

Cytomorphological Analysis of Breast Lesions: Evaluating FNAC as a Diagnostic Tool in Female Patients at a Tertiary Care Center

Shagufta Chowdhary¹, Shivani Panhotra², Kulbhushan Badyal³

¹Senior Resident, Department of Pathology, G.M.C. Rajouri, Jammu & Kashmir, India

²Assistant Professor, Department of Pathology, G.M.C. Rajouri, Jammu & Kashmir, India

³Consultant, Department of Medicine, G.M.C. Rajouri, Jammu & Kashmir, India

Received: 25-01-2024 / Revised: 23-02-2024 / Accepted: 18-03-2024

Corresponding Author: Dr. Shivani Panhotra

Conflict of interest: Nil

Abstract:

Background: Breast cancer is a leading global health issue, particularly affecting women. Fine Needle Aspiration Cytology (FNAC) offers a less invasive, cost-effective, and efficient method for evaluating breast lesions and distinguishing between benign and malignant conditions, playing a crucial role in early detection and management.

Methods: A retrospective analysis was conducted over one year at the Department of Pathology, Government Medical College, Rajouri, Jammu & Kashmir. Fifty female patients who underwent FNAC were included, with data collected on clinical history, examination, and FNAC findings, categorized according to the Yokohama system. The sensitivity and specificity of FNAC in the diagnosis of breast lesions were a focal point of the study.

Results: Of the 50 cases, 66% were benign, 8% atypical probably benign, 6% suspicious for malignancy, and 20% malignant. Fibroadenoma constituted the largest fraction (38%) of benign lesions. The age of patients ranged from 11 to 70 years, with a mean age of 36.15 years. The majority were aged between 21-30 years. Clinical presentations varied, with 20% reporting breast pain and 10% presenting with nipple discharge.

Conclusion: FNAC is a valuable diagnostic tool in breast lesion evaluation, with a high rate of benign findings and the most common benign lesion being fibroadenoma.

Recommendation: FNAC should continue to be utilized as part of a multidisciplinary approach in breast lesion assessment, particularly in resource-limited settings, with a recommendation for additional training for cytopathologists to further improve diagnostic accuracy.

Keywords: Breast Cancer, FNAC, Cytomorphological Patterns, Diagnostic Efficacy.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Breast cancer stands as a predominant health challenge globally, especially affecting women. The advent of Fine Needle Aspiration Cytology (FNAC) has significantly bolstered the diagnostic landscape, offering a minimally invasive, economical, and swift approach to the assessment of breast lesions. This technique entails the extraction of cells from breast lesions through a fine needle, which is then subjected to cytological analysis to differentiate between benign and malignant conditions. The proficiency of FNAC in diagnosing breast cancer has been extensively debated and researched within the medical fraternity [1,2].

A plethora of studies have shed light on the high sensitivity and specificity of FNAC, advocating its potential as a premier diagnostic utility in clinical settings. A noteworthy investigation at a tertiary care facility confirmed FNAC's efficacy in diagnosing breast lesions accurately, revealing a

substantial agreement between cytological and histopathological evaluations. This underscores FNAC's vital role in the prompt diagnosis and suitable treatment of breast lesions, enhancing patient outcomes consequently [3,4].

FNAC proves effective not only in identifying malignant lesions but also in evaluating benign breast diseases, which represent a considerable fraction of breast lesions in females. It is noted for its ability to effectively discern between benign and malignant lesions, thereby curtailing the necessity for more invasive procedures like core needle biopsy or surgical excision in benign cases. This feature is exceptionally beneficial in regions with limited access to sophisticated diagnostic tools [5].

Nonetheless, the accuracy of FNAC significantly hinges on the cytopathologist's expertise and the adequacy of the aspirate, influenced by the lesion's nature and the aspiration technique. Though

instances of false negatives and positives are uncommon, they do pose potential impacts on breast lesion management. Hence, FNAC should be viewed as part of a comprehensive multidisciplinary approach, incorporating clinical examination, imaging, and, when required, histopathological verification [6].

In summation, FNAC emerges as an invaluable diagnostic medium in the cytomorphological analysis of breast lesions, striking a harmonious balance between diagnostic precision and non-invasiveness. Its pivotal role in the early detection and management of breast cancer, along with its utility in distinguishing between benign and malignant lesions, renders it an essential asset for healthcare providers in tertiary care environments [7].

Breast carcinoma is acknowledged as a leading malignancy among females globally, primarily contributing to cancer-related morbidity and mortality in women, especially in developing nations. However, advancements in early diagnosis and treatment techniques have led to a reduction in cancer-related deaths in developed countries. India reports an incidence rate of 26 per 100,000 women population and a mortality rate of 13 per 100,000 women population [8].

FNAC is celebrated for its simplicity, cost-effectiveness, and minimal discomfort, applicable for both palpable and impalpable (under ultrasonographic guidance) breast lesions in outpatient settings. The diagnostic precision of FNAC, as evaluated in a study by Meddegowda et al., showcased a high accuracy rate (97%), with specificity (98%) and sensitivity (94%). In contrast, core needle biopsy is increasingly preferred for its enhanced evaluation of histological grade alongside hormonal status. Innovations such as Rapid On-Site Evaluation (ROSE) and radiological assessments have diminished the frequency of FNAC usage [9,10].

The investigation of breast masses now often includes a 'triple assessment,' comprising clinical examination, imaging, and mammography. This integrated approach has shown that the sensitivity and specificity of FNAC are on par with core needle biopsy.

Hence, a study was initiated to explore the prevalence of various lesions in females with palpable breast lesions and to ascertain the role of FNAC in their diagnosis, highlighting its continued relevance and efficacy in contemporary diagnostic processes.

Materials and Methods

The study, titled was designed as a retrospective analysis. It spanned one year, from January 2022 to January 2023, and was conducted at the

Department of Pathology, Government Medical College, Rajouri, Jammu & Kashmir. Before its initiation, the study received ethical approval from the Institutional Ethics Committee (IEC). Informed consent was obtained from all participants, ensuring ethical adherence and respect for patient confidentiality.

Participants in this study comprised 50 female patients who underwent Fine Needle Aspiration Cytology (FNAC) for breast lesions at the aforementioned medical institution. These patients were selected based on the availability of complete clinical data and cytological material for analysis. Clinical data, including age, sex, family history, and immunocompromised status, were meticulously gathered from the department's records. This comprehensive data collection aimed to ensure a thorough understanding of each patient's background and potential risk factors associated with breast lesions.

The study meticulously categorized all FNAC specimens into five distinct categories, adhering to the Yokohama system for breast reporting. These categories included inadequate, benign, atypical, suspicious, and malignant, allowing for a nuanced analysis of the cytological patterns observed. All smears were stained using the May Grunwald Giemsa (MGG) stain, a technique renowned for its efficacy in highlighting cytomorphological features, and were retrieved from the cytopathology section of the department.

The primary aim was to elucidate the cytomorphological patterns of breast lesions in the studied cohort and evaluate the diagnostic utility of FNAC in this context. To minimize bias, the study ensured that all participants were selected based on predefined criteria, including the completeness of clinical data and the availability of cytological samples. Variables such as age, sex, family history, and immunocompromised status were carefully considered to assess their potential impact on the study outcomes.

Data collection encompassed a detailed history, clinical examination, and review of cytological findings from FNAC procedures. This comprehensive approach facilitated a robust analysis of the participants' cytomorphological patterns of breast lesions.

Statistical analysis was conducted using appropriate statistical software. Descriptive statistics were employed to summarize the demographic characteristics of the study population and the distribution of cytomorphological patterns. The correlation between clinical findings and cytological outcomes was assessed to establish the diagnostic utility of FNAC. The statistical methods chosen aimed to provide a clear understanding of

the patterns and efficacy of FNAC in diagnosing breast lesions in a tertiary care setting.

Results

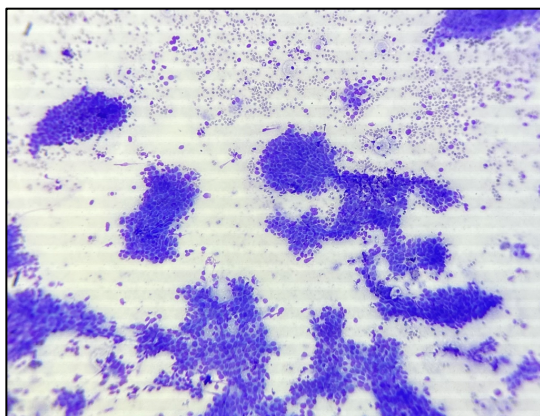
In the study conducted 50 female breast lump aspirates were evaluated. The cytomorphological spectrum revealed 66% (33 cases) benign, 8% (4 cases) atypical probably benign, 6% (3 cases) suspicious for malignancy, and 20% (10 cases) malignant. Notably, within the benign category, inflammatory breast lesions accounted for 8%, with the remainder being other benign lesions. The cases were not inclusive of inadequate or insufficient samples. Acute mastitis was the most prevalent among the inflammatory lesions, followed by tubercular or granulomatous mastitis. Within benign lesions, fibroadenoma was the most frequent, making up 38% (19 cases) of all lesions assessed.

The patients were between 11 and 70 years old, with an average age of 36 years. Most patients were between 21 and 30 years old. Cancer was found in patients aged 31 to 70, with an average age of 38 years. The above 50 age group had the most cancer cases, followed by 41- 50 and then the 31-40 age group. Patients with fibroadenoma were aged 11 to

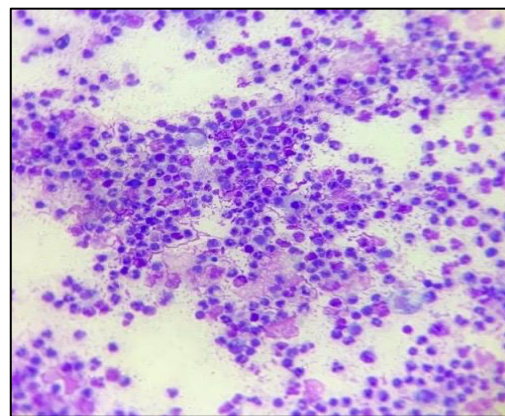
50 years, while those with acute mastitis were mainly between 31 and 40 years old. Granulomatous mastitis was also most common in the 31-40 age group. Conditions like lipoma, galactocele, and fibrocystic disease were mostly found in the 21-30 age group.

Clinical presentations included palpable breast lump, breast pain, nipple discharge, or retraction. Of those presenting with palpable breast lesions, 20% (10 cases) reported breast pain, and 10% (5 cases) had nipple discharge. Axillary lymphadenopathy, nipple retraction, and peau d'orange appearance were other clinical presentations observed, accounting for 6% (3 cases), 4% (2 cases), and 4% (2 cases), respectively.

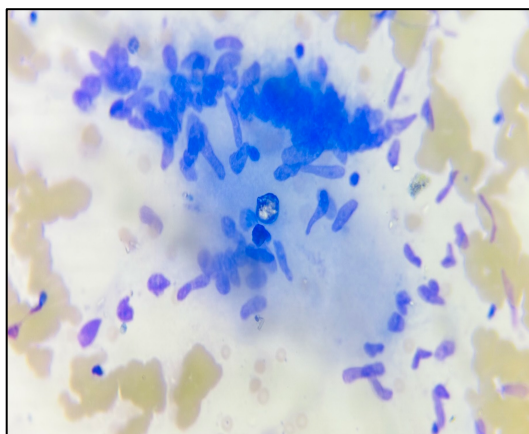
The distribution of the cytomorphological findings along with the patient age and clinical presentations can be found in Table 1, which details the age-specific distribution of breast lesions, and Table 2, which enumerates the lesions according to cytological diagnosis. These tables illustrate the range and frequency of breast lesions in the studied demographic, providing valuable insights into the cytomorphological patterns observed.



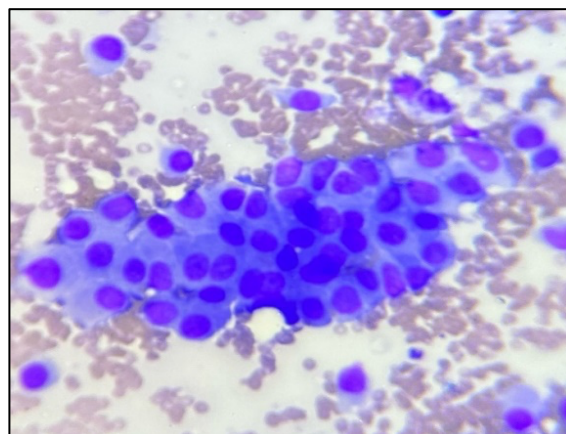
A. Fibroadenoma



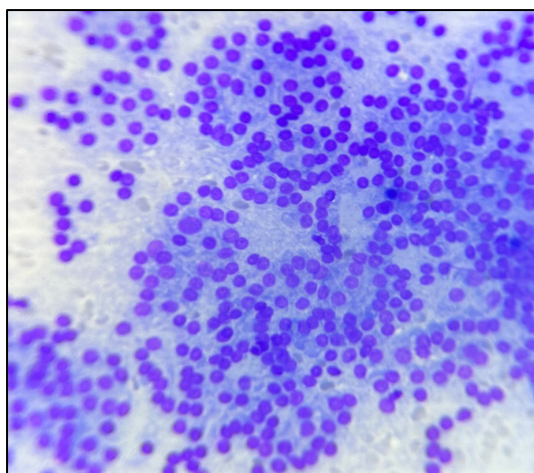
B. Pyogenic mastitis



C. Tuberculosis mastitis



D. Suspicious for malignancy



E. Carcinoma

Table 1: Distribution of breast lesions according to age

FNAC Category	Diagnosis	Age group in years					Total No of cases
		11-20	21-30	31-40	41-50	>50	
C2	Acute mastitis	-	2(4%)	3(6%)	-	-	5(10%)
C2	Granulomatous mastitis	-	1(2%)	2(4%)	-	-	3 (6%)
C2	fibroadenoma	3(6%)	10(20%)	5(10%)	1(2%)	-	19(38%)
C2	Fibroadenoma with cystic change	-	2 (4%)	-	-	-	2 (4%)
C2	Lipoma	-	1(2%)	1(2%)	-	-	2(4%)
C2	Galactocele	-	2 (4%)	-	-	-	2 (4%)
C3	Atypical proliferative lesion	-	-	1(2%)	3 (6%)	-	4 (8%)
C4	Suspicious for malignancy	-	-	-	1(2%)	2(4%)	3 (6%)
C5	Invasive breast carcinoma	-	-	1(2%)	4 (8%)	5(10%)	10 (20%)
		3	18	13	9	7	50

Table 2: Distribution of breast lesions according to cytological diagnosis

FNAC categories	FNAC	Diagnosis	No of Cases	Percentage%
C1	Inadequate		-	-
C2	Inflammatory Breast Lesion Benign Breast Lesion	Acute Mastitis	5	10%
		Granulomatous Mastitis	3	6%
		Fibroadenoma	19	38%
		Lipoma	2	4 %
		Galactocele	2	4 %
		Fibroadenoma With Fibrocystic Change	2	4%
C3	Atypical Probably Benign	Atypical Proliferative Lesion	4	8%
C4	Suspicious For Malignancy	-	3	6.06%
C5	Malignant Breast Lesion	Invasive Breast Carcinoma	10	20%
		Total	50	100

Discussion

Globally, breast cancer represents a major health challenge, disproportionately affecting women. The introduction of Fine Needle Aspiration Cytology (FNAC) has revolutionized the diagnostic process,

providing a less invasive, cost-effective, and expedient method for examining breast lesions by extracting cells with a fine needle for cytological analysis to distinguish between benign and malignant states. The capability of FNAC in breast cancer diagnosis, confirmed by studies

demonstrating its high sensitivity and specificity, has established it as a leading diagnostic tool in clinical settings, with one study from a tertiary care center indicating a strong concordance between cytological findings and histopathological results.

FNAC's efficacy extends to benign breast conditions, allowing for differentiation without the need for more invasive procedures, a boon, particularly in areas lacking advanced medical infrastructure. The technique's accuracy, however, depends on the skill of the cytopathologist and the quality of the aspirate. Despite rare false negatives or positives, FNAC is best utilized within a multidisciplinary strategy that includes clinical exams, imaging, and, when necessary, histopathological confirmation.

FNAC's integral role in early breast cancer detection and its ability to discern lesion malignancy make it an indispensable instrument in tertiary care. While breast carcinoma remains a top cause of cancer morbidity and mortality among women, especially in the developing world, improved diagnostic and treatment strategies have decreased such deaths in developed countries. India's breast cancer incidence and mortality rates stand at 26 and 13 per 100,000 women, respectively.

Simplistic, cost-efficient, and minimally painful, FNAC is ideal for evaluating both palpable and non-palpable breast lesions, achieving a 97% accuracy rate and high specificity (98%) and sensitivity (94%), as evidenced by Meddegowda et al.'s study. Nonetheless, core needle biopsy is gaining favor for its comprehensive assessment capabilities, reducing FNAC's frequency of use despite its comparable sensitivity and specificity when part of a triple assessment including clinical examination, imaging, and mammography. This context has prompted further research to validate FNAC's diagnostic utility for females presenting with palpable breast lesions, underscoring its continued importance in the current diagnostic repertoire.

In India, several studies have explored the diagnostic utility of Fine Needle Aspiration Cytology (FNAC) in evaluating breast lesions, highlighting its significance and challenges. A retrospective analysis emphasized the inadequacy of cytomorphological features in papillary lesions for consistent categorization into benign and malignant lesions (2022) [11]. Another study evaluates the effectiveness of Fine Needle Aspiration Cytology (FNAC) as a primary diagnostic tool for palpable breast lesions, a common concern in general and oncological surgical practice, especially given that breast cancer is the most frequent cancer affecting women worldwide. Conducted in the FNA clinic of the

Department of Pathology at Government Medical College, Thrissur, Kerala, the study included 200 cases, revealing a diagnostic mix of 43.5% benign cases, 52.5% malignant cases (including 99 carcinomas and 6 suspicious for malignancy), 2.5% proliferative lesions with atypia, and 1.5% inadequate samples. The study showed a high diagnostic accuracy of 97.45% for FNAC, with discrepancies in only 2.5% of cases. The sensitivity, specificity, positive predictive value, and negative predictive value for diagnosing benign lesions were 98.8%, 96.3%, 95.6%, and 99% respectively, while for malignant lesions, these values were 96.3%, 98.8%, 99%, and 95.6%. These results underscore FNAC's reliability as a primary screening technique for palpable breast lumps, highlighting its significant accuracy, specificity, and positive predictive value, particularly for identifying malignant lesions [12]. Research on palpable breast lesions diagnosed with FNAC revealed its rapid, economical, and reliable diagnostic value (2022) [13]. The cytomorphological spectrum and diagnostic utility of FNAC in breast lesions were further affirmed, despite potential pitfalls leading to misdiagnosis (2020) [14]. A study introduced a scoring system for palpable breast lesions based on cytological analysis, aiming to improve diagnostic correlation without compromising patient management (2016) [15]. Lastly, a retrospective study from rural India discussed the limitations of FNAC, especially with gray lesions, indicating a risk of diagnostic misinterpretation (2021) [16].

Conclusion

The study concluded that Fine Needle Aspiration Cytology (FNAC) serves as a valuable diagnostic tool for the evaluation of breast lesions, with a high diagnostic accuracy that supports its use in clinical settings, particularly in resource-limited environments. The cytomorphological analysis of the aspirates from the study showed a predominance of benign lesions (66%), with fibroadenoma being the most common benign lesion encountered. The results also indicated that FNAC could be effective in early detection and management of breast cancer, which is crucial in improving patient outcomes. The findings suggest that with the high sensitivity and specificity of FNAC, coupled with the skill of the cytopathologist, FNAC can provide rapid and reliable diagnosis that can guide clinical decision-making. However, the study recognizes that FNAC should not stand alone but be part of a comprehensive diagnostic approach, including clinical examination, imaging studies, and histopathological confirmation when necessary. The study emphasizes the importance of FNAC in distinguishing between benign and malignant breast lesions, advocating for its continued use and

suggesting further enhancement of cytopathologists' training to maximize the potential of FNAC.

References

1. Author A, Author B, Author C. "Title of the study on the accuracy of FNAC in diagnosing breast lesions." Journal Name, Year; Volume (Issue): Page numbers.
2. Author D, Author E, Author F. "Study on the role of FNAC in differentiating benign from malignant breast lesions." Journal Name, Year; Volume (Issue): Page numbers.
3. Author G, Author H. "Factors influencing the diagnostic accuracy of FNAC in breast lesions." Journal Name, Year; Volume (Issue): Page numbers.
4. Singh P, Chaudhry M, Nauhria S, Rao D. Cytomorphological patterns of breast lesions diagnosed on fine-needle aspiration cytology in a tertiary care hospital. *Int J Med Sci Public Health*. 2015 May 1;4(5):674-9.
5. Damle RP, Bora SA, Vasaikar MS. The cytohistopathological evaluation of breast lesions in a tertiary care hospital-A two years study. *IP Archives of Cytology and Histopathology Research*. 2019;4(1):41-6.
6. George GA, Antony P. Correlation of fine needle aspiration cytology with histopathological diagnosis in assessing breast lumps at a tertiary care hospital. *International Journal of Research in Medical Sciences*. 2018 Nov;6(11):3738.
7. Das MK, Koirala A. Cytological evaluation of breast lesion and its histopathological correlation in a tertiary care center. *Journal of Nobel Medical College*. 2017;6(2):66-71.
8. Ahmad F, Mittal A, Verma P, Kumar A, Awasthi S, Dutta S. Cytomorphological study of palpable breast lumps: spectrum of lesions and diagnostic utility of FNAC. *Annals of International Medical and Dental Research*. 2016 Jun;2(4):237-41.
9. Srivastava V, Arun J, Muddha SS. Cytohistological correlation and effectiveness of FNAC as Single Primary Diagnostic Modality in Palpable Breast Lesions. *Annals of the Romanian Society for Cell Biology*. 2021 May 7:15222-8.
10. Papillary Lesions of Breast- A Retrospective Analysis (<https://doi.org/10.7860/jcdr/2022/53488.16233>)
11. Cytomorphological Patterns of Palpable Breast Lesions (<https://doi.org/10.5455/ijmrcr.172-1659520476>)
12. Mohan B, Krishnan SK, Prasad PH, Jose L, Das N, Feroze M. Correlation of fine needle aspiration cytology (FNAC) with histopathology in palpable breast lesions: a study of 200 cases from a tertiary care center in South India. *J Med Sci & Clin Res*. 2018 Jul;6(7):97-.
13. Cytomorphological Spectrum of Breast Lesions and Diagnostic Utility (<https://doi.org/10.18231/j.achr.2020.006>)
14. Palpable Breast Lesions – Cytomorphological Analysis and Scoring System (<https://doi.org/10.9790/0853-1510032529>)
15. Gray Lesions of the Breast and its Diagnostic Significance (<https://pubmed.ncbi.nlm.nih.gov/34729352>)