Section: Pathology

Original Research Article

CYTOMORPHOLOGICAL PATTERNS OF BREAST LESIONS DIAGNOSED BY FINE-NEEDLE ASPIRATION CYTOLOGY AND THEIR CONCORDANCE WITH HISTOPATHOLOGICAL FINDINGS IN A RURAL TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Fine-needle aspiration cytology (FNAC) offers a rapid, minimally invasive, and reliable diagnostic method for breast lesions, crucial for distinguishing benign from malignant conditions. The objective is to evaluate the cytomorphological patterns of breast lesions, analyze diagnostic correlations between FNAC and histopathology, and interpret clinico-demographic variables. **Materials and Methods:** A prospective observational study of 50 breast lesion cases was undertaken. Clinical, radiological, FNAC, and histopathology findings were compared. Statistical analysis included chi-square testing ($p<0.05$ significant). **Result:** Benign lesions, especially fibroadenoma, predominated (44%). Strong concordance between FNAC and histopathology was noted ($p<0.001$). Malignant and benign entities exhibited distinct cyto-morphological spectra, and the second to third age decades harbored the majority of cases. **Conclusion:** FNAC remains a cornerstone for early diagnosis and triage of breast lesions in rural India, demonstrating accuracy, reproducibility, and strong cyto-histological correlation.

INTRODUCTION

Breast lumps are a frequent clinical finding affecting women globally and represent a broad spectrum of pathological entities ranging from benign lesions to malignant tumors. Early and accurate differentiation between benign and malignant breast lesions is essential to guide appropriate management and prognosis. Fine-needle aspiration cytology (FNAC) serves as a minimally invasive, rapid, and cost-effective diagnostic technique, particularly advantageous in resource-limited rural healthcare settings. FNAC enables quick sampling of lesions with minimal patient discomfort, providing critical initial diagnostic information.[1,2]

The accuracy of FNAC has been documented extensively, often showing high sensitivity and specificity when compared with histopathology, the gold standard for definitive diagnosis. Furthermore, integration of cytological grading systems such as the International Academy of Cytology (IAC) Yokohama system with radiological frameworks like the Breast Imaging Reporting and Data System (BIRADS) improves lesion stratification and diagnostic precision. These scoring systems together afford a common communication platform for clinicians and pathologists, enhancing diagnostic reliability and patient triaging.[3-8]

Despite these advantages, FNAC's diagnostic performance requires ongoing validation in various clinical settings, especially rural hospitals where access to advanced imaging and histopathology may be limited. This study aims to characterize the cytomorphological patterns of breast lesions diagnosed by FNAC in a rural tertiary care hospital, comparing clinical, cytological, and histopathological data, and assessing the statistical correlation and applicability of FNAC as a frontline diagnostic modality.[9,10]

MATERIALS AND METHODS

This prospective observational study was conducted at a tertiary care pathology department over a

defined period. Fifty cases of palpable breast lumps were evaluated using FNAC. After obtaining written informed consent, smears were prepared via standard FNAC technique by experienced cytopathologists using 23-25-gauge needles. Smears were stained with May-Grünwald-Giemsa and Hematoxylin & Eosin methods.[7] Cytomorphological evaluation was performed as per standardized criteria, categorizing lesions into fibroadenoma, fibroadenosis, galactocoele, abscess, ductal breast carcinoma, and granulomatous mastitis. All relevant clinical data, radiological findings, and cytopathological, histopathological results were documented and analyzed using descriptive statistics. Demographic (age, sex), anatomical (side, quadrant), clinical, radiological (BIRADS), cytological (Yokohama), and histopathology diagnostic data were extracted. Statistical analysis used frequency tables, cross-tabulations, and chi-square tests to assess FNAC-histopathology correlation ($p < 0.05$ deemed significant).

RESULTS

Out of 50 cases Benign breast lesions dominate the pathological landscape in FNAC among young females (21–30 years) in rural settings, particularly fibroadenoma (Image 3a) was the most common diagnosis followed by ductal carcinoma (Image 3e,f) and benign proliferative breast lesion with 12,4 and 3 cases respectively along with a single case of galactocoele, granulomatous lymphadenitis and epidermal inclusion cyst(Image 3b,c,d). Histopathological confirmation closely matches cytology with 22 cases of fibroadenoma (41.2%), ductal carcinoma was observed in 8 cases (15.7%) (Image 4a,b), Granulomatous mastitis accounted for 2 cases (3.9%),establishing FNAC's diagnostic performance as robust ($p < 0.001$). Statistical testing showed a highly significant association between cytological and histopathological diagnoses ($p < 0.001$). Age group also correlated significantly with histopath pattern ($p = 0.007$). The use of BIRADS in conjunction with cytological features enhances triage, while rare lesions (keloid, abscess, granulomatous mastitis) reinforce the method's value across clinical spectra.[1,2]

Table 1: Age group distribution of patients with breast lesions

Age Group	Cases
<20	7
21–30	22
31–40	8
41–50	9
51–60	4
>60	0

Table 2: Site and Sex Distribution of patients with Breast Lesions

Site	No. of Cases
RIGHT UOQ	8
B/L BREAST	4
(All other sites)	≤3 each
Sex	Cases
Female	50

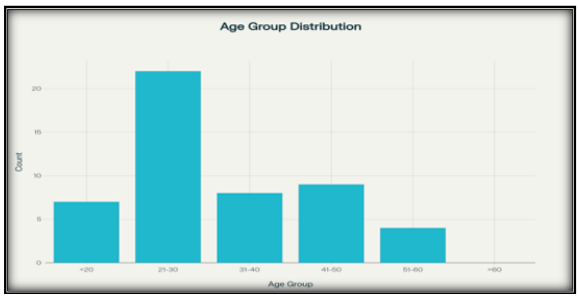

Figure 1: Bar chart of age group distribution of patients with breast lesions.

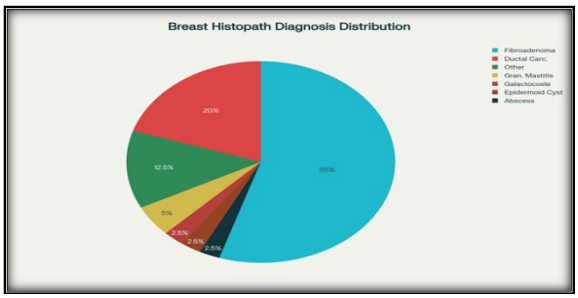

Figure 2: Distribution of breast lesions diagnosed on Histopathology (n=50).

Table 3: Histopathological Diagnosis

Histopathological Diagnosis	Cases
Fibroadenoma	22
Ductal Carcinoma	8
Granulomatous Mastitis	2
Epidermoid Cyst	1
Galactocoele	1
Abscess	1
Cystic Lesion	1
Fibroadenosis	1
Keloid	1

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Duct Ectasia	1
Others	16
Total	55

Table 4: Cytological Diagnosis

Cytological Diagnosis	Cases
Fibroadenoma, yokohama category 2	12
Ductal carcinoma, yokohama category 5	4
Benign proliferative breast lesion, yokohama category 2	3
Others/Inadequate for opinion	31

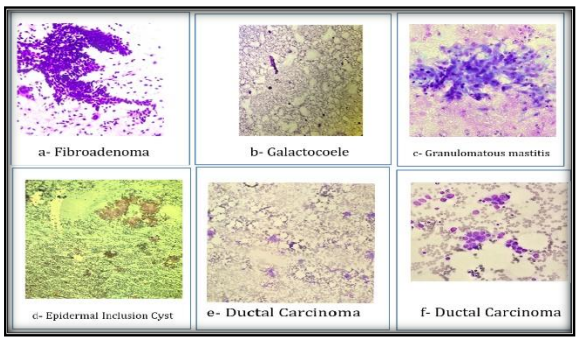

Figure 3: FNAC findings showing a) Fibroadenoma b) Galactolcoele c) Granulomatous mastitis d) Epidermal inclusion cyst e & f) Ductal carcinoma on H & E, PAP & MGG Stain.

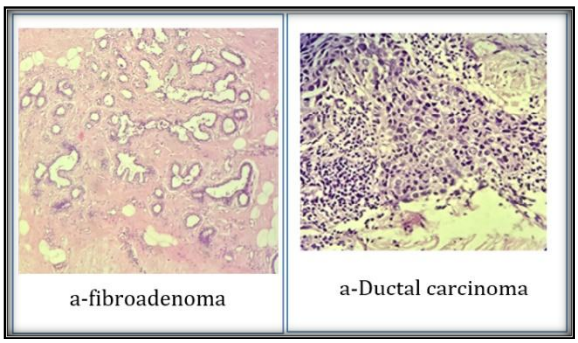

Figure 4 Histopathological finding showing a) Fibroadenoma and b) Ductal carcinoma on H & E Stain.

Table 5: Age Group with Histopathological Diagnosis

Age Group	Fibroadenoma	Ductal carcinoma	Others (Sum)
10-19	8	0	0
20-29	11	0	4
30-39	3	1	5
40-49	0	5	3
50-59	0	2	2

Table 6: Cyto-Histological Concordance

Cytological Diagnosis	Histopathological Diagnosis	Concordant Cases (sample)
Fibroadenoma, yokohama category 2	Fibroadenoma	12
Ductal carcinoma, yokohama category 5	Ductal carcinoma	4
Benign proliferative breast lesion, yokohama category 2	Fibroadenoma / fibroadenosis	3

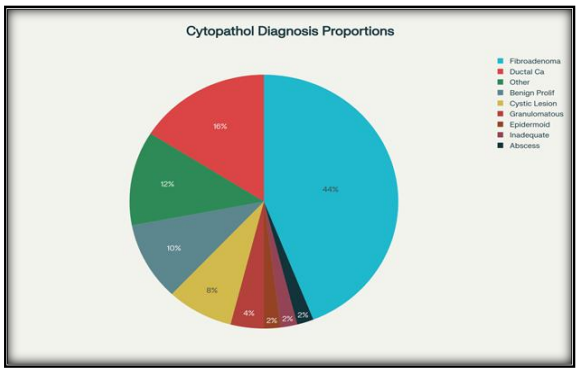

Figure 5: Distribution of breast lesions diagnosed on FNAC (n=50).

DISCUSSION

The present study confirmed that benign breast lesions were predominant (44% fibroadenoma) among the 50 cases analyzed [Table 3], with the majority occurring in young females aged 21–30 years [Table 5]. This age-wise distribution aligns with the findings of Chaudhry et al. who reported similar predominance in the second and third decades [Table 1, Figure 1]. The age group significance was statistically supported with p = 0.007 indicating a genuine association between age and lesion type.[3]

[Table 2] illustrates the distribution of histopathological diagnoses, where fibroadenomas were most frequent, followed by ductal carcinoma. Benign lesions are concentrated in younger age groups, while ductal carcinoma appears mainly after age 30. [Table 5] The bar charts and age distribution histogram [Figure 1 and 2] visually emphasize the prevalence of benign lesions in younger women, substantiating epidemiological trends from similar rural cohorts.[5,9,10]

Comparison with other studies: Rajasekaran and Sivanesan reported a benign lesion prevalence of 88%, with fibroadenoma as the most common pathology and a FNAC-histopathology agreement of 93%. Likewise, core needle biopsy studies affirm the equivalence in diagnostic outcomes with FNAC when performed properly. The present study's diagnostic p-value (< 0.001) aligns with these

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reports, further validating FNAC as a first-line diagnostic approach.[2,4,12]

Additionally, the integration of BIRADS scoring with FNAC cytology enhances diagnostic confidence. Kochhar et al. showcased a strong Pearson correlation ($r = 1.957$, $p < 0.001$) between Yokohama categories and BIRADS, reinforcing combined use for better lesion characterization. Our findings substantiate this multimodal diagnostic strategy, especially beneficial in rural settings with limited radiodiagnostic infrastructure.[8,16,17]

The strong cyto-histological concordance observed ($p < 0.001$) between FNAC diagnoses categorized by the Yokohama system and histopathological confirmation [Table 6] corroborates the high diagnostic accuracy of FNAC reported in other rural Indian and international studies. For instance, Singh et al. demonstrated FNAC sensitivity and specificity rates of over 90%, comparable to this study's findings. In the current dataset, the classical cytomorphological features of fibroadenoma and ductal carcinoma were clearly distinguishable, supporting FNAC as a reliable triage tool.[15,18,19]

Rare diagnoses such as keloid, granulomatous mastitis, and abscesses, although less frequent, underscore the broad diagnostic utility of FNAC and the need for histopathological confirmation in atypical cases. These findings echo those by Sankaye et al., who emphasized FNAC's role in excluding malignancy in inflammatory and unusual lesions.[9]

In summary, the evidence from this study confirms FNAC's high accuracy, rapid turnaround time, and minimal invasiveness, which are essential for efficient breast lesion evaluation in resource-constrained rural environments. Employing standardized reporting systems and combining cyto-radiological assessments further improve diagnostic reliability and patient management, consistent with contemporary best practices.[5,10,12]

CONCLUSION

FNAC is indispensable for breast lesion evaluation, ensuring prompt, minimally invasive distinction between benign and malignant entities. FNAC, validated against histopathology, remains integral for the assessment and initial management of breast lesions in resource-constrained settings. Its accuracy, rapid turnaround, and minimal invasiveness offer distinct advantages for early detection and sorting of neoplastic and non-neoplastic pathology, particularly among high-volume rural populations. Continued professional training and standardised reporting improve diagnostic precision.

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