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Clinicopathological Study of Breast Lumps and Role of International Academy of Cytology Yokohama Reporting System at Tertiary Care Center

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ABSTRACT

Introduction: The breast carcinoma incidence is increasing worldwide currently the incidence is 12.4% and developed countries show higher incidence. In India, breast cancer has exceeded cancers of the cervix and the oral cavity. The present study helps to differentiate and categorise the palpable breast lumps with the help of FNAC based on Yokohama reporting system.

Aim: To assess the FNAC findings of breast masses based on Yokohama reporting system.

Materials and Methods: The present study was conducted in the department of Pathology from January 2024 to December 2024 at Tertiary care center. The FNAC data of female patients between 10 to70 years of age with palpable breast lumps was collected and reported according to Yokohama reporting system and histopathology was done wherever necessary

Results: The present study includes 62 cases out of which 43 cases (69.3%) were benign and 19 cases (30.6%) were malignant. Most common benign breast lesion was fibroadenoma 33 (53.2%) and malignant lesion was Duct cell carcinoma 19 (25.8%). Frequencies of right breast lesions were high compared to left breast lesions. In the present study according to Yokohama reporting system. C1 (Insufficient/inadequate) constitutes 8.06%(n=5) The highest number of lesions were categorized under C2 (Benign) constitutes 53.22%(n=33) followed by C3 (Atypical) constitutes 3.22%(n=2) C4 (Suspicious of malignancy) constitutes 4.83% (n=3) C 5(Malignant) constitutes 30.64%(n=19). Histopathology diagnosis available in 32 cases showed fibroadenoma 14 (43.75%) Galactocele 1(3.125%) Granulomatous abscess 1(3.125%) Duct cell carcinoma 7 (21.87%) core needle biopsy diagnosed as duct cell carcinoma 1(3.125%) fibrocystic disease 4 (12.5%).
The calculated Risk of malignancy (ROM) in category C1& C II was 0% and in category III ROM was 55.5%, 100% in Yokohama category IV and V. FNAC correlation with histopathology was significant (P Value=<0.01 & Chi square value 40.7).

Conclusion: FNAC is a valuable diagnostic tool which provides rapid and reliable diagnosis in breast lesions. The Yokohama reporting system helps to standardize and improve the reporting of breast cytology.

Keywords: *Fine-needle aspiration cytology, Yokohama reporting system, Benign, Malignant.*

INTRODUCTION

Breast cancer ranks among the leading causes of cancer mortality in females globally.[1,2] Palpable breast lumps pose a frequent diagnostic challenge for clinicians, emphasising the need to distinguish benign from malignant lesions.[3] Breast masses are among the most common clinical presentations encountered in surgical and pathology practice, particularly in

women across a wide age spectrum. They include a broad range of conditions, from benign lesions such as fibroadenoma and fibrocystic changes to malignant tumours of breast. Early and accurate diagnosis is crucial for appropriate management and improved patient outcome.

The International Academy of Cytology (IAC) Yokohama System for Reporting Breast Fine-Needle Aspiration (FNA) Cytology emerged in 2016 Yokohama International Congress on Cytology, convened by cytopathologists, radiologists, surgeons, and oncologists specializing in breast disease management.[4] This standardized reporting system categorizes breast cytology into five diagnostic groups—insufficient(C-1), benign(C-2), atypical(C-3), suspicious for malignancy, (C-4), and malignant(C-5),—each associated with a defined risk of malignancy(ROM),. This System aims to enhance diagnostic accuracy, improve communication between clinicians and pathologists to facilitate better patient management.

In resource-limited settings, breast FNAC being a rapid, minimally invasive, and cost-effective diagnostic tool for the initial evaluation of breast lesions[5], It plays a vital role in the early detection of benign and malignant conditions and thereby guiding clinical management. This represents a widely adopted procedure, serving as a cornerstone in initiatives to lower breast cancer mortality through timely diagnosis.[6,7]

The present study aims to analyze the clinicopathological spectrum of breast lumps and to assess the role of fine-needle aspiration cytology (FNAC)and diagnostic utility of the IAC Yokohama reporting system in a tertiary care setting.

AIMS

1. To assess the FNAC findings of breast masses based on Yokohama reporting system

OBJECTIVES

1. To identify the types of lesions of Breast
2. To study age and clinical presentation of breast neoplasms
3. To present the FNAC reports using Yokohama reporting system.

MATERIALS AND METHODS

The present study was a retrospective study conducted in the Department of Pathology Government General Hospital, for a period of one year from January 2024 to December 2024. It included female patients presenting with palpable breast lumps who were referred for fine-needle aspiration cytology (FNAC).

Inclusion Criteria

Female patients aged 10–70 years with palpable breast lumps.

Exclusion Criteria

- Non-palpable breast lumps in females.
- Palpable breast masses in males.
- Patients currently receiving treatment.
- Recurrent breast lump cases.

Ethical clearance for this study was obtained from the Institutional Ethics Committee at Government Medical College, Participants received a clear explanation of the study's objectives, along with assurances of complete data confidentiality and privacy. An information sheet was provided and explained in their preferred language, addressing all queries to ensure full comprehension, followed by documented informed consent.

The study encompassed 62 breast lesion cases, categorized according to the IAC Yokohama classification. FNAC results were integrated with clinical and imaging data; benign imaging findings required no further action, while suspicious clinical/imaging features prompted core needle biopsy (CNB). Atypical, suspicious, or malignant FNAC cases underwent CNB or excision biopsy. FNAC diagnoses were cross-verified against histopathology to determine the Yokohama system's diagnostic accuracy, sensitivity, specificity, positive and negative predictive values for breast lump assessment. Among the FNAC cases, 32 (57%) advanced to histopathological confirmation at our facility.

The International Academy of Cytology (IAC) Yokohama System classifies breast fine-needle aspiration (FNA) cytology into five categories, each stratified by its associated risk of malignancy (ROM):

- C1: Inadequate/Insufficient
- C2: Benign
- C3: Atypical
- C4: Suspicious for malignancy
- C5: Malignant

The absolute risk of malignancy for each category is calculated as the proportion of histologically confirmed malignant cases within that cytological group relative to the total cases in the same category.[8,9] Breast FNA cytology provides a swift, precise, and economical diagnostic approach with negligible complications, effectively evaluating both benign and malignant breast lesions across diverse presentations.

- Absolute risk of Malignancy (ROM) is the number of malignant cases in a given diagnostic category for the FNAC result divided by the total number of cases in that diagnostic category.
- Absolute risk of Malignancy (ROM) =
  The number of malignant cases in a given diagnostic category x100
  The total number of cases in that diagnostic category

In the present study from C-3 to C-5 category lesions the Tru-cut biopsies, excisional biopsies, and surgical specimens were collected in the Pathology Department, fixed in 10% formalin, processed via automated tissue processor for paraffin embedding, sectioned, and stained with hematoxylin and eosin.

OBSERVATION AND RESULTS

In this study, a total of 62 cases with breast lesions were examined. Out of 62 cases, distribution of cytological diagnosis of breast lesions is shown in Table 1. Observations of the present study were analyzed and recorded with respect to age, quadrant of involvement, size, laterality, and clinical presentation. In our study, age ranged from 10 to 70 years. Majority cases belong to 31–50 years. The most common age group of benign lesions was 41–50 years. The most common age group of malignant breast lesions was 51–60 years. Right breast involvement was more common seen in 34 cases.

Table – 1: FNAC Results age wise – Benign and Malignant

Age Group	Benign (n=43)	Benign %	Malignant (n=19)	Malignant %
10-20	6	14.0%	0	0.0%
21-30	14	32.6%	0	0.0%
31-40	11	25.6%	3	15.8%
41-50	9	20.9%	6	31.6%
51-60	2	4.7%	8	42.1%
61-70	1	2.3%	2	10.5%
Total	**43**	**100%**	**19**	**100%**

Majority lumps were in the upper outer quadrant, seen in 32 (51.61%) cases, Maximum breast lumps were of size 2–5 cm seen in 38 (61.29%) cases on cytology, 43 cases were benign and 19 cases were malignant.

Table – 2 : Cytological diagnosis according to Yokohoma classification

Yokohama category	No. of cases	Cytological diagnosis
CI (Insufficient)	5 (8.06%)	Proliferative benign mammary lesion (1) Benign mammary lesion with cystic change (2) Granulomatous inflammation (2)
CII (Benign)	33 (53.22%)	Fibroadenoma (28) Subareolar abscess (1) Duct ectasia (2) Fibrolipoma (1) Lipomatous lesion (1)
CIII (Atypical)	2 (3.22%)	Fibroadenoma With epithelial hyperplasia (1) Atypical ductal hyperplasia (1)
CIV (Suspicious of Malignancy)	3 (4.83%)	Suspicious of carcinoma (3)
CV (Malignant)	19 (30.64%)	Carcinoma breast (19)

There were 19 cases of infiltrating duct carcinoma (NST), C1 constitutes 8.06%(n=5) The highest number of lesions were categorized under category 2 (benign) figure1 (photomicrograph-1) C2 constitutes 53.22%(n=33) followed by category 3 (atypical) constitutes 3.22%(n=2) C4 constitutes 4.83% (n=3) C5-Malignant Category figure2 (photomicrograph-2) consists of cellular aspirate with evidently malignant cytologic features., In present study C5 constitutes 30.64%(n=19).

Table 3: Cytopathological categorization

Cytology Diagnosis (Yokohama Category)	Number of Cases (Specimens Received)	Histopathological Diagnosis	Number of Cases
Fibroadenoma (C2)	16	Fibroadenoma	14
		Fibrocystic change	1
		Galactocele	1

Galactocele (C2)	2	Galactocele	1
Fibrocystic disease (C2)	5	Fibrocystic disease	4
Duct papilloma (C3/C4)	1	Duct papilloma	1
Atypical ductal hyperplasia (C3)	1	Duct cell carcinoma	1
Duct cell carcinoma (C5)	8	Duct cell carcinoma	7

Histopathology diagnosis available in 32 cases showed fibroadenoma 14(43.75%) Galactocele 1(3.125%) Granulomatous abscess 1(3.125%) Duct cell carcinoma 7 (21.87%) core needle biopsy diagnosed as duct cell carcinoma 1(3.125%) figure3 (photomicrograph-3) fibrocystic disease 4(12.5%). Cytology diagnosis Atypical ductal hyperplasia 1case (3.125%) in biopsy it was confirmed as duct cell carcinoma in biopsy. (photomicrograph-3 &4)

Table 4: Distribution of cytohistologically correlated cases for benign and malignant lesion in each category of IAC Yokohama system with calculation of ROM

Category	Total Cytology Cases (N=62)	Malignant on Histology((N=19)	ROM (%)
C1: Inadequate	5	0	0.0
C2: Benign	33	0	0.0
C3: Atypical	3	1	33.3
C4: Suspicious	2	2	100.0
C5: Malignant	19	19	100.0

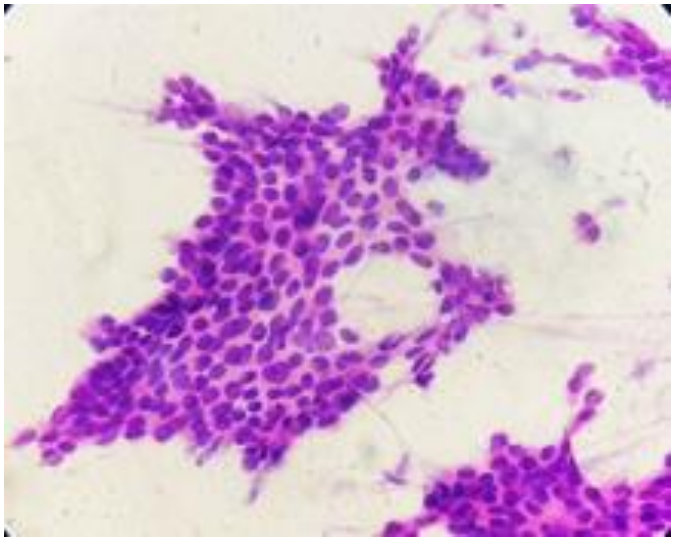

Figure 1: (Photomicrograph-1) Cytology smear of fibroadenoma (H&E stain, 40x).

(IAC Yokohama C2 category).

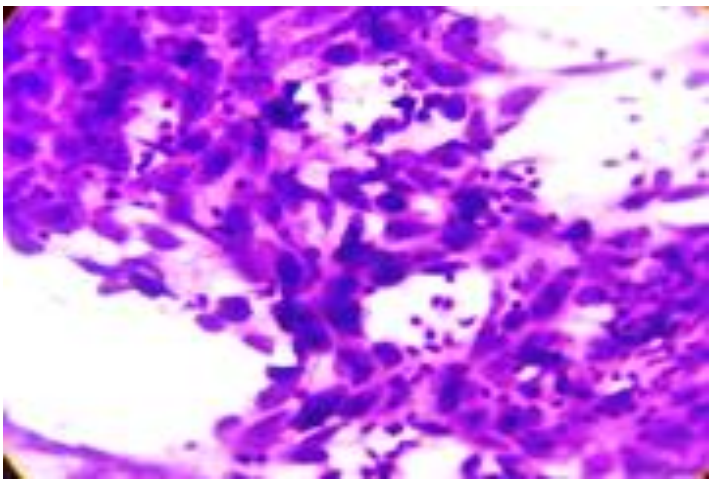

Figure 2: (Photomicrograph-2)Cytology smear showing duct cell carcinoma

(H&E stain, 40x). (IAC Yokohama C5 category).

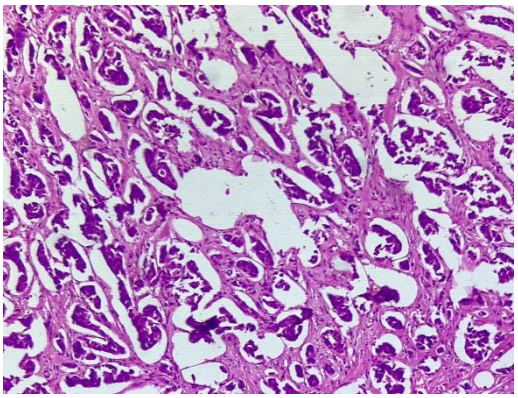

Figure 3: (Photomicrograph-3) Histopathological section of infiltrating duct carcinoma,NST (H&E Stained 40x)

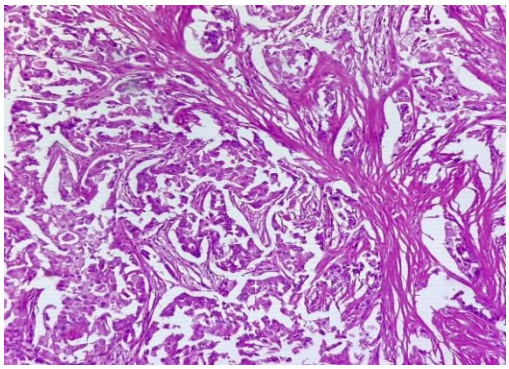

Figure 4: (Photomicrograph-4) Histopathological section of infiltrating duct carcinoma, NST type With desmoplastic stroma (H&E Stained 40x)

DISCUSSION

In the present study, we collected the data of 62 patients, FNAC slides were retrieved and reviewed. All the slides were observed and findings recorded. Out of 62 cases, it was found that 43 cases were diagnosed to have benign lump by FNAC and 19 cases had malignant lumps. Fibroadenoma was the commonest benign breast lump accounted for 24.19%, followed by fibrocystic changes (19.35%), benign Phyllodes (1.6%), atypical ductal hyperplasia (4.83%), and in the malignant group the most common was Duct cell carcinoma accounting for (30.64%).

In the present study, benign breast lesions peaked in the 41–50 years age group, while malignant lesions were most common in 51–60 years. These findings align with patterns in Indian studies using the IAC Yokohama reporting system but show a perimenopausal shift compared to younger peaks.

Malignant cases peaking at 51–60 years indicate postmenopausal onset, consistent with rising incidence post-50 in tertiary Indian settings.[10] Malignant lesions align closely, with medians around 45–48 years across Indian Yokohama cohorts, supporting 51–60 years as a high-risk window. A study done by Munjal et al[11] (mean age 33 years overall) showed 25% in 41–60 years, which was similar to the present study. Another study done by Phonglosa et al.[12] showed Benign Peak at 34 years age and 48 years age for Malignant Peak.

The older benign peak (41–50 vs. typical 20–30s) may stem from delayed presentations in tertiary care, hormonal factors, or referral bias. Yokohama system's categorization (C2 benign ROM ~1–5%) validates these age-risk stratifications, aiding triage. Compared to Western studies (younger malignancies), Indian data like this emphasize earlier screening.

Right side breast was more commonly involved in the present study which is similar to the study done by Sreedevi [10] In the present study, upper outer quadrant of the breast most commonly involved which is also seen in a study done by Kosthi *et al*.[13] In the present study, the most common benign lesion was fibroadenoma and the most common malignant lesion was infiltrating duct carcinoma (NST).

In the present study, analysis of 32 correlated cases demonstrates robust alignment between IAC Yokohama cytological diagnoses and histopathology, achieving near-perfect specificity for benign (C2) and malignant (C5) categories, with fibroadenoma showing 87.5% confirmation (14/16). Table 4. High concordance for fibroadenoma (87.5%) and infiltrating duct carcinoma (100%) was similar to study done by Dogra et al [14], such as one with 100% fibroadenoma match (74 cytology cases) and 100% for malignant C5 (16/26).

Breast fine-needle aspiration cytology (FNAC) demonstrates high sensitivity (90–95%) and near-perfect positive predictive value (PPV, approaching 100%) for identifying breast carcinoma.[10] False negatives are uncommon, typically arising from challenges in diagnosing low-grade malignancies or sampling limitations, while false positives remain rare and often involve misinterpretation of fibroadenomas, intraductal papillomas, or papillary lesions.[13] In resource-rich settings, FNAC integrates into the triple assessment (clinical examination, imaging, and cytology), achieving a PPV near 100%. Accordingly, this study correlates FNAC findings—classified via the IAC Yokohama system—with histopathology wherever possible to assess its diagnostic utility in reporting breast cytopathology at a tertiary care centre. This study validates the utility of the IAC Yokohama system in cytological reporting, highlighting FNAC's role in facilitating early breast cancer detection and screening.

In resource-constrained regions, breast FNAC remains a frontline procedure to reduce breast cancer mortality.[6] While open excision biopsy is the gold standard. Absolute risk of malignancy (ROM) quantifies confirmed malignancies within each cytological category relative to its total cases.[8]

Table 6: Comparison with other studies

Metric	Current Study	Chauhan et al.[15]	Dogra et al. [14]	Phonglosa et al.[12]
Overall Concordance	93.8%	98.4%	90–91%	98.97%
Fibroadenoma Accuracy	87.5%	87.8%	Comparable	High C2
C5 PPV	100%	100%	100%	98.4%
C3 ROM	100%	N/A	Elevated	14.3% (similar category)

Fibroadenoma concordance stood at 87.5% (14/16), comparable to Chauhan et al. [15] (87.8% in 331 cases), Agarwal et al.[16] (high C2 match), and Phonglosa et al.[12] (strong benign reproducibility) shown in Table 6. Minor variances—fibroadenoma mimicking fibrocystic change or galactocele (12.5%)—echo overlapping features noted by Swain et al.[17] (93.3% overall) often due to sampling in proliferative lesions.

CONCLUSION

In high-resource settings, fine-needle aspiration cytology (FNAC) serves as a key diagnostic aid for breast lesions, enhanced by the triple assessment (clinical exam, imaging, cytology). Ultrasound guidance and rapid on-site evaluation further boost diagnostic precision. The IAC Yokohama system's five categories stratify lesions by malignancy risk, guiding tailored management. Predominantly retrospective institutional audits confirm its success in unifying reporting standards and elevating accuracy.

Ethical Considerations:

The study protocol was submitted to the Scientific Committee & Institutional Ethics Committee (IEC) for review and approval before the commencement of data collection.

Data Analysis:

1. Data was entered in Microsoft Excel, SPSS version and analyzed.
2. Data was presented as proportion

   p value <0.05 was taken as significant

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