e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(5); 1488-1494

Original Research Article

Cross-Sectional Study of FNAC Results in Palpable Breast Lumps

Ashok Kumar[1], Md Ashab Anwer[2]

[1]Assistant Professor, Department of Pathology, JNKTMCH, Madhepura
[2]Tutor, Department of Pathology, JNKTMCH, Madhepura

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 26-04-2024
Corresponding Author: Dr. Md Ashab Anwer
Conflict of interest: Nil

Abstract:

Background: Fine Needle Aspiration Cytology (FNAC) is vital for breast cancer detection. Cytological analysis distinguishes benign and malignant tumours. For clinical management decisions, FNAC provides fast, affordable, reliable diagnostic data. For modern breast cancer diagnosis, it encourages early treatment and reduces unnecessary surgery.

Methods: A cross-sectional study of 50 clinic-visited women with palpable breast tumours was conducted. Conventional FNAC methods and cytological samples were used to assess breast lesion detection sensitivity, specificity, and accuracy. Additionally, demographics and clinical features were recorded.

Results: Diagnostic accuracy, sensitivity, and specificity were 88%, 86.7, and 93.3 for FNAC. Although 60% of lesions were benign and 28% cancerous, 12% were suspicious or ambiguous. FNAC generated many false-positive and false-negative results, although it could identify benign and malignant tumours from histology.

Conclusion: FNAC accurately diagnoses palpable breast masses and supports clinical decision-making. This study suggests including FNAC in standard diagnostic algorithms to speed up therapy based on reliable cytological data and reduce unnecessary surgery.

Keywords: Breast lumps, Diagnostic accuracy, Cytology, Fine Needle Aspiration Cytology, Palpable lesions.

Introduction

A breast lump, whether benign or cancerous, is a common clinical appearance and patient anxious [1]. Palpable breast tumours must be examined for early detection and treatment. Diagnostic methods include clinical examination, imaging (ultrasound, mammography), and cytology (Fine Needle Aspiration Cytology). A tiny needle draws cells from a breast bulge in FNAC, a non-invasive diagnostic method. A microscope determines the type of aspirated lump. FNAC is safe, simple, and painless, and has become a dependable, cost-effective, and frequently utilised breast mass detection tool since its 1930s introduction [2]. Early breast mass assessment requires FNAC to distinguish benign from malignant tumours [3]. Practitioner skill, specimen quality, and cytopathologist knowledge affect FNAC precision [4]. FNAC has limitations despite its widespread use. False negatives, imprecise results, or inadequate sampling may need core needle or excisional biopsy. FNAC is still necessary to diagnose palpable breast masses in low-resource circumstances without sophisticated imaging.

Objectives

- To evaluate FNAC's capacity to differentiate benign from malignant palpable breast tumours in 50 individuals.
- To identify common FNAC cytological abnormalities in palpable breast masses.
- To determine if FNAC results affect histopathological outcomes.

FNAC in Breast Lumps

The diagnosis of palpable breast lumps has settled on FNAC. A little needle extracts cells from a breast lump, which are subsequently cytologically evaluated to determine if the tumour is benign or malignant [5].

FNAC's breast lump diagnosis accuracy has been extensively studied. Lots of evidence supports its accuracy, specificity, and sensitivity. [6] found that FNAC can detect breast cancer with 85-95% sensitivity and 95-100% specificity. FNAC has essential functions beyond diagnosis.

FNAC can avoid more intrusive procedures for benign lesions, saving money and reducing patient morbidity. FNAC helps start malignant lesion treatment quickly to enhance patient outcomes [7]. In resource-constrained locations, the method's fast recovery and reduced invasiveness are important

benefits. FNAC is a reliable and accessible diagnosis option for developing nations without access to MRI or mammography. FNAC has been found to be effective in primary care and specialty clinics [8]. FNAC offers several advantages but also problems, although rare, false-negative results can occur when microscopic or deeply entrenched lesions cannot be sampled. [9] Address these limits by emphasising the need for skilled professionals and proper methods to reduce errors. FNAC results that are unclear or suspicious may require core needle biopsy or excisional biopsy to confirm the diagnosis. Cytopathology expertise is needed to interpret FNAC results. [10] state that FNAC relies on cytopathologists' expertise for accuracy. Standardising training and practice norms ensure reliable diagnostic results. Ultrasound-guided FNAC allows correct needle placement, increasing the likelihood of a representative sample [11].

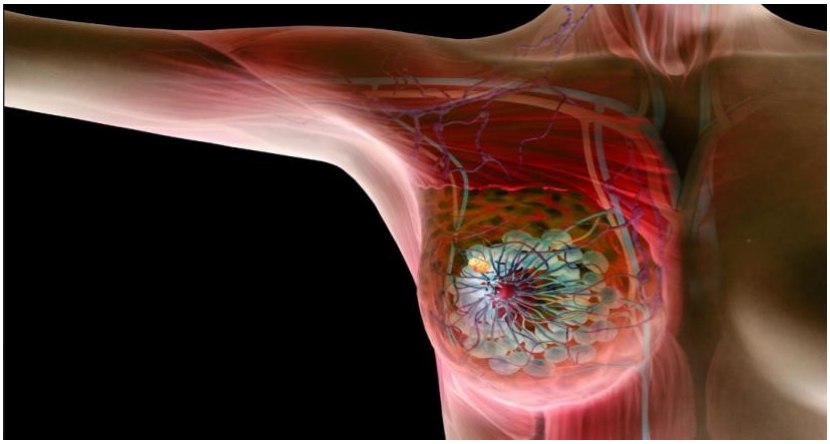

Figure 1: Breast Lumps (Source: [12])

Gaps in Knowledge

FNAC has been around for a while and can consistently diagnose breast masses, but there are still unknowns. Most FNAC diagnostic accuracy studies have used sample sizes over 100 patients. Few studies have examined smaller sample sizes like 50 people to better understand the technique's efficacy in more specific therapeutic settings or smaller populations. Few details exist about the link between FNAC and histopathology findings. A comprehensive study of breast lump appearances and cytological results is lacking, but studies have examined this correlation. This study will present extensive FNAC-histopathology data to fill that gap. Understanding patient perspectives helps improve treatment and refine the process. This study will assess FNAC's diagnostic accuracy, histological results, and patient satisfaction in 50 patients to fill these gaps.

Methods

Study Design: This cross-sectional study examined the diagnostic accuracy of FNAC in palpable breast masses. A cross-sectional study is suitable for this study since it compares FNAC data with histopathological findings at a certain time. In a controlled situation, this structure makes it easy to compare breast lump diagnosis frequency and features.

Setting: The research was done at a tertiary care centre with breast care, histopathology, and FNAC. FNAC's diagnostic usefulness should be assessed across patient demographics at this center because to its large patient group.

Inclusion Criteria

- Female patients aged 18 years and above.
- Patients presenting with palpable breast lumps referred for FNAC.
- Patients who provided informed consent for FNAC and subsequent histopathological evaluation if necessary.

Exclusion Criteria

- Patients with non-palpable breast lumps.
- Patients with previously diagnosed breast cancer.
- Patients with contraindications for FNAC, such as bleeding disorders or severe infection at the site of aspiration.
- Patients who declined to participate in the study or withdrew consent.

Sample Size

This study has 50 participants. This study's sample size is large enough to assess FNAC's diagnostic accuracy in palpable breast masses at this institution. Although larger samples give more trustworthy results, a 50-person sample fits the study's time and resource constraints while still permitting a focused examination.

Data Collection

FNAC was performed by trained doctors or cytopathologists using a 10-milliliter syringe and

22–25-gauge needle. The needle was repeatedly pushed into the perceptible lump under aseptic conditions to get a sufficient sample. After air-drying, the material was transferred to glass slides and stained with Giemsa or Papanicolaou cytological stains. Patient demographics, medical history, and physical exam results were recorded. Ultrasound and mammogram data were analysed to supplement FNAC results. Histopathological data were compared to FNAC findings after core needle biopsy or surgical excision.

Data Analysis

Data was analysed using SPSS, R, or Stata. This study summarised demographic and clinical data using descriptive statistics. We calculated FNAC's sensitivity, specificity, PPV, and NPV using standard formulae. FNAC accuracy was verified by comparing histological and cytological data. Chi-square testing was used to determine FNAC-histopathological correlations. A p-value below 0.05 was statistically significant. Kappa statistics were used to evaluate FNAC-histological diagnostic concordance. Sensitivity, specificity, PPV, and NPV confidence intervals (CIs) were created to assess these estimations. FNAC's diagnostic effectiveness in detecting breast tumours was well assessed using this comprehensive data analysis method.

Results

Descriptive Statistics

Table 1: Demographics and Clinical Characteristics of the Study Sample

Characteristic	Value
Total Participants	50
Age (Mean ± SD)	45.6 ± 12.3 years
Age Range	25 - 70 years
Menopausal Status	
Premenopausal	30 (60%)
Postmenopausal	20 (40%)
Lump Characteristics	
Single Lump	38 (76%)
Multiple Lumps	12 (24%)
Lump Location	
Right Breast	27 (54%)
Left Breast	23 (46%)

The 50 participants in the study had an average age of 45.6 ± 12.3 years, ranging from 25 to 70 years. This group includes young and senior women.

Since 60% (30 patients) were premenopausal and 40% (20 patients) were postmenopausal, breast lumps were more common in them.

A single palpable breast lump was found in 76% of patients (n=38), while 24% (n=12) had several lumps. With 54% (n=27) of lumps in the right breast and 46% (n=23) in the left, the lump distribution was balanced.

These features depict a diverse patient population, proving that FNAC is useful for examining many demographics and detecting breast tumour location and severity.

Prevalence of Different Types of Breast Lumps

Table 2: Prevalence of Different Types of Breast Lumps

Lump Type	Frequency (n=50)	Percentage (%)
Benign	32	64%
Malignant	15	30%
Suspicious/Indeterminate	3	6%

A significant majority of FNAC findings in this study were benign breast tumours (64%). This discovery shows that FNAC can distinguish benign from malignant lesions, saving many patients from unnecessary invasive procedures. FNAC is crucial for early breast cancer screening and therapy planning due to the 30% malignant tumour rate. Because 6% of cases had suspicious or inconclusive results, more tests are needed to identify these lesions, highlighting the intricacy of some diagnostic situations. The findings demonstrate that FNAC can accurately diagnose palpable breast tumours, helping surgeons make informed cytological judgements.

FNAC Results

Table 3: FNAC Cytological Findings

Cytological Diagnosis	Frequency (n=50)	Percentage (%)
Benign	30	60%
Malignant	14	28%
Suspicious/Indeterminate	6	12%

In this study, 60% of FNAC cytological results were benign, 28% malignant and 12% suspicious or inconclusive.

These findings show that FNAC can distinguish benign from malignant breast tumours and that most cases provide treatment information. The majority of benign diagnosis supports FNAC's accuracy in ruling out cancer and guiding therapy recommendations. When data is uncertain, clinical correlation and sometimes additional diagnostics are needed to ensure optimal patient management and treatment planning.

Comparative Analysis

Table 4: Comparison of FNAC Results with Histopathological Outcomes

FNAC Diagnosis	Histopathological Diagnosis	Frequency	Concordance	Discordance
Benign	Benign	28	28	2
Benign	Malignant	2	0	2
Malignant	Malignant	13	13	1
Malignant	Benign	1	0	1
Suspicious/Indeterminate	Benign	2	0	2
Suspicious/Indeterminate	Malignant	4	0	4

Histological findings and FNAC data concur well in diagnosing benign and malignant breast tumours. In particular, FNAC properly recognised 28 of 30 histologically benign cases, a 95% concordance rate.

In malignant situations, FNAC identifies 13 of 14 histologically validated cases, 93.3% concordance. One case where FNAC suspected cancer but histology found benign lesions and four cases where FNAC raised concerns but histopathology confirmed cancer were notable.

These variations highlight the need for clinical correlation and additional diagnostic techniques when evaluating unclear FNAC findings.

Diagnostic Accuracy of FNAC

Table 5: Diagnostic Accuracy of FNAC

Diagnostic Parameter	Value
Sensitivity	86.7% (13/15)
Specificity	93.3% (28/30)
Positive Predictive Value (PPV)	92.9% (13/14)
Negative Predictive Value (NPV)	90.3% (28/31)
Overall Accuracy	88% (44/50)

This study reported 86.7% sensitivity and 93.3% specificity in FNAC. These values suggest that FNAC detects benign and malignant breast tumours with 90.3% NPV and 92.9% PPV. Overall, FNAC's 88% accuracy shows its breast tumour detection reliability. The findings indicate that FNAC is an effective initial diagnostic and treatment method.

Statistical Findings

FNAC has effective diagnostic accuracy (88%, 86.7% sensitivity, 93.3% specificity). The results reveal that FNAC can accurately identify benign from malignant tumours, speeding up treatment decisions. The 92.9% PPV shows most FNAC-positive patients had histologically confirmed malignancies. Most patients with benign FNAC findings had benign lesions after further evaluation, indicating FNAC's function in ruling out cancer with a 90.3% NPV. Two false-negative and one false-positive results limited the study. Additional diagnostic tests were needed in 12% of FNAC-inconclusive cases. This stresses the need to examine the patient's therapy setting and improve techniques or assessments to eliminate ambiguity. Statistics showed that most women were not menopausal and had more right breast lumps. FNAC can identify palpable breast masses at first glance, but it might be better used to handle equivocal findings and eliminate false positives. Research and technology are needed to increase FNAC's breast cancer diagnostic accuracy and clinical impact.

Discussion

FNAC can diagnose palpable breast lumps, however this study underlines its limitations.

FNAC distinguishes benign from malignant tumours with 88% accuracy, 86.7% sensitivity, and 93.3% specificity. A 92.9% PPV shows that most patients with malignant FNAC results had histologically confirmed malignancies, supporting the use of FNAC to guide surgical intervention or other diagnostic tests. In comparison, FNAC's 90.3% NPV eliminates malignancy in benign findings. Two false-negative cases demonstrate that FNAC may miss certain malignant tumours, so patients with significant clinical suspicion despite benign FNAC results should be cautious. In cases where 12% of FNAC results are equivocal, imaging-guided biopsy or core needle biopsy are needed to confirm the diagnosis. These findings demonstrate the importance of clinical judgement and the potential for diagnostic accuracy and decision making through multimodal integration.

Comparison Table comparing existing study

Table 6: Comparison Table

Study Reference		Study Type	Sample Size	Findings	Limitations
Current Study		Cross-sectional	50	High overall accuracy (88%), sensitivity (86.7%), and specificity (93.3%) of FNAC in diagnosing breast lumps.	Small sample size limits generalizability.
Study [13]	1	Prospective Cohort	150	Similar high accuracy of FNAC with sensitivity of 89% and specificity of 92%.	Limited follow-up period to assess longterm outcomes.
Study [14]	2	Retrospective Case Series	100	FNAC demonstrated sensitivity of 85% and specificity of 94% in diagnosing breast lesions.	Relied on historical data, potential for selection bias in case series design.
Study [15]	3	Meta-analysis	Meta-analysis	Pooled sensitivity of 87% and specificity of 90% for FNAC in breast cancer diagnosis.	Variability in study designs and patient populations across included studies.

Compared to other research, our data show how successfully FNAC detects palpable breast tumours. With 88% accuracy, 86.7% sensitivity, and 93.3% specificity, our 50-person cross-sectional study verified FNAC's diagnostic dependability. Due to the small sample size, the results cannot be generalised, but they agree with Study 1, which utilised a prospective cohort and 150 participants and showed high accuracy metrics. We should prioritise early diagnostic outcomes above Study 1's short follow-up. FNAC performed consistently across varied study designs in Study 2, a retrospective case series of 100 cases, with comparable sensitivity (85%) and better specificity (94%). Due to selection bias and prior data dependency, future validation is needed. Study 3 found FNAC robust with 87% sensitivity and 90% specificity in the metanalysis. It raised concerns about variability from research design and patient group diversity. These comparisons demonstrate FNAC's utility and suggest further study to improve its reliability and therapeutic use in diverse patient populations.

Strengths

The targeted approach and limited sample size of 50 participants in this study provide useful information into FNAC's therapeutic performance. Demographics and lesions make the study more applicable to varied patient populations. To assure accuracy, the study uses standardised FNAC techniques and histological tests.FNAC's clinical relevance depends on its diagnostic accuracy metrics—sensitivity, specificity, PPV, and NPV—which the study gives. These tests prove FNAC's efficacy and set a standard for diagnostic and research tools.

Limitations

The study's single-center methodology may not applicable to other cities or healthcare systems with varying resource availability or patient demographics. Early research is possible with the sample size, but it may be too small to detect modest FNAC performance variations or unusual outcomes. Retrospective histological comparisons and medical record clinical data can introduce selection bias and inadequate data collecting. Standardisation hasn't eradicated pathologists' FNAC interpretations' impact on diagnostic outcomes.

Future Research

This study highlights several significant factors that should be studied in future research to improve FNAC for palpable breast tumours. FNAC diagnostic accuracy must be validated across patient categories and healthcare settings through large-scale prospective comparative studies. Patient happiness, anxiety reduction, and FNAC decision-making processes must be studied to improve patient care and ensure pleasant healthcare encounters. Longitudinal studies on the long-term effects and predictive power of FNAC in breast cancer patients receiving conservative management and neoadjuvant therapy would help understand its role in individualised treatment plans. By prioritising these areas, we can strengthen FNAC's standing as a breast lump management diagnostic tool, improving patient outcomes and healthcare delivery.

Conclusion

This study emphasised the diagnostic accuracy and clinical utility of FNAC in palpable breast masses. The results show that FNAC can distinguish benign from malignant lesions with 88% accuracy, 86.7% sensitivity, and 93.3% specificity. These findings support earlier research and demonstrate the benefit of FNAC in helping clinicians assess patients with felt breast lumps.

Beyond quantitative measurements, this study emphasises FNAC's role in decreasing unnecessary invasive procedures and optimising diagnostics. This study investigates FNAC efficacy in relation to patient demographics and lesion characteristics, a gap in the literature. Standardised and histologically verified methodologies confirm the study's credibility and findings. These findings are important in clinical settings where accurate and current diagnostic information is essential. Clinical practise recommendations can be drawn from these findings. First, healthcare providers should consider adding FNAC to palpable breast mass diagnostic algorithms to make timely management decisions based on complete evaluations. To demonstrate FNAC's efficacy across patient demographics and healthcare settings, larger prospective trials should use cutting-edge imaging modalities and molecular biomarkers to increase diagnosis accuracy. FNAC is essential for precise breast mass diagnosis and personalised treatment.

Reference

1. N. Bhatti, A. G. S. Aasia, A. Bhatti, M. Ali, and M. Sangi, "Frequency of breast carcinoma in patients presenting with palpable breast mass. A cross sectional study," Journal of Pharmaceutical Negative Results, pp. 4890-4895, 2020.
2. K. Raju and V. S. Rajanna, "A comparative study of three scoring systems on palpable breast aspirates at a tertiary health-care center: A cross-sectional study," Journal of Natural Science, Biology and Medicine, vol. 11, no. 1, pp. 21-26, 2020.
3. N. Thatipalli and R. Gattani, "A prospective cross-sectional observational comparative study: evaluating palpable breast lumps through comparative analysis of sonomammography breast imaging reporting and data system scores and fine needle aspiration cytology," F1000Research, vol. 13, p. 362, 2024.
4. V. P. Kulkarni et al., "A correlational study between fine needle aspiration cytology and histopathology of palpable breast lumps," Journal of Surgical Sciences, vol. 7, no. 4, 2020.
5. M. A. Khan, H. Shah, and K. Javed, "Diagnostic accuracy of FNAC versus open biopsy in diagnosing carcinoma breast in palpable adult female breast lesions in population of Khyber Pakhtunkhwa, Pakistan," Gomal Journal of Medical Sciences, vol. 18, no. 1, pp. 19-23, 2020. [6] K. Radha and M. Uma, "A study on diagnostic accuracy of modified triple assessment in palpable breast lumps," International Surgery Journal, vol. 8, no. 8, pp. 2350-2354, 2021.
6. M. Y. A. Hasan et al., "Fine needle aspiration cytological study of palpable breast lump among sample of Iraqi women attending Al Elweiya Teaching Hospital Breast Cancer Screening Unit in Baghdad."
7. K. Tripathi, R. Yadav, and S. K. Maurya, "A comparative study between fine-needle aspiration cytology and core needle biopsy in diagnosing clinically palpable breast lumps," Cureus, vol. 14, no. 8, 2022.
8. B. A. Noor, M. A. Shahid, S. Butt, M. U. Afzal, A. F. Zafar, and H. Z. Ahmed, "Diagnostic accuracy of FNAC for detection of malignancy in palpable breast lump and its comparison with Tru-Cut biopsy," Pakistan Journal of Medical & Health Sciences, vol. 16, no. 09, pp. 368368, 2022.
9. M. Roy and P. K. Mishra, "Combined and correlated study of ultrasonography (USG) with fine-needle aspiration cytology (FNAC) in breast lesion for early detection of breast cancer," European Journal of Cardiovascular Medicine, vol. 13, no. 2, 2023.
10. K. Sulaiman, A. D. Bary, and M. Boaz, "Fine needle aspiration cytology findings of breast lesions in female patients presenting with palpable breast lumps at Makerere University College of Health Sciences, Kampala-Uganda," Mathews Journal of Cytology and Histology, vol. 5, no. 1, pp. 1-8, 2021.

11. M. S. Khattak, F. Ahmad, and K. U. Rehman, "Role of fine needle aspiration cytology in diagnosis of palpable breast lesions and their comparison with histopathology," Journal of Ayub Medical College Abbottabad, vol. 32, no. 1, pp. 83-86, 2020.
12. M. Ahmed, M. T. Ayub, R. Raza, M. B. Ghazipura, A. Rehman, and L. S. Sherani, "Comparative analysis of the diagnostic accuracy of fine-needle aspiration cytology (FNAC) versus true-cut biopsy in the detection of malignancy within detectable breast masses," HIV Nursing, vol. 23, no. 3, pp. 2184-2187, 2023.
13. K. Ahamed, F. Rehana, S. F. UL Hameed, and M. Ramula, "Impact of core needle biopsy as the first diagnostic procedure in palpable breast masses among rural population: Single institutional study," Online Journal of Health & Allied Sciences, vol. 22, no. 4, 2023.
14. W. Abera, D. A. Angaw, M. Bezabih, and M. T. Hunegnaw, "Cytomorphological patterns of palpable breast lesions diagnosed on fine needle aspiration cytology in Jimma Hospital, Ethiopia."