-classification reported in a prospective study of 110 patients, where FNAC correctly sub classified 25/32 fibroadenoma cases[21].

The misclassification rate in this study (11.8% of fibroadenoma FNAC diagnoses later found malignant) is higher than another study which reported the false-negative rate of 7.6%, which had an overall diagnostic accuracy of FNAC of 94%[22].

In current study, FNAC malignant agreement rate of 88.2% is slightly lower than many recent series. A study compared the FNAC vs. histopathology in 124 breast tumor cases reported sensitivity of 97.7%, specificity of 89.1%, positive predictive value of 95.5% (for malignancy) and negative predictive value of 94.2%[23]. Other studies have shown similar high specificity and PPV for FNAC when diagnosing malignant lesions. In KVG Medical College (India), FNAC showed 100% specificity and PPV in malignant diagnoses, with sensitivity ~93.9%[24].

CONCLUSION

FNAC is a reliable and fast diagnostic method for breast lumps. It has an 88.2% diagnostic accuracy for malignant and 100% for benign phyllodes. It is accurate with manageable complications. The procedure is outpatient-based, reducing hospital stays. Its quick turnaround makes it useful for early diagnosis.

LIST OF ABBREVIATIONS

None

ACKNOWLEDGEMENT

None

FUNDING

None

CONFLICT OF INTEREST

None

ETHICAL APPROVAL

Ethical approval was obtained from the Institution Research Board (IRB) of Nishtar Medical University, Multan (Ref: 109/2023).

AUTHORS' CONTRIBUTION

All authors contributed equally as per ICMJE.

REFERENCES

1. Zaheer S, Yasmeen F. Historical trends in breast cancer presentation among women in Pakistan from join-point regression analysis. Pak J Med Sci. 2024 Jan-Feb;40(1Part-I):134-139. doi: 10.12669/pjms.40.1.7123
2. Hussain I, Majeed A, Masood I, Ashraf W, Imran I, Saeed H, et al. A national survey to assess breast cancer awareness among the female university students of Pakistan. PLoS One. 2022;17(1):e0262030. doi: 10.1371/journal.pone.0262030.
3. Menhas R, Umer S. Breast cancer among Pakistani women. Iran J Public Health. 2015 Apr;44(4):586-7. https://pmc.ncbi.nlm.nih.gov/articles/PMC4441973/ PMID: 26056679
4. Ali MT, Abdullah SN. Comparison of Fine Needle Aspiration and Core Needle Biopsy in Diagnosis of Granulomatous Mastitis Presenting with Breast Lump. Saudi J Pathol Microbiol. 2024;9(5):87-92. DOI: 10.36348/sjpm.2024.v09i05.003
5. Kulkarni SS, Murchite S, Patil A. A comparative study between fine needle aspiration cytology and core needle biopsy in the diagnosis of palpable breast lumps. J Surg Res. 2022;5(2):221-8. DOI: 10.26502/jsr.10020215
6. Verma P, Sharma R, Sharma N, Gulati A, Parashar A, Kaundal A. Fine-needle aspiration cytology versus core-needle biopsy for breast lesions: a dilemma of superiority between the two. Acta Cytologica. 2021 Sep 3;65(5):411-6. doi: 10.1159/000517005.
7. Ahmed I, Bharti S. Histological Correlation Of All Palpable Breast Lumps Using Fine Needle Aspiration Cytology. Innovative Journal of Medical and Healthcare Research. 2024:26-43. Doi: https://ijmhr.com/index.php/ijmhr/article/view/15
8. Reddy R, Prabhala S, Somalwar SB, Deshpande AK. Evaluation of Breast, Lymph Node, and Thyroid Fine Needle Aspiration Cytology by Liquid Based Smears and Conventional Smears. Journal of Experimental Pathology. 2024 Feb 7;4(1):34-44. doi: https://doi.org/10.33696/pathology.4.044
9. Taye E, Ali MM, Toma A, Teklehaimanot A. Comparison of Fine Needle Aspiration Cytology and Histopathology in the diagnosis of lymph node pathologies at health facilities

located in Hawassa: A 5-year retrospective study. SAGE Open Medicine. 2022 Dec;10:20503121221138324. doi: 10.1177/20503121221138324.

10. Agrawal N, Kothari K, Tummidi S, Sood P, Agnihotri M, Shah V. Fine-needle aspiration biopsy cytopathology of breast lesions using the International Academy of Cytology Yokohama System and rapid on-site evaluation: a single-institute experience. Acta Cytologica. 2021 Nov 4;65(6):463-77. DOI: 10.1159/000518375

11. Qadri S, Khan SP, Farooq S, Bhat AR. Cytomorphological pattern of breast lesions diagnosed on fine-needle aspiration cytology in a district hospital in Kashmir valley. Int J Adv Med. 2022 Jun 27;9(7):814-17. DOI: https://dx.doi.org/10.18203/2349-3933.ijam20221709

12. Pradhan M, Mandal A, Biswas BK, Hazra A, Kumar D. The role of fine-needle aspiration cytology in the evaluation of breast lumps. Cureus. 2024 Oct 3;16(10):e70748. doi: 10.7759/cureus.70748.

13. Jan Y, Hussain S, Waqas , Shah M, Din A, Khan A. Comparison of fine needle aspiration cytology (FNAC) and trucut biopsy in evaluation of suspicious palpable breast lesions. Rawal Med J. 2016;41(2):205-8. https://rmj.org.pk/fulltext/27-1453531563.pdf?1757760116

14. Dikshit R, Gupta PC, Ramasundarahettige C, Gajalakshmi V, Aleksandrowicz L, Badwe R, et al. Cancer mortality in India: a nationally representative survey. Lancet. 2012 May 12;379(9828):1807-16. DOI: 10.1016/S0140-6736(12)60358-4

15. Ibikunle DE, Omotayo JA, Ariyibi OO. Fine needle aspiration cytology of breast lumps with histopathologic correlation in Owo, Ondo State, Nigeria: a five-year review. Ghana Med J. 2017 Mar;51(1):1-5. doi: 10.4314/gmj.v51i1.1.

16. Tripathi K, Yadav R, Maurya SK. A comparative study between fine-needle aspiration cytology and core needle biopsy in diagnosing clinically palpable breast lumps. Cureus. 2022 Aug 5;14(8):e27709. doi: 10.7759/cureus.27709.

17. Hirachand S, Lakhey M, Akthar J, Ghimire R, Dhakhwan R. Comparison of FNAC and open biopsy in palpable breast lumps. Health Renaissance. 2010;7(1):9–12.

18. Kumar PSK, Mahesh GS. Clinical profile and correlation between FNAC and histopathology of breast lumps in a teaching hospital. Glob J Med Res 2014;14:2. https://globaljournals.org/GJMR_Volume14/3-Clinical-Profile-and-Correlation.pdf

19. Vishnu VK, Ashwini RK, Rajagopalan S. Comparison between histopathology and fine needle aspiration cytology in the case of breast lumps. Int Surg J 2019;6:4095-7. DOI: https://doi.org/10.18203/2349-2902.isj20195129

20. Abdel-Hadi M, Abdel-Hamid GF, Abdel-Razek N, Fawzy RK. Should fine-needle aspiration cytology be the first choice diagnostic modality for the assessment of all nonpalpable breast lesions? The experience of a breast cancer screening center in Alexandria, Egypt. Diagn Cytopathol. 2010;38(12):880–889. doi: 10.1002/dc.21305.

21. Shrestha R, Vaidya P, Adhikari M, Adhikari SV, Shrestha A. Role of FNAC in Breast Lump and its Histopathological Correlation. J Nepalgunj Med Coll. 2024;22(1):7-10. DOI: https://doi.org/10.3126/jngmc.v22i1.69700

22. Sharma AD, Ojha K, N NB. Diagnostic utility of fine-needle aspiration cytology (FNAC) and frozen section against histopathology in evaluating benign and malignant breast lesions. Cureus. 2024;16(1):e53108. DOI: 10.7759/cureus.53108

23. Mišković J, Zorić A, Radić Mišković H, Šoljić V. Diagnostic value of fine needle aspiration cytology for breast tumors. Acta Clin Croat. 2016;55(4):625-628. doi: 10.20471/acc.2016.55.04.13.

24. Bindu Rani KM, Shridevi SH, Jayalaxmi YK. Palpable breast lumps: a correlation of diagnostic accuracy between FNAC and histopathology. Trends Clin Med Sci. 2023;6(special issue 1):94-101. https://pisrt.org/psrpress/j/tcms/2023/special-issue/palpable-breast-lumps-a-correlation-of-diagnostic-accuracy-between-fnac-and-histopathology.pdf