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Histomorphological Corroboration of the Benign Category (C2) of the Yokohama System for Reporting Breast Cytology

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ABSTRACT

Background: Fine needle aspiration cytology (FNAC) is the preferred investigation tool for all palpable breast lumps. Benign lesions diagnosed on FNAC and their histopathological corroboration are essential to exclude any other associated lesions. This study aims to evaluate the spectrum of benign breast lesions, assess the risk of malignancy of Category 2, diagnostic accuracy of the Yokohama system and generate more data, as there is a paucity of literature from our area on studies in benign breast lesions specifically based on the newly proposed Yokohama system.

Methods: Our study was a cross-sectional study. Records of benign breast lesions diagnosed based on the Yokohama system for reporting breast FNAC and corresponding histopathological examination (HPE) during 1st January 2020 to 31st December 2023 were retrieved and included in the study.

Results: Out of 313 cases of breast FNACs diagnosed as the benign category, corresponding histopathological diagnoses were available in 104 cases (33.2%). The most common lesion was fibroadenoma (41.8%), followed by mastitis (14.3%). The risk of malignancy was found to be zero. However, in 19 cases, FNAC findings differed from or were supplemented by histopathological examination, resulting in a diagnostic accuracy of 81.7% for identifying benign breast lesions using the Yokohama Breast Cytology Classification System.

Conclusion: FNAC serves as a valuable tool in distinguishing between benign and malignant breast lesions; however, it may sometimes miss a focus with another lesion and provide a different diagnosis.

Key-words: Benign breast lesion, FNAC, Histopathological examination, Yokohama system

INTRODUCTION

The breast can be affected by a wide spectrum of disorders, ranging from inflammatory and benign lesions to carcinoma.[1] Benign diagnoses constitute 24-77.5% of breast FNACs and the associated risk of malignancy (ROM) in lesions diagnosed as benign on FNAC ranges from less than 1% to 3%.

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The psychological and financial burden of investigating benign breast disease to rule out malignancy is significant.[2] FNAC, the preferred investigation tool for all palpable breast lumps, is cost-effective, quick, and readily available, with negligible complications.[3-5] As a part of triple assessment, which includes imaging studies and clinical examination, FNAC is comparable to core needle biopsy (CNB).[4] The International Academy of Cytology (IAC) introduced the Yokohama system for reporting breast fine needle aspiration cytology in 2016 and categorized the breast cytology findings into five categories. Each category has a clear descriptive term, i.e., a definition, ROM and suggested management pathway.[2]

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Benign lesions diagnosed on FNAC and their histopathological corroboration are essential to exclude any other associated lesions. This study also aims to assess the ROM of Category 2, diagnostic accuracy of the Yokohama system and generate more data, as there is a paucity of literature from our area on studies in benign breast lesions specifically based on the newly proposed Yokohama system. This will also bridge the gap, which will help in enhancing the communication between the clinicians and the pathologist, resulting in better patient management.

MATERIALS AND METHODS

Place of Study- This was a retrospective observational study conducted in the Cytology and Histopathology Sections, Department of Pathology, RIMS, Imphal, for a period of two months from 1st October to 30th November 2024.

Inclusion Criteria- All consecutive cases of breast lumps diagnosed by FNAC as Category 2 of the Yokohama system for reporting breast cytology from 1st January 2020 to 31st December 2023 and their corresponding histopathological cases were included.

Exclusion Criteria- Cases from male patients and those with incomplete clinical and pathological data were excluded.

Data Collection- Samples were collected as per the inclusion and exclusion criteria. Records and registers, Giemsa- and Haematoxylin & Eosin-stained sections, and paraffin blocks of the study population were retrieved from the archive. Demographic and clinical characteristics such as age, laterality, size of lesion, cytological, and histopathological findings were collected and analysed. All data of the pathological findings were re-assessed and compared with the original reports.

Methods- Cytology smears were evaluated and reported according to the International Academy of Cytology Yokohama System for Reporting Breast Fine Needle Aspiration Cytology [2]. Histopathological examination (HPE) of tissue specimens was performed and interpreted based on standard histopathology criteria as described in authoritative surgical pathology textbooks [6].

Statistical Analysis- The data were analysed using IBM SPSS Statistics Version 21 software. Descriptive statistics, such as mean values, were used for continuous variables like age and lesion size. Percentages were used for categorical variables like laterality, cytological diagnosis, and histological diagnosis. Diagnostic accuracy and the Risk of Malignancy (ROM) for Category 2 of the Yokohama system were also calculated.

Ethical Issues- The study was carried out after obtaining approval from the Research Ethics Board, RIMS, Imphal (REB NO: A/206/REB/Prop(Fp)244/172/28/2024). Appropriate measures were taken to ensure the confidentiality and privacy of patient information.

RESULTS

In the present study, FNAC was used to diagnose a range of benign breast lesions categorized under Category 2. Among the 313 cases analyzed, fibroadenoma emerged as the most frequently diagnosed lesion, accounting for 41.8% of all benign findings. This was followed by mastitis (14.3%) and benign proliferative breast lesions (11.8%), while other less common but clinically significant entities, such as galactocele, lactating breast, duct ectasia, and subareolar duct papillomatosis were also observed. These results highlight the diverse presentation of benign breast pathology detectable through FNAC and its reliability in initial diagnosis (Table 1).

Table 1: Distribution of breast lesions diagnosed by FNAC

Cytodiagnoses	Total no. of cases	Percentages (%)
Fibroadenoma	131	41.8
Mastitis	45	14.3
Benign Proliferative breast lesions	37	11.8
Fibrocystic changes	34	10.9
Inflammatory lesions	22	7
Fat necrosis	15	4.8
Galactocele	9	2.9
Fibroadenoma with usual ductal hyperplasia	8	2.5
Lactating breast	6	1.9
Epithelial hyperplasia	5	1.6
Subareolar duct papillomatosis	1	0.3

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To assess the diagnostic accuracy of FNAC, 104 cases were further correlated with histopathological examination (HPE). Of these, 76 cases (81.7%) showed complete concordance between the FNAC and HPE findings. In 19 cases, minor discrepancies were noted, such as the presence of additional components like atypical ductal hyperplasia or phyllodes tumor identified histologically. Notably, none of the cases were found to be malignant on histopathology, resulting in a Risk of Malignancy (ROM) of 0%. These findings demonstrate that FNAC is a highly accurate tool for diagnosing benign breast lesions and plays an important role in triaging patients (Table 2).

Table 2: Corroboration of cytological and histological diagnoses

Cytodiagnoses	Histodiagnoses	Total cases
Fibroadenoma	Fibroadenoma	76
Fibroadenoma with usual ductal hyperplasia	Fibroadenoma with usual ductal hyperplasia	2
Benign proliferative breast lesion	Benign proliferative breast lesion	2
Fibrocystic disease	Fibrocystic disease	3
Chronic mastitis	Chronic mastitis	2
Fibroadenoma with usual ductal hyperplasia	Fibroadenoma with atypical ductal hyperplasia	1
Fibroadenoma	Fibroadenoma with atypical ductal hyperplasia	4
Fibroadenoma	Tubular adenoma	1
Fibroadenoma	Phyllodes	1
Epithelial hyperplasia	Complex fibroadenoma	1
Usual ductal hyperplasia	Fibroadenoma with both usual ductal hyperplasia and atypical ductal hyperplasia	1
Benign proliferative breast lesion	Fibrocystic disease of breast	3
Benign proliferative breast lesion	Sclerosing adenosis	1
Benign proliferative breast lesion	Atypical ductal hyperplasia	2
Fibrocystic disease	Fibrocystic change with focal usual ductal hyperplasia	2
Mastitis	Granulomatous mastitis with both usual ductal hyperplasia and atypical ductal hyperplasia	1
Caseating granulomatous mastitis	Fat necrosis	1

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Fig. 1 presents a pie chart showing the distribution of different benign breast lesions diagnosed by FNAC, with fibroadenoma comprising the majority, followed by mastitis and benign proliferative lesions. Fig. 2 illustrates a bar diagram representing the frequency of various benign breast lesions, clearly indicating fibroadenoma as the most common. Fig. 3 shows the age-wise distribution of cases, with the highest number of benign breast lesions observed in the 21–30 years age group. Fig. 4 compares FNAC diagnoses with histopathological diagnoses, highlighting both concordant and discordant cases. Fig. 5 demonstrates the risk of malignancy (ROM) in Category 2 lesions according to the Yokohama System, showing no malignant cases and thus a ROM of zero. Fig. 6 compares the diagnostic accuracy of FNAC from the present study with findings from similar studies, showing high consistency and validity. Fig. 7 provides a flowchart summarizing the methodology and patient inclusion process used in the study. Fig. 8 features representative cytological images from FNAC smears, such as those of fibroadenoma and benign epithelial lesions. Fig. 9 includes histopathological microphotographs correlating with the FNAC findings, confirming the benign nature of the lesions. Finally, Fig. 10 presents a schematic diagram outlining the FNAC technique and its diagnostic steps, offering visual guidance on the procedure's advantages in evaluating breast lumps.

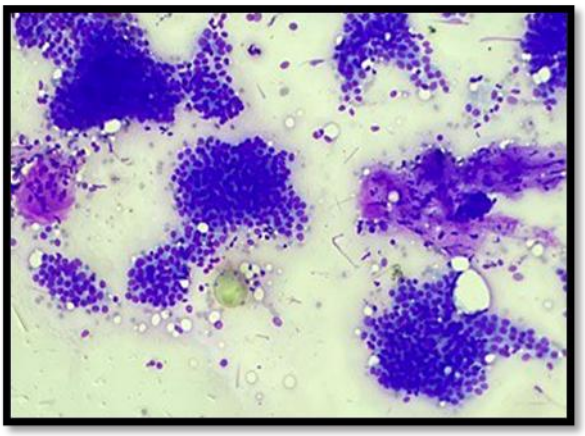

Fig. 1: Fibroadenoma (100X, Giemsa stain)

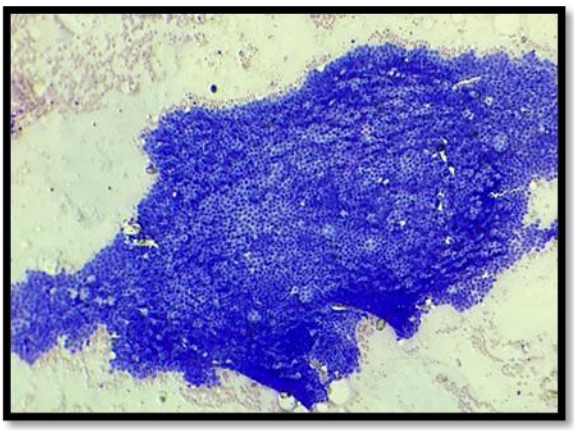

Fig. 2: Usual ductal hyperplasia (100X, Giemsa stain)

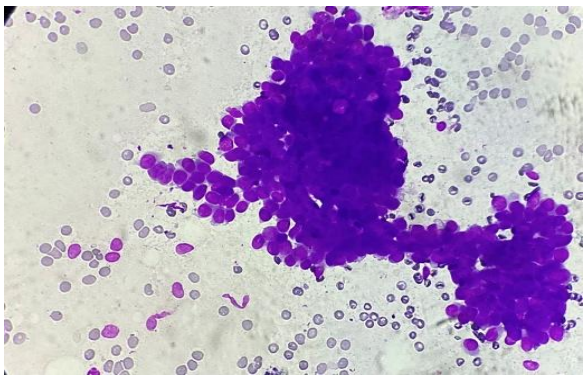

Fig. 3: Benign proliferative lesion (400X, Giemsa stain)

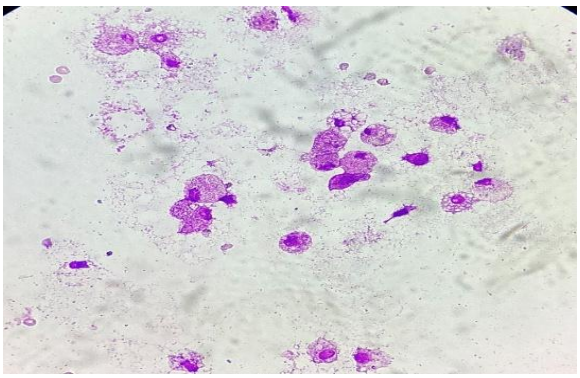

Fig. 4: Galactocele (400X, Giemsa stain)

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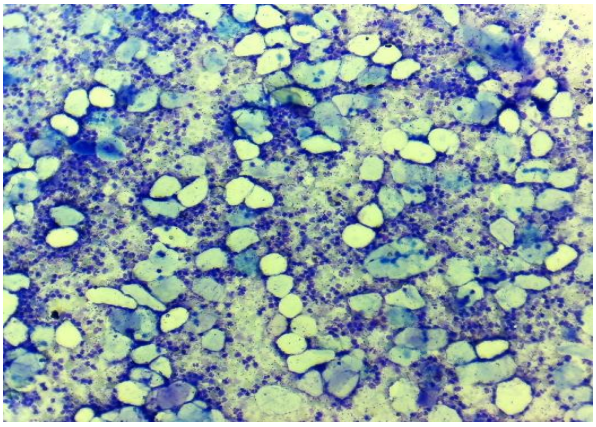

Fig. 5: Sub-areolar abscess (200X, Giemsa stain)

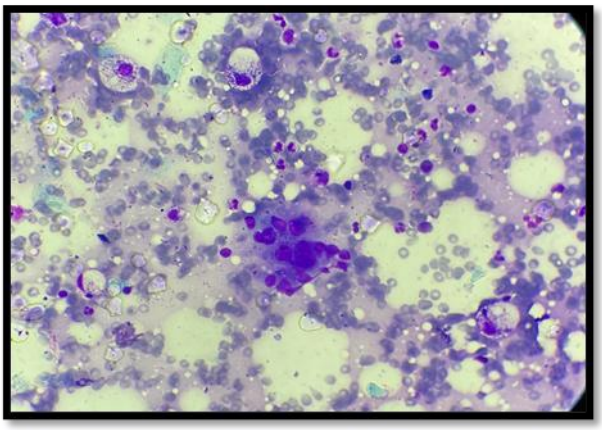

Fig. 6: Fibrocystic disease of breast (400X, Giemsa stain)

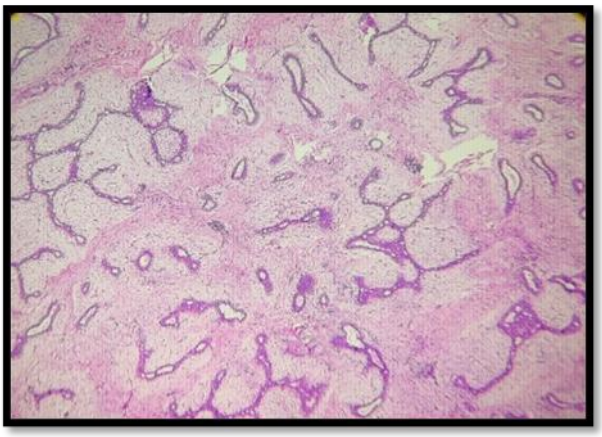

Fig. 7: Fibroadenoma (100X, H&E stain)

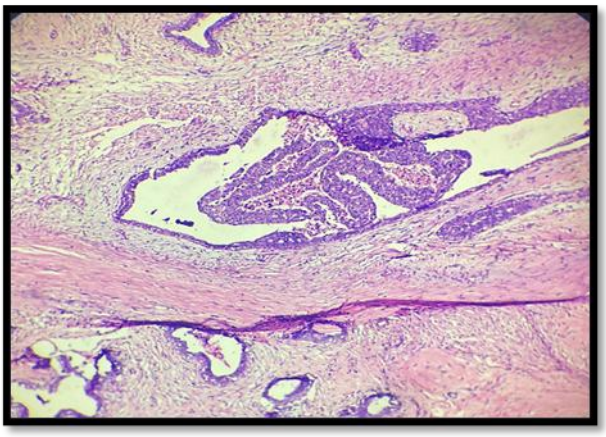

Fig. 8: Fibroadenoma with usual ductal hyperplasia (200X, H&E stain)

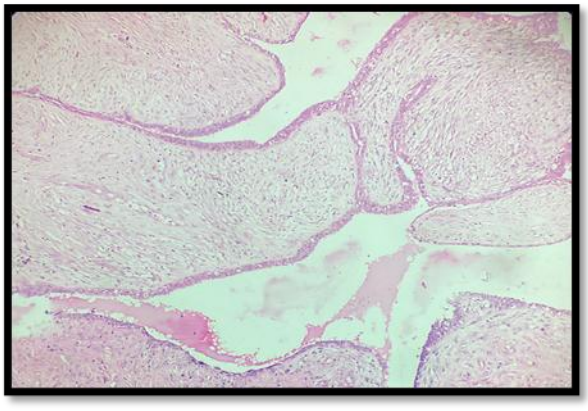

Fig. 9: Benign phyllodes tumor (100X, H&E)

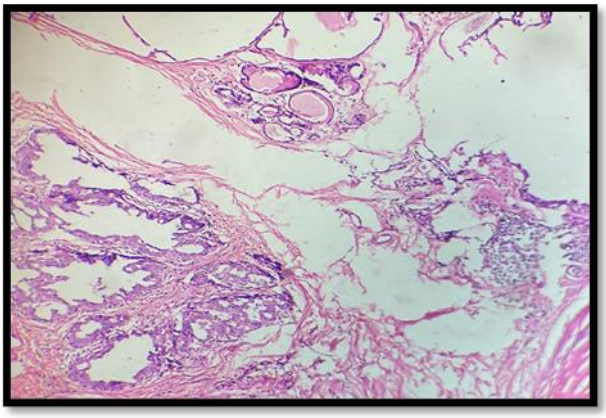

Fig. 10: Fibrocystic change with epithelial hyperplasia (100X, H&E)

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DISCUSSION

Fine needle aspiration cytology is one of the preferred investigative tools for all palpable breast lumps and it is almost comparable to core needle biopsy (CNB)[1,2]. However, histopathological examination remains the gold standard method of diagnosis.[6] The IAC Yokohama system for reporting breast lesions classifies them into five categories, effectively addressing the diagnostic grey zone between benign and malignant entities. [2,7] This system also facilitates a standardized reporting format and management protocol, promoting consistency across institutions and enhancing communication between surgeons and pathologists. [7-11]

Our study included a total of 313 cases of benign breast lesions diagnosed by FNAC, and histopathological corroboration was done in 104 cases. The biopsy rate was 33.2% which was higher than the study done by Sankaye *et al.* [3] (22.1%) and Gore *et al.* [12] (17.5%). In our study, the most common presentation was a palpable breast lump, which was like the findings of Embaye *et al.* [13] Higher incidence of involvement in the left breast was shown by our study, whereas Sankaye *et al.*[3] observed equal involvement of both breasts.

Table 3: Comparison between different studies

Study parameters	Sankaye *et al.* [3]	Velu *et al.*[5]	Sharif *et al.* [14]	Panjvani *et al.* [15]	Rathi *et al.* [16]	Present study
Year	2014	2016	2020	2013	2013	2024
Region	Maharashtra, India	Puducherry, India	Sargodha, Pakistan	Ahmedabad, India	Agra, India	Manipur, India
Total no of benign cases	131	60	54	144	101	313
Most common type of benign lesion	Fibroadenoma (46.5%)	Fibroadenoma (65%)	Fibroadenoma (44.4%)	Fibroadenoma (30.18%)	Fibroadenoma (36.1%)	Fibroadenoma (41.8%)
Most common age group	19-50 years	20-29 years	31-40 years	21-30 years	-	21-30 years > 31-40 years

In our study, the most common benign lesion of the breast was fibroadenoma (41.8%), which was similar to the findings of the studies done by other authors mentioned in Table 3. Most cases occurred in individuals aged 21-30 years, followed by those aged 31-40 years, aligning with the observations of Panjvani *et al.* [15], Velu *et al.* [5] and Sharif *et al.* [14]

The risk of malignancy was found to be zero in our study, as no malignancy was found in HPE. Sharif *et al.* [14], Panjvani *et al.* [15] and Velu *et al.* [5] also found that the risk of malignancy was low: 1.8%, 2.2% and 3.3% respectively. However, Sankaye *et al.* [3] and Gore *et al*. [12] got higher risk of malignancy: 10.3% and 25%, respectively.

The diagnostic accuracy of FNAC in differentiating benign from malignant breast lesions was 100% in our study. Sharif *et al.* [14], Panjvani *et al.* [15], Velu *et al.* [5] and Das *et al.* [17] also found high diagnostic accuracy (98.2%, 97.8%, 96.7% and 94.5% respectively). However, Sankaye *et al.* [3] and Gore *et al.* [12] found it to be 89.7% and 75%, respectively.

In this study, 19 cases had either different diagnoses or additional findings on histopathological examination. Therefore, the diagnostic accuracy of FNAC in diagnosing benign categories of the Yokohama breast reporting system was 81.7%. Das *et al.* [17], Velu *et al.* [5] and Sankaye *et al.* [3] got 94.5%, 91.7% and 58.6% diagnostic accuracy in diagnosing benign breast lesions.

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These differences in diagnostic accuracy might be because of inadequate aspiration or missed aspiration from the foci having different lesions/ malignancies. Differing sample sizes of the studies might have also contributed to these differences in the diagnostic accuracy. A successful breast FNAC procedure hinges on correct technique and well-prepared smears. Suboptimal technique remains a leading cause of quality assurance challenges.[18]

STRENGTH

The main strength of our study was that it provided the diagnostic accuracy of FNAC in diagnosing benign breast lesions and it also provided valuable information about the different spectrum of benign breast diseases in our region.

LIMITATIONS

A total of only 104 cases were available for corroboration of cytodiagnoses with histopathological diagnoses due to the limited study period. Also, most of the FNACs were done as a blind procedure.

CONCLUSIONS

FNAC effectively differentiates benign from malignant breast lesions, thereby reducing unnecessary surgeries. However, it may sometimes miss coexisting lesions and yield a different or additional diagnosis. The Yokohama System, with a diagnostic accuracy of 81.7%, plays a crucial role in addressing the grey zone areas. Multiple aspirations from different sites of the lesion could have increased the diagnostic accuracy in diagnosing breast lesions. If feasible, ultrasonography-guided FNACs are recommended.

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