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Categorisation of Fine Needle Aspirates of Breast Lesions Using 'Yokohama Grading System for Reporting Breast Cytopathology' – A Retrospective Study In Tertiary Care Hospital

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ABSTRACT
BACKGROUND: *Breast lumps are common in women of all ages. FNAC is a simple, relatively painless, inexpensive OPD procedure with speedy results to differentiate benign from malignant lesions. The Yokohama System for Reporting Breast Cytopathology, consists of a five-category classification: category 1- insufficient material; category 2- benign; category 3- atypical, probably benign; category 4- suspicious for malignancy; and category 5- malignant.This categorisation by Yokohama system of reporting helps pathologist in the diagnostic clarity and guides clinician in the appropriate patient management, hence the need for this study.*
AIMS AND OBJECTIVES:
1.To categorise the Breast FNAC samples according to Yokohama system of reporting in our hospital.
2.To assess sensitivity, specificity, PPV, NPV and diagnostic accuracy.
MATERIALS AND METHODS:*Present study is a retrospective observational study on FNAC samples received during a period of one year(July 2021 to june 2022). All FNACs of breast lesions were retrospectively categorised using Yokohama Reporting system for Breast cytology.Clinical, radiological andhistopathological correlation have been done wherever possible. All FNAC samples that were received with a clinical diagnosis of breast lesion in the Department of Pathology, SVMC, Tirupathi were included in the study. Inadequate samples were excluded from the study.The aspirates of 180 breast lesions were analysed and categorized according to Yokohama grading system.*
RESULTS: *Out of 180 cases, histopathological correlation is available in 72 cases.When atypical, suspect, and malignant cases were regarded as positive test findings, maximum sensitivity (97%) was attained. Maximum diagnostic accuracy (97.5%) andthe highest specificity (100%) was noted when only malignant cases were treated as positive test results.*
CONCLUSION: *The IAC Yokohama system is an excellent system for accurately diagnosing breast fine needle aspirates with greater reproducibility of reports and better communication between the pathologist and clinician.*
KEY WORDS: *IAC Yokohama Grading System For Reporting Breast Cytopathology, Histopathological Correlation, Diagnostic accuracy.*

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I. Introduction:

Breast carcinoma is the most common cancer in females worldwide. It is the most common cause of cancer-related deaths in women in developing countries. In developed nations, it isthe second cause of cancer-related deaths subsequent to lung cancer.Fine needle aspirationis a simple, quick, affordable, and minimally invasive diagnostic test for both palpable and impalpable (under the supervision of ultrasound) breast masses. However, the use of core needle biopsies has been more widespread in recent years since they make it possible to assess both the histological grade and the hormonal status (oestrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor (Her2)).

For the diagnosis of breast cancer, FNAC has a high sensitivity of 90%–95% and a high positive predictive value ~100%.With the help of surgeons, oncologists, and radiologists, a group of knowledgeable cytopathologists created the IAC Yokohama Breast FNAC Reporting system. The Yokohama System for Reporting Breast Cytopathology, consists of a five-category classification: category 1- insufficient material; category 2- benign; category 3- atypical, probably benign; category 4- suspicious for malignancy; category 5- malignant.

To enhance the interpretation of breast cytology, a consistent reporting method has been devised. By connecting the reporting system with management alternatives, it also attempts to enhance communication between the cytopathologist and clinician.

The present study aims at classifying the breast FNAs according to the IAC Yokohama system and evaluating the diagnostic accuracy of different categories. Thesensitivity, specificity, PPV, and NPV were also assessed.

II. Materials And Methods:

A retrospective observational study done on FNAC samples received during a period of one year(July 2021 to June 2022).All FNACs of breast lesions were retrospectivelycategorised using Yokohama Reporting system for Breast cytology. Clinical, radiological and histopathological correlation have been done wherever possible. All FNAC samples that were received with a clinical diagnosis of breast lesion in the Department of Pathology, SVMC, Tirupathi were included in the study. Inadequate samples were excluded from the study. The aspirates of 180 breast lesions were analysed and categorized according to Yokohama grading system.

FNAC was performed using standard technique under aseptic precautions with the patients lying/sitting in a comfortable position. Two passes per case was performed using 10 ml syringe with 21-23G needle. In cases with bloody material and cystic swelling, further needling was performed. At least three smears were prepared on pre-cleaned slides using the standard one-step conventional methods and stained with H & E. Smears were examined under microscope after mounted with DPX (dextrene polystyrene xylene). Results thus obtained were subjected to statistical analysis.

The cases inthe insufficient category were excluded from further statistical analysis, as they could not be included in either negative or positive for malignancy. Using the histological diagnosis as thegold standard, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy were calculated.

The above ratios were calculated for the following groups–

Group A- Only the "malignant" category was regarded as a positive report.

Group B- All cases in the "malignant" and "suspicious of malignancy" category were regarded as positive formalignancy.

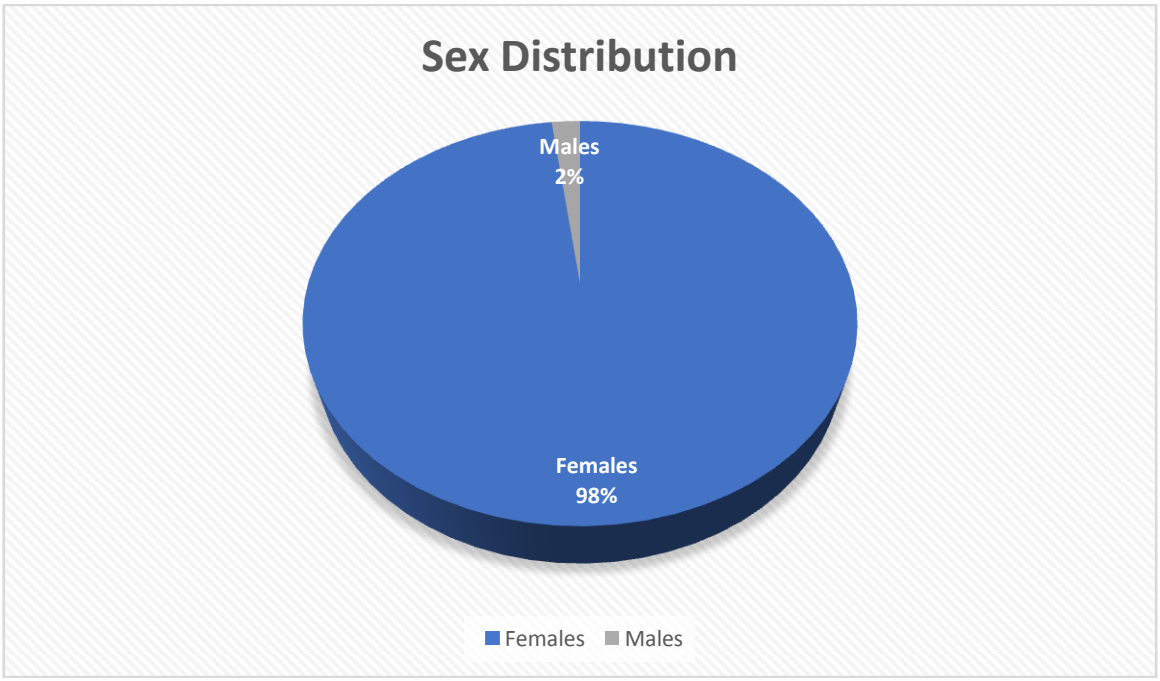
Group C- All cases in the "malignant," "suspicious of malignancy," and "atypical" categories were regarded as positive for malignancy.

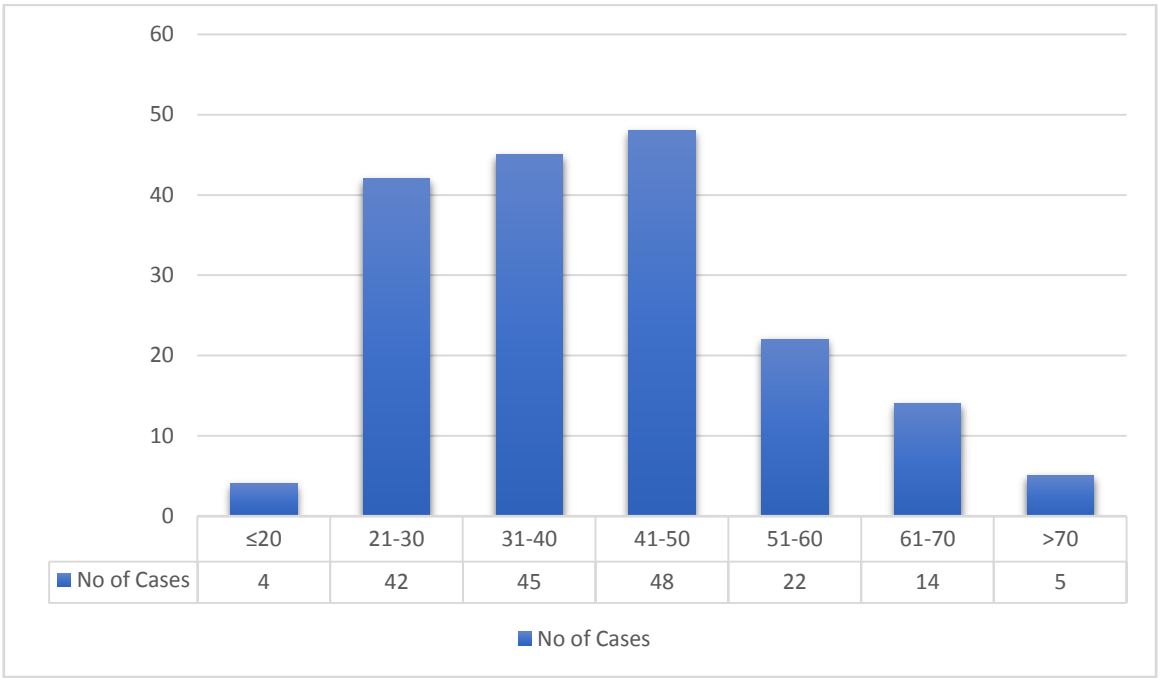
III. Results:

A total of 180 patients were included in this study. The fine needle aspirate result was categorized according to The Yokohama Grading system. Among them, 176 (97.7%) were females and 4 (2.3%) were males. Largest number of cases were seen in age group of 41-50 years (26.6%) followed by 31 – 40 years (23.3%).(Table 1).

Table 1: Age and Sex wise distribution of various breast lesions

Age	Males	Females	Total	%
≤20	1	3	4	2.40%
21-30	3	39	42	23.30%
31-40		45	45	25%
41-50		48	48	26.60%
51-60		22	22	12.20%
61-70		14	14	7.70%
>70		5	5	2.70%
Total	4	176	180	100%

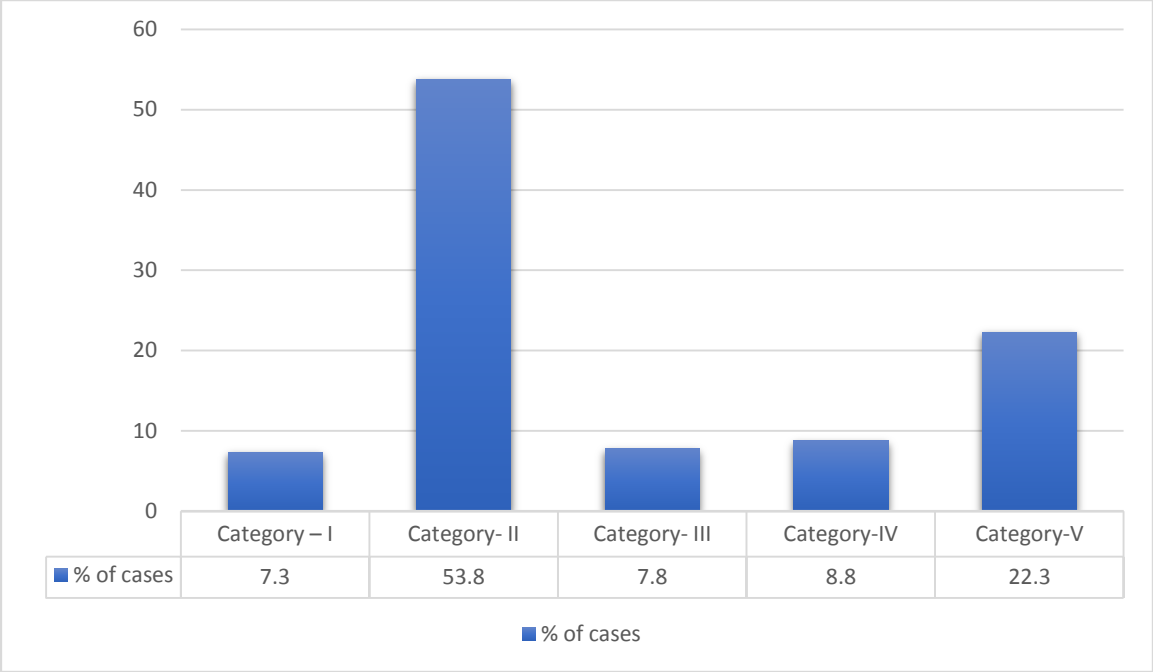




The 180 breast FNAs were categorized according to the IAC Yokohama System as follows:(Table 2)

Table 2: Distribution of various breast lesions according to Yokohama Grading System

Yokohama Category	FNAC results	Total	% of cases
Category – I	Insufficient material	13	7.3%
Category- II	Benign	97	53.8%
Category- III	Atypical, probably benign	14	7.8%
Category-IV	Suspicious for malignancy	16	8.8%
Category-V	Malignant.	40	22.3%
	Total	180	100%



In 72 cases (40%), histopathological correlation was available.The histopathological diagnoses for the breast lesions in different cytological categories were evaluated and aresummarized with cyto- histological correlation in [Table 3].

Table 3: Cytology Histology Correlation

	YOKOHAMA GRADING CATEGORIES				
HISTOLOGICAL DIAGNOSIS	INSUFFICIENT(category 1)	BENIGN(CATEGORY 2)	ATYPICAL(CATEGORY 3)	SUSPICIOUS OF MALIGNANCY(CATEGORY 4)	MALIGNANT(CATEGORY 5)
BENIGN	3(fibroadenoma-2, inflammatory lesion-1)	33(fibroadenoma-23,fibrocystic disease-3,abscess-1,chronic non specific mastitis-3,gynaecomastia-3)	8(benign phyllodes-5,fibroadenoma with usual ductal hyperplasia-3)	2 (fibroadenoma)	
MALIGNANT	1(invasive duct cell carcinoma)	1(invasive duct cell carcinoma)		1(invasive duct cell carcinoma)	23(invasive DCC-23)

Among the suspicious and malignant categories, invasive ductal carcinoma was the most common histological diagnosis, whereas in the benign category, fibroadenoma was the mostcommon. In the atypical category, the majority of the histological diagnoses were benign (fibroadenomas and benign phyllodes).
The sensitivity, specificity, PPV, NPV, anddiagnostic accuracy of the three groups are summarized in [Table 4].

	Group A (category malignant considered as positive)	Group B (category malignant and suspicious considered positive)	Group c (category malignant ,suspicious and atypical considered positive)
Sensitivity	92%	96%	97%
Specificity	100%	95.30%	76.70%
PPV	100%	92.30%	70.50%
NPV	95.50%	97.60%	97%
Accuracy	97.50%	95.50%	83.80%

Maximum diagnostic accuracy is achieved (97.5%) when malignant cases are considered positive for malignancy , whereas highest sensitivity is achieved (97%) whenmalignant, suspicious, and atypical are considered positive for malignancy.

IV. Discussion:

The "triple test" technique, which integrates clinical, radiographic, and pathological factors to provide a final diagnosis and direct patient therapy, should be used to examine all breast lesions. The triple test is typically composed of a clinical examination, a mammogram, and a FNAC. In the current situation, however, it also includes USG, particularly in the context of young women and core needle biopsy as a substitute for FNAC.

FNAC is a simple and cost-effective procedure with a quick turnaround time, but usage of core needle biopsy has gained popularity as it allows the assessment of histologicalgrade and hormonal status. When used in concordance with clinical and radiological findings, the sensitivity and specificity of FNAC is comparable to that of core needle biopsy.

FNAC has a very crucial role to play, especially in a tertiary care centre where it is not feasible to take an adequate number of core needle biopsies in each patient with a breastlump due to time and cost limitations and it is easier to perform in experienced hands and more cost-effective as compared to core needle biopsies.

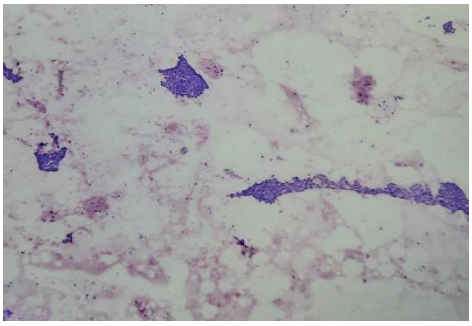
The use of a standardized reporting system will aid in the reproducibility of reports between different institutions and better patient care through improved communication betweenclinicians and pathologists.

In the present study, 180 fine-needle aspirates from the breast lesions were retrospectively categorized according to the IAC Yokohama Reporting System. Our study had 7.3% insufficient,53.8% benign, 7.8% atypical, 8.8% suspicious, and 22.3% malignant lesions, respectively. This distribution is similar to the results obtained by Kamataret al.[10] who had 5% C1, 71%C2, 1% C3, 2% C4, and 21% C5 lesions, respectively.

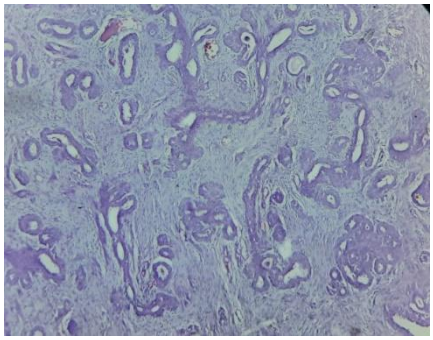
In the current study, the maximum sensitivity (97%) was achieved when atypical, suspicious, and malignant cases (Group C) were considered positive test results. However, theinclusion of atypical cases in positive results resulted in decreased specificity and accuracy. The highest specificity (100%) andmaximum diagnostic accuracy (97.5%) was seen when only malignant cases (Group A) were includedin positive test results. Wong et al.,Montezuma et al.,Agarwal et al.,and De Rosa et al. demonstrated similar findings.McHugh et al. observed highest sensitivity and specificity in similar scenarios, and theyobserved maximum accuracy when only malignant cases were considered as positive test results.

On histology, among the suspicious and malignant categories, invasive ductal carcinoma was the most common histological diagnosis[figure 2], whereas in the benign category, fibroadenoma[figure 1] was the mostcommon and the majority of the breast lesions in the atypical group were either fibroadenomas or low-grade phyllodes. On cytomorphology, it is difficult to distinguish between the two lesions. The classification of a fibroadenoma with focal usual ductal hyperplasia as proliferative breast disease with atypia was made possible by the presence of loose cohesive clusters with mild atypia and very few benign bipolar nuclei in the background . We were unable to provide a benign diagnosis in the two cases with cellular fibroadenomas included in the suspect group due to a lack of myoepithelial cells and mild epithelial atypia. Malignant lesions were mistakenly diagnosed as benign because of the low-grade atypia and limited cellularity that accompanied them.

Figure 1:

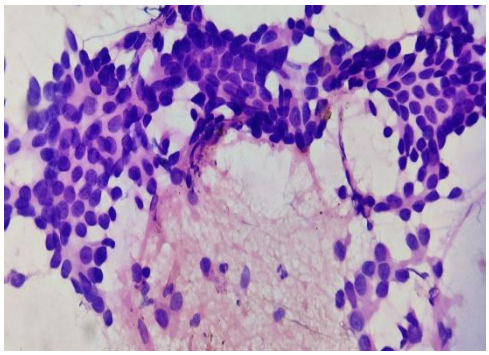


H&E 10X tight clusters of benign looking ductal epithelial cells with myoepithelial rimming

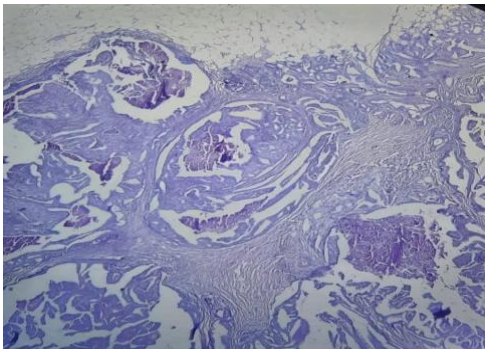


H&E 20X Fibroadenoma

Figure 2:



H&E 20X discohesive clusters of ductal epithelial cells with moderate nuclear enlargement with prominent nucleoli and lack of myoepithelial rimming



H&E 20X Invasive ductal cell carcinoma

The malignant lesion that was initially classified as benign may have been a result of a sampling error. Therefore, a core needle biopsy should be performed after any "triple test" parameter results that are inconsistent with two out of the three parameters. Atypical and suspicious are the two undetermined categories in the Yokohama System that allow for the classification of borderline lesions such atypical ductal hyperplasia, which are more likely to progress to cancer than benign lesions.

Similar to the Milan system for reporting salivary gland lesions and the Bethesda system for reporting thyroid cytopathology, the IAC Yokohama Reporting System for breast cytology offers a uniform reporting platform with higher consistency of reports. We advise using FNA to assess breast masses and then categorise them using the Yokohama system. Only in situations where the cytological diagnosis is abnormal, suspected, or malignant can the core needle biopsy be restricted.

V. Conclusion:

FNAC is a valuable tool for evaluating palpable breast lumps in poorly-resourced healthcare settings.This study revealed that women above the age of 40 years old are more likely to develop malignant breast lesions as opposed to less than 40 years old.The IAC Yokohama system is an excellent system for accurately diagnosing breast fine needle aspirates with greater reproducibility of reports and better communication between the pathologist and clinician.

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