

# Cytological and Histological Correlation of Breast Lesions at Tertiary Care Hospital the Cross-Sectional Study

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## Abstract

**Introduction:** In recent years, cytology has emerged as a primary screening modality for suspected breast pathologies promising high accuracy. In this study, we correlate the cytological and histopathological findings.

**Methods:** A total of 108 patients with suspected breast masses (107 women and 1 man; aged 19–70 years) were evaluated using fine-needle aspiration cytology (FNAC), followed by histopathology. The level of agreement between FNAC and histopathology was assessed using Kappa statistics.

**Results:** Mean age of patients was  $37.04 \pm 11.53$  years. As per IAC criteria, C1, C2, C3, C4, and C5 pathologies were detected in 3 (2.8%), 80 (74.1%), 3 (2.8%), 2 (1.9%), and 20 (18.5%) cases, respectively. Histopathological diagnosis was benign, borderline, and malignant in 82 (75.9%), 1 (0.9%), and 25 (23.1%) cases, respectively. There was good agreement between cytology and histopathology for the detection of malignant and borderline pathologies ( $\kappa = 0.974$ ;  $P < 0.001$ ).

**Conclusion:** Cytology was a useful diagnostic tool for the evaluation of breast lesions.

**Key words:** Breast lesions, Fine-needle aspiration cytology, Cytology, Histopathology, Malignant, Benign lesion

## INTRODUCTION

Evaluation of suspected breast lesions involves the use of clinical, imaging, biochemical, cytological, and biopsy for therapeutic planning/histopathological assessment. The primary focus of different diagnostic modalities is to ensure the use of minimally invasive and precise techniques for this purpose. Two most common diagnostic techniques used for breast lumps include fine-needle aspiration cytology (FNAC) and trucut biopsy. In recent years, FNAC has emerged as a very efficient tool for the diagnostic evaluation of palpable breast lumps.<sup>[1]</sup>

Advantages of FNAC are its easy availability, simplicity of the technique, low cost, and most of all, low risk of complications. However, despite these advantages, it is often criticized for inadequacy. However, despite this limitation, FNAC got wide popularity and today it is considered to be an essential component in the triple test for breast cancer.<sup>[2]</sup>

Keeping in view, the significance of differentiation of breast diseases, particularly in the pre-operative milieu, FNAC holds a high relevance and significance. Hence, the present study was planned to carry out the cytological study of various suspicious breast lesions and to correlate them with histopathology as gold standard.<sup>[3]</sup>

## MATERIALS AND METHODS

The present study was carried out at the Department of Pathology in collaboration with the Department of Surgery, TS Misra Medical College and Hospital, Lucknow, after seeking approval from the Institutional Ethics Committee

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and obtaining informed consent from the patients. The present study was descriptive study, and minimum sample size projections were done using the formula  $(4 * p * [1 - p]) / d^2$  (where “p” was taken as 0.5 and d indicated absolute error allowance taken as 10% or 0.1). The calculated sample size was 100, however, we included a total of 108 cases with suspicious breast pathologies (aged 19–70 years; 107 women and 1 man; mean age  $37.04 \pm 11.53$  years) whose cytological smear as well as histological section were available for study. Cases having history of treated malignancy and those with autolyzed/necrosed tissue specimens were excluded from the study.

Detailed history was taken, followed by clinical examination. FNAC was performed on all the cases that came with a history of breast lumps. The aspirate was collected in a 10-mL syringe and was fixed into the plunger and it was pushed so that the contents of the needle were blown gently on the slides. The cellular preparation on the slides was kept thin and even. Cytological smears were prepared, air dried, and stained by Leishman stain. The prepared slides were evaluated under the microscope at both low and high-power fields. FNAC findings were reported as per International Academy of Cytologists (IAC) criteria recommended by the National Health Service Breast Screening Program (NHSBPP)<sup>[4]</sup> as follows:

C1	Inadequate
C2	Benign
C3	Atypia, probably benign
C4	Suspicious of malignancy
C5	Malignant

Specimens of breast lesions for histopathological examination (both mastectomy and biopsy sample) whose cytology was available were received in the histopathology section.

Detailed gross examination was done, and the specimens were fixed in 10% formalin, followed by thorough sampling. Histopathological evaluation was done using the standard protocol. Immunohistochemical staining was done wherever needed.

The data were fed into the computer using MS-Excel 2013 software. Data were analyzed using IBM SPSS 21.0 software. Kappa statistic was calculated to assess the level of agreement. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated. “P” < 0.05 was considered statistically significant [Figures 2-5].

## RESULTS

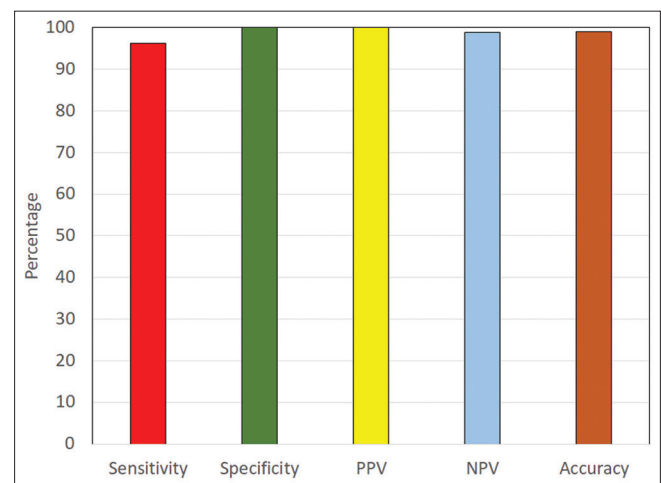
Cytologically, the majority (74.1%) of cases were diagnosed as C2 (benign), followed by C5 (malignant) (n = 20; 18.5%). There were 3 (2.8%) cases each diagnosed as inadequate

and atypical (C3), respectively, and 2 (1.9%) diagnosed as suspicious of malignancy (C4). The distribution of different cytological diagnoses is shown in Table 1 and Figure 1.

Histopathologically, a total of 82 (75.9%) cases were diagnosed as benign, 1 case (0.9%) was diagnosed as borderline, and 25 (23.1%) were diagnosed as malignant. Among histopathologically diagnosed benign cases, fibroadenoma (n = 51; 47.2%) and fibrocystic disease (n = 19; 17.6%) were the most common. The single case diagnosed as borderline was identified as cystosarcoma phyllodes. Out of 25 (23.1%) cases diagnosed as malignant, 22 (20.4%) cases were diagnosed as infiltrating ductal carcinoma, 2 (1.9%) as lobular carcinoma, and 1 (0.9%) papillary carcinoma, respectively [Table 2].

**Table 1: Cytological Findings according to IAC Criteria**

IAC category	Finding	No. of cases	Percentage
C1 (n=3)	Inadequate	3	2.8
C2 (n=80)	Fibroadenoma	53	49.1
	Fibrocystic disease	15	13.9
	Breast abscess	2	1.9
	Galactocoele	2	1.9
	Lactating adenoma	2	1.9
	Acute mastitis	2	1.9
	Chronic mastitis	1	0.9
	Phyllodes tumor	1	0.9
	Gynecomastia	1	0.9
	Epithelial cyst with secondary inflammation	1	0.9
C3 (n=3)	Atypical ductal hyperplasia	2	1.9
	Atypical ductal cell	1	0.9
C4 (n=2)	Suspicious malignancy	2	1.9
C5 (n=20)	Ductal carcinoma	17	15.7
	Lobular carcinoma	2	1.9
	Papillary carcinoma	1	0.9



**Figure 1: Diagnostic efficacy of cytology for detection of malignant + borderline lesions (considering C3–C5 as the criteria)**



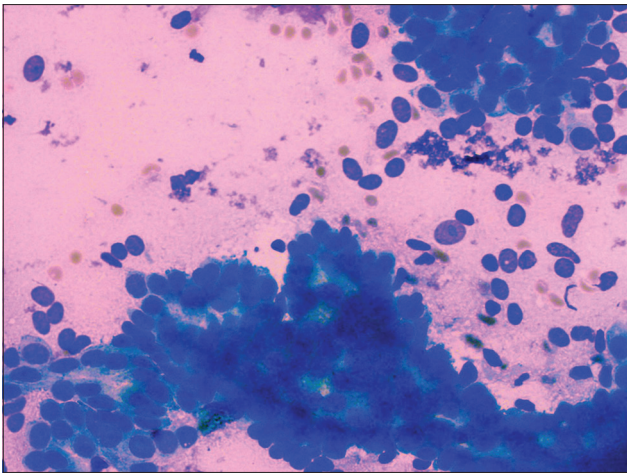


Figure 2: Cytological smear - Benign breast disease fibroadenoma breast (Giemsa stain x40)

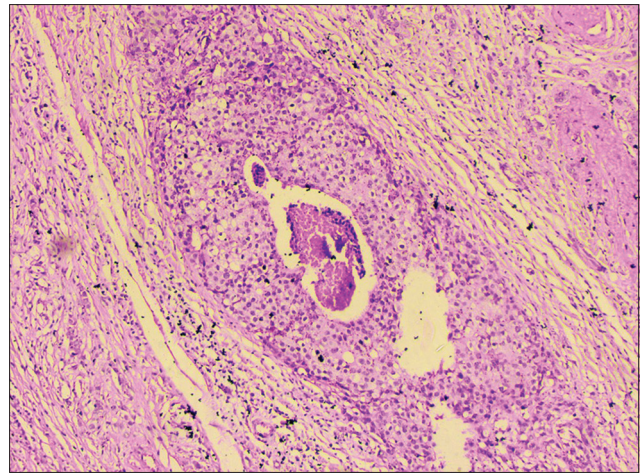


Figure 5: Infiltrating ductal carcinoma (H and E x10)

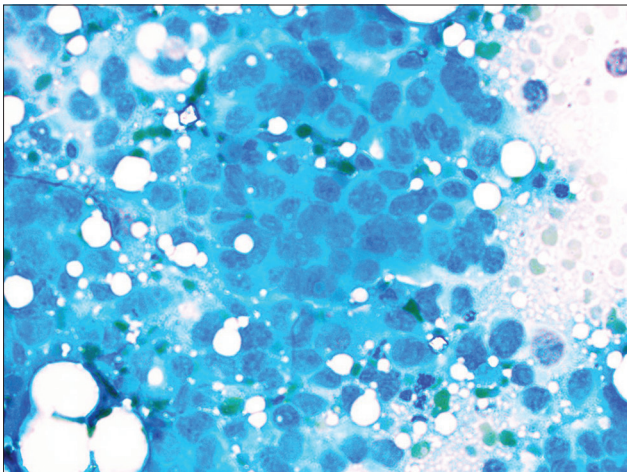


Figure 3: Cytological smear - Ductal carcinoma breast (Giemsa stain x40)

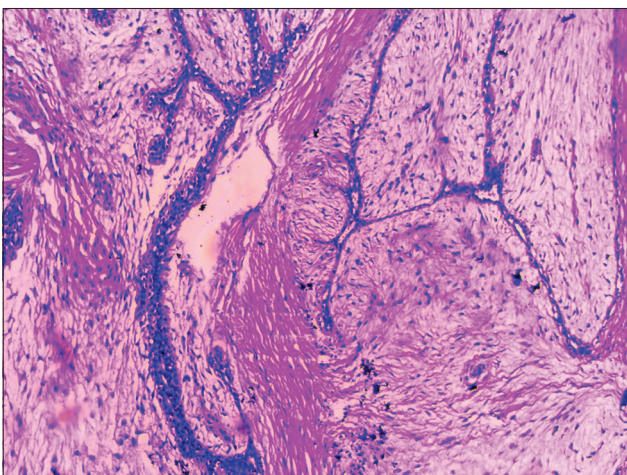


Figure 4: Fibroadenoma breast (H and E x10)

Statistically, there was a strong association between cytological and histopathological diagnosis ( $P < 0.001$ ) [Table 3].

Table 2: Histopathological diagnosis

Finding	No. of cases	Percentage
Benign	82	75.9
Fibroadenoma	51	47.2
Fibrocystic disease	19	17.6
Acute mastitis	2	1.9
Breast abscess	2	1.9
Galactocoele	2	1.9
Lactating adenoma	2	1.9
Chronic mastitis	1	0.9
Gynecomastia	1	0.9
Epithelial cyst with secondary inflammation	1	0.9
Phyllodes tumor	1	0.9
Borderline	1	0.9
Cystosarcoma phyllodes	1	0.9
Malignant	25	23.1
Infiltrating ductal carcinoma	22	20.4
Lobular carcinoma	2	1.9
Papillary carcinoma	1	0.9

Histopathologically, a total of 26 cases were diagnosed as malignant/borderline malignant and 79 as benign. The sensitivity and specificity of cytology for diagnosis of malignant/borderline breast lesions were 96.2% and 100%, respectively. Cytology had 100% positive and 98.8% negative predictive values. Cytology had 99% accuracy in the detection of malignant/borderline lesions [Table 4].

## DISCUSSION

The present study had an inadequacy rate of only 2.8%. According to IAC criteria, the majority (74.1%) of cases were diagnosed as C2 (benign), followed by C5 (malignant) (18.5%). There were three (2.8%) cases each identified as inadequate (C1) and atypical (C3), respectively. A total of two (1.9%) were diagnosed as suspected of malignancy (C4). Similar to the present study, Vasavada and Kher<sup>[5]</sup> in their study found C2 and C5 as

**Table 3: Correlation of IAC cytology categories with histopathological diagnostic categories**

HPE Diagnosis	IAC Cytology Category					Total
	C1	C2	C3	C4	C5	
Benign	3 (3.7%)	79 (96.3%)	0	0	0	82
Borderline	0	0	1 (100%)	0	0	1
Malignant	0	1 (4.0%)	2 (8.0%)	2 (8.0%)	20 (80%)	25
Total	3	80	3	2	20	108

$\chi^2=135.55$ ;  $P<0.001$ ; percentages have been calculated row-wise

**Table 4: Evaluation of diagnostic efficacy of cytology for detection of malignancy/borderline malignancy (considering C3-C5 as the criteria)\***

Cytopathological Diagnosis	Histopathological diagnosis		Total
	Malignant/Borderline	Benign	
C3-C5	25	0	25
C2	1	79	80
Total	26	79	105

\*After excluding 3 inadequate cytologies

Sensitivity	Specificity	PPV	NPV	Accuracy
96.2%	100%	100%	98.8%	99.0%

$\kappa=0.974$ ;  $P<0.001$

the most dominant types (56.67% and 26.0%), however, the proportion of inadequate specimens (C1) was much higher in their study (10.67%). Patel *et al.*<sup>[6]</sup> too in their study found benign (C2) cytology as the dominant type (78%) and malignant to be the next most common type (20%), however, in their study, representation of other cytological categories was very less. They reported only 1% of cases each in the C1 and C3 categories and none in the C4 category. In the study by Gore *et al.*,<sup>[7]</sup> no case was in the C1 category. However, the proportion of those with C2 and C5 cytology (71.7% and 24.3%) as well as C3 (3.6%) was comparable to our study.

In the present study, fibroadenoma ( $n = 53$ ) and fibrocystic disease ( $n = 14$ ) were the most common benign pathologies diagnosed cytologically. The single male was diagnosed as gynecomastia. These findings are similar to that reported by Patel *et al.*<sup>[6]</sup> who in their series of 78 cytologically diagnosed benign cases found fibroadenoma ( $n = 45$ ) and fibrocystic disease ( $n = 15$ ) as the most common cytological diagnosis. Compared to the present study, where benign cytologies were more common than the malignant cytologies, Naganagoudar and Yanagi<sup>[8]</sup> despite reporting a dominance of malignant cytologies ( $n = 36$ ) over benign cytologies ( $n = 18$ ), reported a dominance of fibroadenoma ( $n = 15/18$ ) in the benign category. Mandal *et al.*<sup>[9]</sup> in their study also found 138/176 (78.4%) of their benign cytological diagnoses to be fibroadenoma or fibrocystic disease.

In the present study, out of 20 cytological diagnoses under the C5 category, 17 were ductal carcinomas, 2 lobular carcinomas, and 1 papillary carcinoma, respectively. Thus, cytologically malignant pathologies were represented by three types of malignancies predominated by ductal carcinoma. Compared to the present study, Patel *et al.*<sup>[6]</sup> in their study identified all the malignant cytologies as ductal carcinoma. Dominance of ductal carcinoma as the cytologically diagnosed malignancy has also been supported by other workers too.<sup>[9]</sup>

In the present study, there was a high consistency between cytological and histopathological diagnoses with a concordance rate of 86.4% for different confirmed FNAC diagnoses. For borderline and malignant pathologies, FNAC was 99% accurate. Similar to the findings of the present study, a high consistency between cytological and histopathological diagnoses ranging from 77.7% to 100% for seven out of ten cytological diagnoses was also reported by Mandal *et al.*<sup>[9]</sup> in their study. Similar high consistency between different histopathological and FNAC diagnoses was also reported by other workers too.<sup>[10,11]</sup>

## CONCLUSION

Cytology plays an important role in the evaluation of suspected breast lesions. It is highly precise and accurate in the detection of various underlying breast pathologies. It can be recommended as a useful minimally invasive diagnostic measure for the evaluation of breast pathologies.

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