

# Validation of the IAC Yokohama system for reporting breast fine-needle aspiration cytology categorization of breast lesions in Vindhya region population



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## ABSTRACT

**Background:** In 2016, International academy of cytology (IAC) has established a standardized approach for reporting breast fine-needle aspiration cytology (FNAC) by categorizing the lesions in five tier system from C1 to C5 to standardize reporting, which will enhance Breast fine-needle aspiration biopsy cytology performance, interpretation, and reporting. **Aims and Objectives:** The aim of the study was to categorize FNAC cases according to The IAC Yokohama System and evaluate the diagnostic ability of FNAC. **Materials and Methods:** The current prospective analytical study was carried out in the Department of Pathology, Shyam Shah Medical College, Rewa, Madhya Pradesh, for a period of 15 months from January 2021 to March 2022 (15 months). A total of 100 cases were included in the study based on inclusion criteria. The results were analyzed based on cytological reporting and P value calculated. **Results:** Among the 100 cases studied highest number of cases were from the age group of 21–30 years with 29% (n=29). The most common breast laterality affected was left with 69% of affected cases. The maximum number of cases, 69% (n=69) of the total, were found to be categorized under the category C2 (benign) which was followed by Category C5 (Malignant) seen in 13% (n=13). About 9% (n=9) of the total cases were categorized as suspicious of malignancy (C4). Atypical Lesion (C3) and Unsatisfactory Lesions (C1) were categorized in 5% (n=5) and 4% (n=4) of the total cases, respectively. **Conclusion:** FNAC is a minimally invasive, quick, and efficient pre-operative diagnostic tool that can also be used for postoperative breast lump follow-up to prevent recurrences. FNAC using IAC Yokohama system is a rapid and effective method for the primary categorization of palpable breast lumps and provides better clarity to the clinicians in the management of the patient and can reduce unnecessary surgeries.

**Key words:** Breast; Fine-needle aspiration cytology; Yokohama

## INTRODUCTION

Breast cancer accounts for 25–32% of female cancers in all cities across India and is now the most common cancer in Indian women, having recently overtaken cervical cancer.<sup>1</sup> The incidence of breast carcinoma over worldwide is 10.4%, developed countries have a higher incidence.<sup>2</sup> In India, the incidence of breast cancer has increased by more

than 20% while mortality has increased by 145% due to rapid urbanization, changes in lifestyles and increased life expectancy.

A woman with a breast lump is one of the most prevalent presentations in the outpatient department with increasing public awareness of breast pathologies.<sup>1</sup> It's crucial for surgical pathologists to distinguish between benign and

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malignant breast lesions because a palpable breast lump presents with a diagnostic conundrum to surgeons<sup>2</sup> There has been a long-standing, highly successful, and widespread practice of fine-needle aspiration biopsy (FNAB) for palpable lesions and, more recently, for the assessment of mammographically and ultrasonographically detected lesions.<sup>3</sup> In the diagnosis of breast cancer, fine-needle aspiration cytology (FNAC) offers a high sensitivity of 90–99% and a high positive predictive value of 100% and a high degree of accuracy that is up to 96.2%.<sup>3</sup> FNAB offers significant benefits as a diagnostic test with its rapidity of diagnosis, low cost, high rate of acceptance by patients, low complication rates, virtually no contra-indications, and high accuracy.

The lack of a standardized reporting system has led to pathologists using various terminologies and diagnostic standards, which has confused clinicians when interpreting the cytopathology report and ultimately preventing definitive clinical management. In 2016, The International academy of cytology (IAC) Yokohama Breast FNA Reporting System has been developed by a group of experts in cytopathology assisted by oncologists, radiologists, and surgeons.<sup>4,5</sup> The goal of this international reporting system is to standardize reporting, which will enhance breast FNAB cytology performance, interpretation, and reporting. It will also improve communication between cytopathologists and clinicians by connecting the reporting system with recommended management options.<sup>6</sup>

Categories in Yokohama system of reporting with their risk of malignancy are:

- i. Insufficient/Inadequate-2.6–4.8%
- ii. Benign - 1.4–2.3%
- iii. Atypia - 13–15.7%
- iv. Suspicious - 84.6–97.1%
- v. Malignancy - 99–100%

The present study was undertaken to validate IAC Yokohama system and categorize FNAC diagnosis in the above-mentioned system to improve communication between cytopathologists and clinicians by connecting the reporting system with recommended management options.

### Aims and objectives

The aim of the study was to categorize FNAC cases according to The IAC Yokohama System with the objective to find out the prevalence of various benign and malignant lesions of breast presenting at SSMC and SGMH, Rewa.

## MATERIALS AND METHODS

The current prospective analytical study was carried out in the Department of Pathology, Shyam Shah Medical

College, Rewa, Madhya Pradesh, for a period of 15 months from January 2021 to March 2022 (15 months). After taking ethical clearance from the Institutional Ethical Committee, departmental records were checked, and all the details of the medico-legal autopsies conducted were included in the study.

### Inclusion criteria

The following criteria were included in the study:

- (1) Females with proper clinical history and other investigation.
- (2) Females with palpable breast lump/swellings.
- (3) Patients should be cooperative to the procedure and subsequent follow-ups.

### Exclusion criteria

The following criteria were excluded from the study:

- (1) Patients not willing (written informed consent taken).
- (2) Patients in past or presently undergoing chemotherapeutic treatment for breast cancer.
- (3) Patients with bleeding diathesis.
- (4) Patients without palpable breast lump.
- (5) Male patients with breast lumps.

In the present study, patient falling under inclusion criteria was studied. A total of 100 cases were included in the study and their clinical and radiological details were also taken into consideration. FNAC procedure was performed under all aseptic precautions after an informed consent stained using H&E, Giemsa and Papanicolaou stains and reported. The results obtained in cytology were categorized as per IAC Yokohama system for reporting breast cytology from category 1 to category 5.<sup>7-9</sup> The patients were followed up under proper coordination from department of surgery. If the patients were kept under observation and were considered for medical treatment only the results of cytology were recorded. If the patient was planned for a surgical procedure, the specimen was taken for biopsy. The percentage distribution of cases according to IAC Yokohama is shown in Table 1. Chi-square test for categorical data was used for calculation of P-value to assess statistical significance (Table 1).

## RESULTS

In the present study, highest number of cases were from the age group of 21–30 years with 29% (n=29), followed by 60 years with 5% of the cases (n=5). The youngest female with breast lump was of 15 years of age and the oldest one was 77 years old.

The most common age group with category (C1) unsatisfactory was younger females (<20 years), whereas the categorization for benign and atypical probably benign

lesions (C2) and (C3) were highest among 21–30 years of age group and 31–40 years age group, respectively.

Most malignant lesions were present in age group of 41–50 years followed by older women age group >60 years. No malignant cases were found in the present study in younger females (21–30 years and <20 years) (Table 2).

In the present study, the laterality distribution of breast lump was more common in the left side 69% (n=69) of total cases as compared to the right breast in 31% (n=31) (Table 3).

In the present study, upper and outer quadrant of the breast alone was the most frequently involved quadrant by breast lumps with 49% (n=49) of the total cases followed by lower and outer quadrant 19% (n=19) of the cases. Upper inner quadrant involvement was seen in 6% (n=6) of the cases, lower inner quadrant was involved in 3% of the cases (n=3). Breast lump was present in axillary tail in 3% (n=3) of the cases and the least number of cases were seen in central area (NAC) of the breast in 1% (n=1) of the total (Table 4).

In the present study, cytology reporting showed that the highest percentage of cases were fibroadenoma in 47% (n=47) of total cases followed by Carcinoma Breast in 13% (n=13) and Suspicious of Malignancy reported in 9% (n=9) of cases. Fibrocystic disease was reported in 4% (n=4), Phyllodes tumor, Acute mastitis, breast abscess seen in 3% (n=3) of cases each, atypical ductal hyperplasia, galactocele, granulomatous mastitis, lactational adenoma, sebaceous cyst seen in 2% (n=2) of cases each, duct ectasia, epithelial hyperplasia, lipoma, neurofibroma, nipple adenoma, and usual ductal hyperplasia seen in 1% (n=1) of cases each. About 2% (n=2) are reported as insufficient (Table 5).

In the present study, the maximum number of cases, 69% (n=69) of the total, were found to be categorized under the category C2 (benign) which was followed by Category C5 (Malignant) (Figure 1) seen in 13% (n=13). About 9% (n=9) of the total cases were categorized as suspicious of malignancy (C4) (Figure 2a). Atypical lesion (C3) (Figure 2b) and unsatisfactory lesions (C1) were categorized in 5% (n=5) and 4% (n=4) of the total cases, respectively (Table 1).

P<0.05 is considered as significant. In the present study, P-value obtained was 0.0001 which is very significant.

**Table 1: Cytological categorization as per Yokohama system (n=100)**

Yokohama category	Frequency	
	Numbers (n)	Percent
C1	4	4
C2	69	69
C3	5	5
C4	9	9
C5	13	13
Total	100	100

Chi-square = 100.00; P<0.0001

**DISCUSSION**

FNAC has significantly contributed to the reduction of excisional biopsies in the assessment of breast lesions. Accurate diagnosis of breast cancer is made in 99% of the cases by the combination of clinical examination, mammography, and FNAC. Although core needle biopsy is the preferred procedure, in developed countries but in

**Table 2: Age-wise categorization of breast lump cases (n=100)**

Age (completed age in years)	IAC Yokohama classification										Total n
	C1		C2		C3		C4		C5		
	n	%	n	%	n	%	n	%	n	%	
<20	2	50	22	31.88	0	0	0	0	0	0	24
21–30	1	25	27	39.13	1	20	0	0	0	0	29
31–40	1	25	17	24.64	3	60	2	22.22	1	7.69	24
41–50	0	0	2	2.9	0	0	2	22.22	7	53.85	11
51–60	0	0	1	1.45	1	20	3	33.33	2	15.38	7
>60	0	0	0	0	0	0	2	22.22	3	23.08	5
Total	4	4	69	69	5	5	9	9	13	13	100

**Table 3: Laterality distribution of breast lump cases (n=100)**

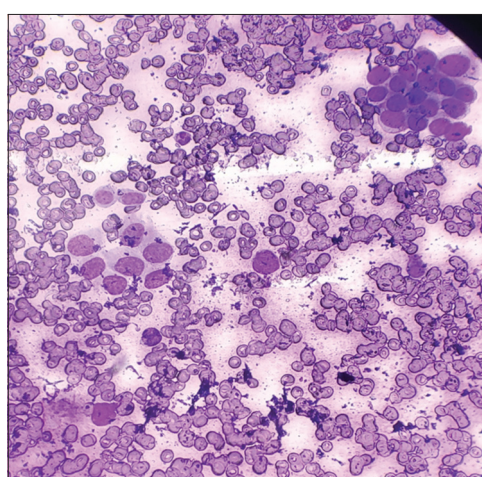
Laterality	IAC Yokohama classification										Total n
	C1		C2		C3		C4		C5		
	n	%	n	%	n	%	n	%	n	%	
Left	3	75	47	68.12	4	80	7	77.78	8	61.54	69
Right	1	25	22	31.88	1	20	2	22.22	5	38.46	31
Total	4	4	69	69	5	5	9	9	13	13	100

**Table 4: Quadrant wise distribution of breast lump cases (n=100)**

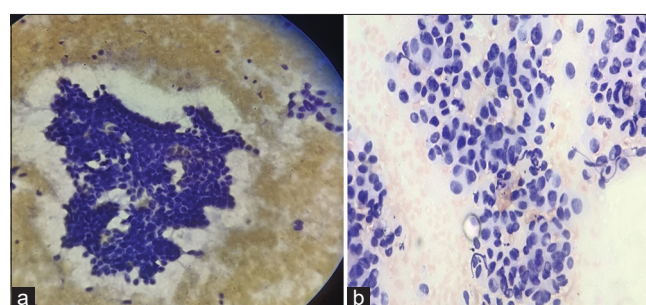
Location	IAC Yokohama classification										Total n
	C1		C2		C3		C4		C5		
	n	%	n	%	n	%	n	%	n	%	
Axillary tail	0	0	3	4.35	0	0	0	0	0	0	3
lower inner	0	0	3	4.35	0	0	0	0	0	0	3
Lower outer	1	25	15	21.74	1	20	1	11.11	1	7.69	19
NAC	0	0	1	1.45	0	0	0	0	0	0	1
Upper inner	0	0	5	7.25	0	0	0	0	1	7.69	6
Upper outer	2	50	38	55.07	1	20	3	33.33	5	38.5	49
More than one quadrant	1	25	4	5.8	3	60	5	56	6	46	19
Total	4	4	69	69	5	5	9	9	13	13	100

**Table 5: Spectrum of distribution of lesions in cytology**

FNAC report	IAC Yokohama										Total n
	C1		C2		C3		C4		C5		
	n	%	n	%	n	%	n	%	n	%	
Phyllodes	0	0	0	0	3	60	0	0	0	0	3
Acute mastitis	0	0	3	4.35	0	0	0	0	0	0	3
Atypical ductal hyperplasia	0	0	0	0	2	40	0	0	0	0	2
Breast abscess	0	0	3	4.35	0	0	0	0	0	0	3
Carcinoma breast	0	0	0	0	0	0	0	0	13	100	13
Duct ectasia	0	0	1	1.45	0	0	0	0	0	0	1
Epithelial hyperplasia	0	0	1	1.45	0	0	0	0	0	0	1
Fibroadenoma	0	0	47	68.12	0	0	0	0	0	0	47
Fibrocystic disease	0	0	4	5.8	0	0	0	0	0	0	4
Galactocele	0	0	2	2.9	0	0	0	0	0	0	2
Granulomatous mastitis	0	0	2	2.9	0	0	0	0	0	0	2
Insufficient	2	50	0	0	0	0	0	0	0	0	2
Lactational adenoma	0	0	2	2.9	0	0	0	0	0	0	2
Lipoma	1	25	0	0	0	0	0	0	0	0	1
Neurofibroma	1	25	0	0	0	0	0	0	0	0	1
Nipple adenoma	0	0	1	1.45	0	0	0	0	0	0	1
Sebaceous cyst	0	0	2	2.9	0	0	0	0	0	0	2
Suspicious of malignancy	0	0	0	0	0	0	9	100	0	0	9
Usual ductal hyperplasia	0	0	1	1.45	0	0	0	0	0	0	1
Total	4	4	69	69	5	5	9	9	13	13	100



**Figure 1:** MGG stained smear of breast lump. Malignancy: A 50-year-old female with breast lump showing low grade carcinomas where fragments are relatively cohesive and crowded with some nuclear overlapping, relatively monotonous, and moderately enlarged cells, showing round to pleomorphic shape, hyperchromasia, small nucleoli



**Figure 2:** H and E stained smears of breast lump. (a) ADH: A 40-year-old female with breast lump showing highly cellular smear having large epithelial tissue fragments consisting of ductal epithelial cells with myoepithelial cells. (b) Suspicious of malignancy: A 44-year-old female with breast lump on cytology showing moderate to highly cellular smear shows large 3-D epithelial tissue fragments with discohesive cells, minimally atypical or enlarged nuclei, pleomorphic nuclei

developing countries, where financial constraints play a major role, FNAC still plays a pivotal role being cheaper,



**Table 6: Distribution pattern of Yokohama categories in different studies**

Study→	Sankaye and Dongre <sup>10</sup> (%)	Muhammed et al. <sup>11</sup> (%)	Rocha et al. <sup>12</sup> (%)	Present study (%)
Sample size→	225	157	809	100
Categories				
Insufficient (C1)	13 (5.77)	3 (1.9)	71 (8.77)	4 (4)
Benign (C2)	131 (58.22)	112 (71.3)	615 (76.02)	69 (69)
Atypical (C3)	8 (3.55)	2 (1.3)	-	6 (6)
Suspicious (C4)	8 (3.55)	2 (1.3)	26 (3.21)	8 (8)
Malignant (C5)	65 (28.88)	38 (24.2)	97 (12)	13 (13)

less invasive with no added expenses and gives good results the same day. The present study showed similar result where highest percentage of cases were reported in benign category 69% (69/100) of all cases.

The previous studies conducted by Sankaye and Dongre,<sup>10</sup> Muhammed et al.,<sup>11</sup> and Rocha et al.<sup>12</sup> reported similar findings with maximum number of cases in Category (C2) benign with 58.2%, 71.3%, and 76.02% of total cases, respectively (Table 6). In the present study, fibroadenoma was most common benign breast lesion in 47% (47/100 cases) which was in agreement with study done by Risaldar et al.,<sup>13</sup> Ahmad et al.,<sup>14</sup> Khanzada et al.,<sup>15</sup> Akhator<sup>16</sup> and Irabor and Okolo.<sup>17</sup>

The involvement of left breast is slightly more in the present study showing 69% of distribution which is similar to the previous studies conducted by Agrawal et al.,<sup>4</sup> and Ahmad et al.,<sup>14</sup> with 51.2% and 51.79% distribution, respectively.

P-value is also calculated for present study and it is <0.0001 which is significant and it implies that the recognition of various Yokohama categories has largely been successful and is comparable to the established standards of IAC Yokohama and this has helped the department in giving appropriate guidance to the surgeons.

### Limitations of study

The primary limitation of this study is the absence of clinical and radiographic evaluation which are crucial for accurately detecting breast masses. This is particularly true in cases that have been classified as atypical or suspicious by cytology.

### CONCLUSION

FNAC using IAC Yokohama system is a rapid and effective method for the primary categorization of palpable breast lumps into benign, malignant, atypical, suspicious, and unsatisfactory categories.<sup>7-9</sup> It also provides better clarity to the clinicians in the management of the patient and can reduce unnecessary surgeries.

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#### Authors' Contributions:

**AG-** Concept and design of the study, prepared first draft of manuscript; **SSK-** Interpreted the results; reviewed the literature and manuscript preparation; **JJ-** Preparation of manuscript, interpretation, and revision of the manuscript; **LT-** Concept, coordination, statistical analysis and interpretation, preparation of manuscript and revision of the manuscript; **SUR-** Manuscript preparation; **RG-** Revision of the manuscript; **HM-** Revision of manuscript; **SS-** Revision of manuscript.

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