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Utilizing the Yokohama System of the International Academy of Cytology to Report Breast Fine Needle Aspiration Cytology

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ABSTRACT

Background- According to the most recent GLOBOCAN figures, breast cancer has become the most frequent cancer globally and is ranked sixth in terms of cancer death. The most reliable, safest, least intrusive, and economical method for evaluating palpable and nonpalpable breast lesions is breast fine-needle aspiration (FNA). It is best interpreted in conjunction with the other "triple test" elements in a multidisciplinary setting.

Methods- For two years, the hospital's pathology data were checked for cases with breast FNAB. Additionally gathered and documented was the related clinicopathologic data, which included lesion diameters, patient demographics, and histologic and/or radiologic follow-up. The best way to diagnose histology was either by lumpectomy, mastectomy, or core needle biopsy (CNB). The lesion sampled by FNAB has to be the same as the CNB.

Results- Of the 90 female breast FNACs in total, the majority (56%) were aged 21 to 40. A palpable breast lump was the most common presenting symptom (66.7%), and in 61.1% of cases, the Upper Outer Quadrant (UOQ) was affected. Of the ninety instances, sixty-five (72.2%) were benign, fifteen (16.7%) were malignant, and ten (11.1%) were not well enough to be diagnosed.

Conclusion- The IAC Yokohama system offers exceptional accuracy for breast FNA, with high specificity and sensitivity for all tumors, all situations, and every examined BIRADS category.

Key-words: Breast cytology, CNB, FNA, IAC system, Yokohama system

INTRODUCTION

Based on the most current GLOBOCAN statistics [1], breast cancer is currently the most frequent cancer globally and ranks sixth in terms of cancer-related mortality. Within a multidisciplinary setting, breast fine-needle aspiration (FNA) is a safe, accurate, low-invasive, and economical way to evaluate breast lesions that are palpable and nonpalpable.

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Combining the radiological and clinical examination components with the "triple test" yields the best understanding [2]. But core-needle biopsy (CNB) has largely replaced it, especially when it comes to breast cancer screening programs [3]. Due to this, several laboratories have restricted the use of FNA to specific scenarios, such as the examination of cystic lesions or cases with a low clinical suspicion of cancer [4].

The Yokohama technique for reporting breast FNA biopsy was recently devised by the International Academy of Cytology (IAC) to standardize reporting and enhance clinician communication. Five reporting categories are available in the system: malignant, atypical, suspicious, benign, and insufficient. Each group is associated with a unique risk of malignancy (ROM) and

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corresponding recommended therapy. We set out to look into the following because this novel system has never been the focus of a meta-analysis before: Locate each reporting category's pooled ROM in the Yokohama system. Apply the Yokohama technique to evaluate the breast FNA's diagnostic accuracy in detecting cancer [5].

An expert panel was gathered by the International Academy of Cytology (IAC) to discuss the IAC Yokohama System for Reporting Breast Fine Needle Aspiration Biopsy Cytopathology. This recommended practice [6] offers a thorough and uniform process for reporting breast FNAB. The approach includes a five-level classification method: malignant, atypical, presumably benign, benign, suspicious for malignancy, potentially invasive or in situ cancer (suspicious), insufficient material, and malignant [7]. Two different variables were assessed in this study. Initially, the risk of malignancy (ROM) rate for each group of breasts FNAB patients at our facility was determined using the algorithm. Second, an evaluation of the impacts of various pathologist proficiency and system familiarity levels was carried out.

MATERIALS AND METHODS

For two years, the hospital's pathology data were checked for cases with breast FNAB. Additionally gathered and documented was the related clinicopathologic data, which included lesion diameters, patient demographics, and histologic and/or radiologic follow-up. The best way to diagnose histology was either by lumpectomy, mastectomy, or CNB. The lesion sampled by FNAB has to be the same as the CNB. A benign finding on follow-up mammography or breast ultrasonography imaging that revealed Breast Imaging Reporting and Data System category 2 was used as a stand-in for a benign histologic counterpart for patients without a histologic examination. A benign diagnosis on a repeat FNAB of the same lesion consistent with the triple evaluation, a stable lesion or one that was declining in size at least six months after FNAB, or the latter two criteria could be used as an alternative.

Inclusion criteria- The study included all female patients with informed permission who arrived with a breast lump for FNAC, regardless of age. The study also took breastfeeding women with breast lumps and female patients with recurring breast lumps.

Exclusion criteria- Patients who just had nipple discharge and cytological examinations performed on freshly prepared nipple smears were excluded. The study also excluded patients who could not tolerate the minimally invasive FNAC treatment or had co-morbidities.

Methodology- Under ultrasound guidance, FNAB was performed by radiologists, surgeons, or oncologists. 22- to 23-gauge needles were placed in holders and used to fill 10-mL syringes after the needles had penetrated the lesion. Next, a mild suction was used. The suction was kept in place as the needles were moved back and forth. There were two passes made to one. Most of the time, direct smears were made from the aspirates, fixed with alcohol, and stained with any combination of Papanicolaou and/or hematoxylin-eosin. In other instances, the mixture was centrifuged for five minutes at 600 rpm using Shandon Cytospin III (Thermo Scientific, Waltham, Massachusetts) to prepare the cytospin. Our organization did not employ a rapid on-site inspection technique.

After being retrieved, every cytologic preparation was examined. The following five categories—insufficient, benign, atypical, probably benign, suggestive for malignancy, and malignant—were used to classify the patients. The histologic details and clinical characteristics of each instance were unknown to the authors.

The four readers' initial results (set 1) were gathered and noted individually. A consensus diagnosis (set 2) was then reached. When all four readers diagnosed a case, such diagnosis was considered the consensus diagnosis. When the four readers couldn't agree on a case, they discussed it with another author, looked at it using a multiheaded microscope, and agreed on the final cytologic category.

Statistical Analysis- The statistical analysis was done using SPSS version 26. A p-value was considered statistically significant if it was less than 0.05.

Ethical Approval- The ethics committee or institutional review board granted ethical approval before the study started.

RESULTS

Of the ninety-nine female breast FNACs, the majority (56%) were aged 21 to 40. Of the 90 instances, 10 (11.1%) were not well enough to be diagnosed, 15

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(16.7%) were malignant, and 65 (72.2%) were benign (Table 1). Most benign lesions were seen in females under 40, whereas a higher percentage of malignancies was found in females over 40.

Table 1: Age-wise distribution of breast lesions.

Age (years)	Benign	Malignant	Non diagnostic	Total cases	Percentage
<10	0	0	0	0	0
11-20	8	0	0	8	8.9
21-30	17	0	4	21	23.3
31-40	22	5	2	29	32.2
41-50	7	4	2	13	14.5
51-60	6	3	1	10	11.1
61-70	4	2	1	7	7.8
71-80	0	1	0	1	1.1
81-90	1	0	0	1	1.1
Total	65	15	10	90	100

The most frequent presenting symptom (66.7%) was a palpable breast lump, which was followed in 13.3% of cases by a painful breast lump. The other symptoms included breast discomfort, a breast lump with nipple discharge, and a breast lump with nipple retraction (Table 2).

Table 2: Clinical presentation of breast lesions.

Clinical presentation	Total cases	Percentage
Palpable breast lump	60	66.7
Pain in breast	8	8.9
Breast lump with pain	12	13.3
Breast lump with nipple discharge	4	4.4
Breast lump with nipple retraction	6	6.7
Total	90	100

The breast's upper outer quadrant (UOQ) was damaged in 61.1% of cases. There was no appreciable variation in the involvement of the right and left breasts (50 and 44.4%, respectively), and only 5 cases (5.6%) were bilateral (Table 3).

Table 3: Breast quadrant involvement of breast lesions.

Breast quadrant	Total cases	Percentage
Upper outer quadrant	55	61.1
Upper inner quadrant	20	22.3
Lower outer quadrant	9	10
Lower inner quadrant	3	3.3
Central quadrant	3	3.3
Total	90	100

The data presented in table 4 shows the distribution of breast lesions based on the side of involvement. There were 152 benign lesions on the right side, accounting for 50% of all cases on that side. Malignant lesions on the right side included 28 cases, with 10 non-diagnostic cases.

There were 126 benign lesions on the left side, representing 44.4% of all cases on that side. Malignant lesions on the left side included 24 cases, with 21 non-diagnostic cases. Bilateral involvement showed 19 cases of benign lesions, making up 5.6% of all cases in this category.

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Table 4: Distribution of breast lesions based on side of involvement

Side of breast involved	Total cases	n (%)
Right	Benign-152	45 (50)
	Malignant-28	
	Non diagnostic-10	
Left	Benign-126	40 (44.4)
	Malignant-24	
	Non diagnostic-21	
Bilateral	Benign-19	5 (5.6)
	Non diagnostic-1	

The data from table 5 presents the distribution of breast lesions according to the IAC Yokohama system. Within the C1 category, which signifies Insufficient/Inadequate samples, there were 8 cases, accounting for 8.9% of the total. Moving on to the C2 category, classified as benign lesions, the most common type was fibroadenoma with 70 cases (77.8%), followed by fibrocystic disease with 46 cases, fibroadenosis with 31 cases, abscess with 19 cases, granulomatous mastitis with 16 cases, fat necrosis with 5 cases, lactational adenoma with 4 cases, phyllodes tumor with 2 cases. In the C3 category denoting atypia-probably benign lesions, papillary lesion with atypia was observed in 164 cases (4.4%). The C4 category labeled suspicious for malignancy had ductal carcinoma as the predominant type with 102 cases (2.2%). Lastly, in the C5 category representing malignant lesions, ductal carcinoma was again prevalent with 34 cases (6.7%).

Table 5: Distribution of breast lesions according to IAC Yokohama system.

IAC category	Type of breast lesions	n (%)
C1 (Insufficient/Inadequate)	-	8 (8.9)
C2 (Benign)	Fibroadenoma-158	70 (77.8)
	Fibrocystic disease-46	
	Fibroadenosis-31	
	Abscess-19	
	Granulomatous mastitis-16	
	Fat necrosis-5	
	Lactational adenoma-4	
	Phyllodes tumor-2	
C3 (Atypia-Probably benign)	Papillary lesion with atypia-16	4 (4.4)
C4 (Suspicious for Malignancy)	Ductal carcinoma-10	2 (2.2)
C5 (Malignant)	Ductal carcinoma-34	6 (6.7)
	Mucinous carcinoma-6	
	Apocrine carcinoma-2	

Fibroadenoma accounted for 41% of all the lesions, making it the most common. Approximately 94.3% of individuals with fibroadenoma were under 40 years old and in the reproductive age range. The chance of having a malignant breast lesion was significantly correlated ($p<0.0001$) with the patient's age over 40, according to the results of the Pearson Chi-square test (Table 6).

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Table 6: Correlation between patients' age and risk of malignancy.

Patientsage	Numberof cases	High risk for malignancy (C4,C5)	Low risk for malignancy (C1,C2,C3)	Chi- square value	p-value
<40 years	65	3	60	74.5	<0.0001 (Highly significant)
>40 years	25	7	20		
Total	381	10	80		

DISCUSSION

One of the most common fine needle aspiration cytology (FNAC) procedures performed globally is on the breast. Using ultrasound guidance, had a long history of effectiveness with both palpable and impalpable lesions [8–13]. Breast lesions are among the sites that FNAC samples the most commonly in developing and impoverished countries. In particular, inexperienced pathologists encountered analytical problems while interpreting breast cytology; therefore, cytopathology training is necessary to eliminate these mistakes [14,15]. The "grey zone" in breast FNAC is home to a variety of diseases, from malignant illnesses like cancer to benign ones like proliferative fibrocystic disease and sclerosing adenosis [16]. It was necessary to provide a standardized and organized reporting system with checklists of cytological features for individual lesions based on an analytical method that combines high-power and low-power cytological characteristics with pattern recognition [17].

In 2016, the "International Academy of Cytology Executive Council" established a "Breast Group" that included cytopathology, surgery, surgical pathology, radiology, and oncology specialists. The group's objectives are to improve the breast FNAC reporting system, encourage the proper use of FNAC in breast lesions, improve communication between the clinical care team and cytopathologist, and support upcoming patient-beneficial FNAC-based breast disease research [18].

Breast lesions are categorized by the International Academy of Cytology (IAC) into five types, each with a thorough description, a ROM, and a categorization. Then, the ROM is connected to suggestions made by managers. To manage patients with breast lesions successfully, the system also highlights how crucial it is for breast FNAC specialists to be proficient in making slide smears, conducting biopsy operations, and analyzing slide material. This requires straightforward guidance and open communication with medical experts [19].

After identifying that each of the five categories reflects a unique risk of malignancy, the breast group developed best-practice approaches for each category. This procedure considered the notable differences in the accessibility of imaging, core needle biopsy (CNB), surgical pathology, and treatment options across developed and developing nations. The management algorithms of these best-practice standards will consider the FNAC and CNB obligations, while also considering the notable differences in medical infrastructure [20].

Ninety-nine individuals had FNAC for breast masses; 48 of these cases were classified into the four groups of the Yokohama approach based on biopsy or histological confirmation. These results are based on the breast cytology IAC Yokohama reporting technique. For a cytomorphological diagnosis, slides that are poorly smeared, sparsely cellular (i.e., do not meet the adequacy criterion), or improperly fixed are considered insufficient or inadequate.

Six of the 19 instances that made up the current study had a histology connection, and two of those cases were subsequently determined to be malignant. Our study had a ROM of 33.3%, which was more significant than Montezuma's research [21]. which was comparable to Hoda at 4.8% (2.6%) and Tejeswini [22] (22.22%). Inadequate FNAC might result from technical issues or the kind of lesion. ROM could not be created since a non-representative yield would raise cancer risk. Wang therefore concluded that the following strategies would help lower the likelihood that insufficient samples will be interpreted incorrectly: aspirator proficiency, radiographic guided FNAC, additional repeated aspirates using the Rapid On-Site Evaluation (ROSE) technique, and immediate cytological evaluation [23].

Categorized II cases show clear benign cytological features that may or may not point to a specific benign

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lesion. This group includes neoplasms, infections, inflammatory lesions, benign cysts, and epithelial hyperplasia. Montezuma and Tejeswini believe this are the most prevalent group in the current investigation [21,22]. There were 142 instances in this category. Upon histology, none of the 142 instances were found to be malignant. The ROM was 0%, lower than what Tejeswini and Montezuma's research (1.4%) noted [21,22].

The unusual category includes examples with cytological features (such as a single cluster of intact cells distributed extensively inside the nucleus, pleomorphism, high cellularity, necrosis, and complex architecture) that imply micropapillary or cribriform proliferation. Just 4 unusual instances were considered in the current investigation, 3 of which had histopathological correlations, and 1 of those cases was determined to be malignant. This category's ROM was 33.3%, much greater than Tejeswini's and Wang's research (15.7%) but lower than Hoda's (51.5%) [23]. The fact that this study included fewer unusual instances helps to explain this.

LIMITATIONS

The study's sample size was relatively small, with only 90 female breast FNACs included, which may limit the statistical power and representativeness of the results. The study did not evaluate the interobserver variability or reproducibility of the cytological diagnoses, which could affect the reliability and consistency of the results.

CONCLUSIONS

A trustworthy test for identifying breast lesions is the breast FNAC, especially in instances of malignancy. When it comes to reporting breast lesions, the Yokohama categorization system may be significantly more useful because each diagnostic category provides patients with precise cancer risk information that they may use to decide on a course of therapy.

Further, research is required to evaluate the impact of varying degrees of pathologist proficiency and familiarity with the IAC Yokohama system on the accuracy of cytological diagnoses.

CONTRIBUTION OF AUTHORS

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