ORIGINAL RESEARCH

Accuracy of Breast Lesion Diagnosis: Integrating the Yokohama System with Histopathology

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ABSTRACT
Introduction: Breast carcinoma (BC) is most popular in females, and it has exceeded lung carcinoma. Cytopathological analysis plays a crucial role in the diagnosis and management of breast lesions. The Yokohama System offers a standardized approach to categorizing breast lesions, aiding in treatment decisions. It is also used as a therapeutic method for management.**Aim:**The aim of this study is to categorize breast lesions using the International Academy of Cytology (IAC) Yokohama system and to correlate with the histopathology report.**Materials and Methods:**A retrospective examination of cytopathological data from breast lesions collected between January 2021 and December 2023 at Shantabaa Medical College & General Hospital in Amreli was carried out. Fine needle aspiration cytology (FNAC) specimens were classified according to the Yokohama System categories. Two pathologists reviewed the cytology and histopathology slides from studies carried out retrospectively over three years at a single center.**Results:** The maximum number of cases falls into the age distribution between 36 and 45 years (32 cases, 31.07%), with an increased number of cases in the upper outer quadrant (55 cases, 53.40%), and from all cases the maximum number of cases fall into the benign category (49 cases, 47.57%). In our study, the risk of malignancy (ROM) was 100% in category V, 94% in category IV, and 0.5% in category III.**Conclusion:**The utilization of the Yokohama System in cytopathological analysis of breast lesions at our tertiary institute showed promising results in categorizing lesions and guiding subsequent management decisions. The high concordance rate between FNAC and histopathological findings underscores the reliability of this approach. Further studies are warranted to validate these findings and explore the clinical implications in diverse healthcare settings.
Key words: Breast Carcinoma, FNAC, Yokohama

INTRODUCTION

Carcinoma of the breast (BC) is the most popular malignancy in females worldwide. It's exceeded carcinoma of the lung, the principle cause of worldwide cancer incidence in 2020, with a rate of 2.3 million newly discovered cases, or 11.7% of all cancer cases. Epidemiological data have shown that the global burden of BC is expected to cross almost 2 million by 2030. [1] Fine needle aspiration cytology (FNAC) for breast swellings is a highly delicate, easy, and cost efficient approach, a quick and dependable technique, and good for planning for the swelling. [2] An earlier diagnosis of BC by FNAC can find atypical cytological findings and can be used to tell the difference between benign and malignant breast lesions. This allows for a more targeted treatment plan that preserves the breast and provides more management options. [3,4] The International Academy of Cytology (IAC) Breast Group was gathered in 2016 at the Yokohama International Congress of Cytology to develop an international reputation and standard reporting system. [5] The IAC Yokohama system reports breast cytology material and gives five different category types: I means there isn't enough material; II means the tissue is benign; III means it's not typical and is probably benign; IV means it's suspicious for cancer and is likely in situ or invasive carcinoma; and V means it is malignant. By stratifying lesions into distinct diagnostic categories, the Yokohama System facilitates clearer communication between pathologists and clinicians, aiding in treatment decision-making. [4]

The aim and objectives of our study are to categorize breast lesions using the IAC-Yokohama system and correlate them with histopathology reports.

MATERIALS AND METHOD

The study was conducted descriptively and retrospectively for three years, from January 2021 to December 2023, in a pathology laboratory carried out at Shantabaa Medical College & General Hospital, Amreli. All females were included, including those who came with palpable breast swelling. Males who came with breast swelling and lesions that were not palpable were not included. A total of 103 cases satisfied the inclusion and exclusion criteria. Two pathologists reviewed the slides of the Papanicolaou (pap) and Haematoxylin and Eosin (H & E) stains. Institutional ethical approval for the study was obtained.

RESULTS

The present study was conducted at a pathology laboratory and included a total of 103 cases. The majority of cases fell within the age group of 36–45 years (32/103, 31.07%), while the fewest cases were observed in the 65–75 years age group (4/103, 3.88%), with the mean age being 42.30 years (Table 1).

The distribution of cases across different regions of the breast was as follows: upper outer, upper inner, lower outer, lower inner, near the areola, and retroareolar. The upper outer quadrant had the highest number of cases (55/103, or 53.40%), while only one case (1/103, or 0.97%) was located near the areola (Table 2).

In this study, the IAC Yokohama system categorized the breast lesions into three main groups: benign (49/103 cases, or 47.57%), suspicious for malignancy (24/103 cases, or 23.30%), and malignant (20/103 cases, or 19.42%). Figure 1 illustrates this distribution. The least number of cases, 8/103 (7.77%), were categorized as atypical, probably benign (Table 3).

In Category III, atypical cases that are probably benign include proliferative breast disease with atypia and atypical ductal hyperplasia (Table 3).

In our study, histopathological evaluation was available for 26 cases in Category II, all of which were benign. In Category III, histopathology was available for 2 cases: one was benign, and the other was malignant. Category IV had 18 cases, of which 17 were malignant and 1 was benign, while all 20 cases in Category V were malignant. The risk of malignancy (ROM) for all categories was calculated (Table 4, Chart 4).

The ROM in our study was 100% in Category V, 94% in Category IV, and 0.5% in Category III. In comparison, Aithmia et al. (5) reported ROMs of 100%, 50%, 50%, and Surekha et al. (3) reported ROMs of 98%, 81%, 6.2%, respectively (Table 5, Chart 5).

Chart 1: Yokohama system for breast cytology with outcome.

Table1: Distribution of cases by age
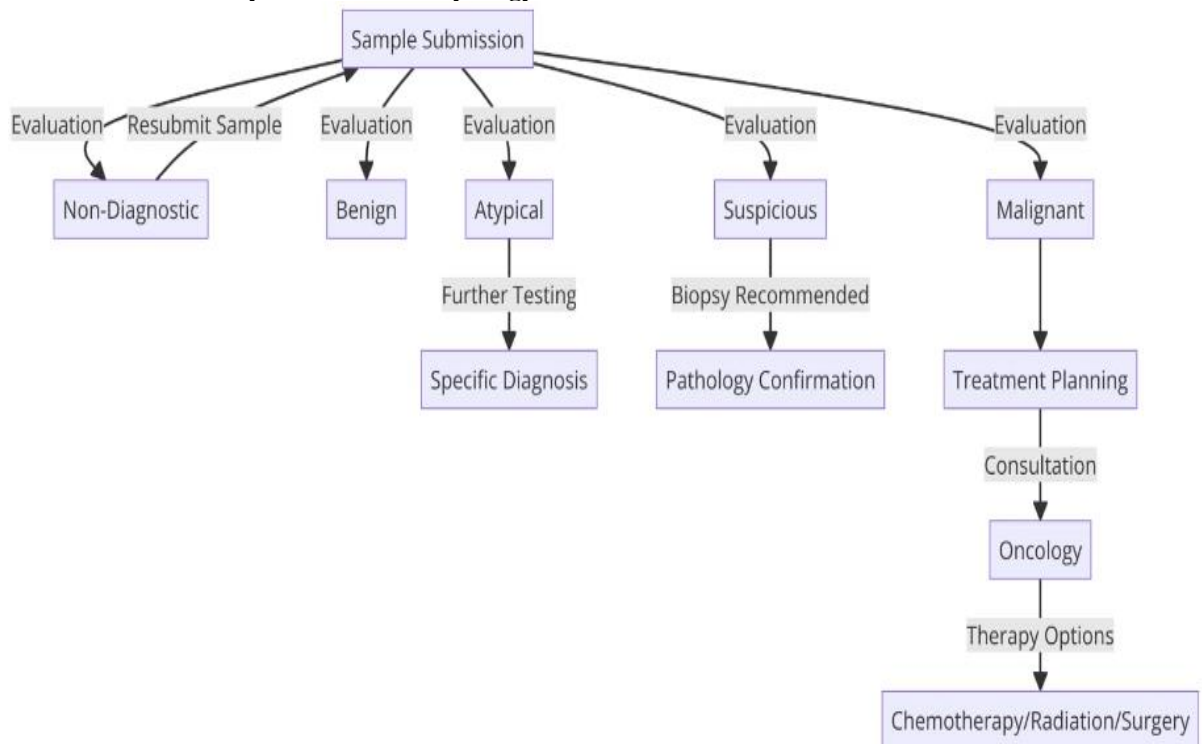
Age	Number of cases	Percentage
16-25years	11	10.68%
26-35years	26	25.24%
36-45years	32	31.07%
46-55years	12	11.65%
56-65years	18	17.48%
66-75years	4	3.88%
Total cases	103	100%

Table 2: Distribution of cases in regions

Regions	Number of cases	Percentage
Upper outer quadrant	55	53.40%
Upper inner quadrant	18	17.48%
Lower outer quadrant	8	7.76%
Lower inner quadrant	9	8.74%
Near areola	1	0.97%
Retroareolar	10	9.71%
All four quadrants	2	1.94%
Total cases	103	100%

Table 3: Distribution of cases by Yokohama category

Diagnosis	Yokohama category	No of cases	Percentage
Unsatisfactory, inadequate	I	2	1.94%
Benign	II	49	47.57%
Atypical, probably benign:	III	8	7.77%
Suspicious of malignancy	IV	24	23.30%
Malignancy	V	20	19.42%
	Total cases	103	100%

Table 4: Distribution of cases by Histopathology

Yokohama Category	Cytology cases	Histopathology available cases	Benign Cases	Malignant Cases	ROM
I	2	0	0	0	0
II	49	26	26	0	0
III	8	2	1	1	0.5%
IV	24	18	1	17	94%
V	20	20	0	20	100%

Table 5: Comparison of ROM

YokohamaCategory	ROM of present study	ROM of Aithmia et al.	ROM of Surekha et al.
I	0	0	0
II	0	2.27%	1.1%
III	0.5%	50%	6.2%
IV	94%	50%	81%
V	100%	100%	98%

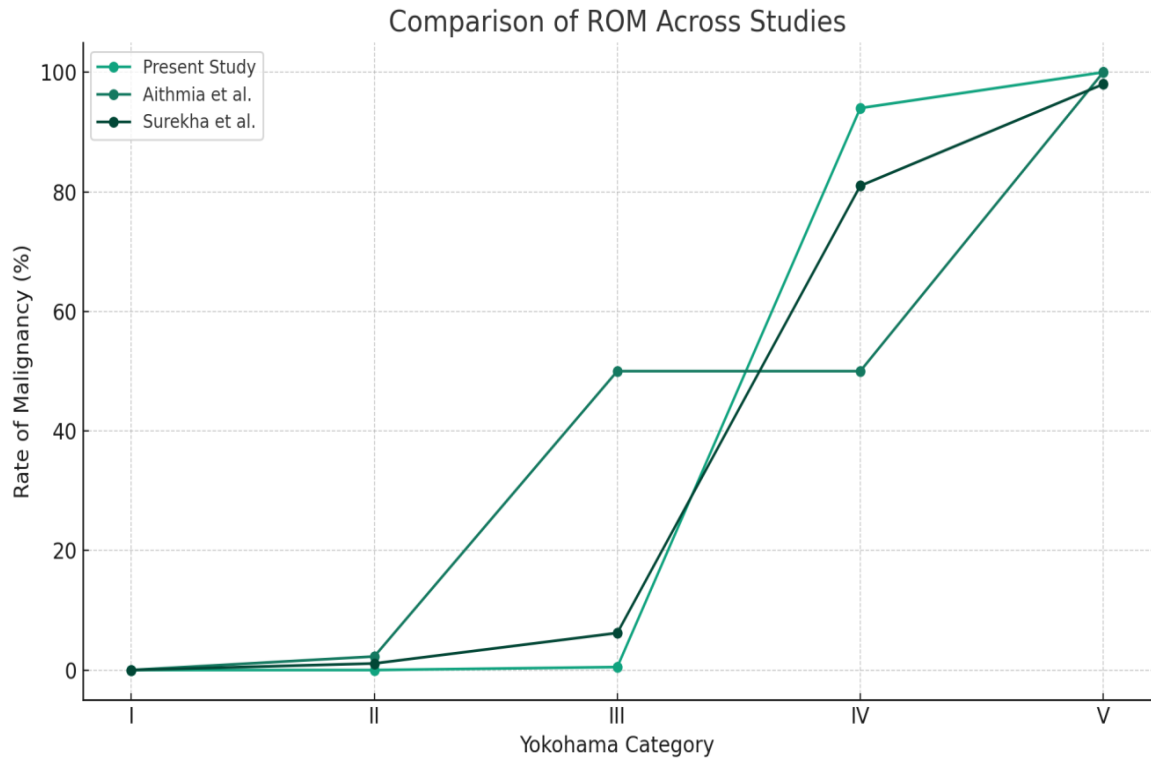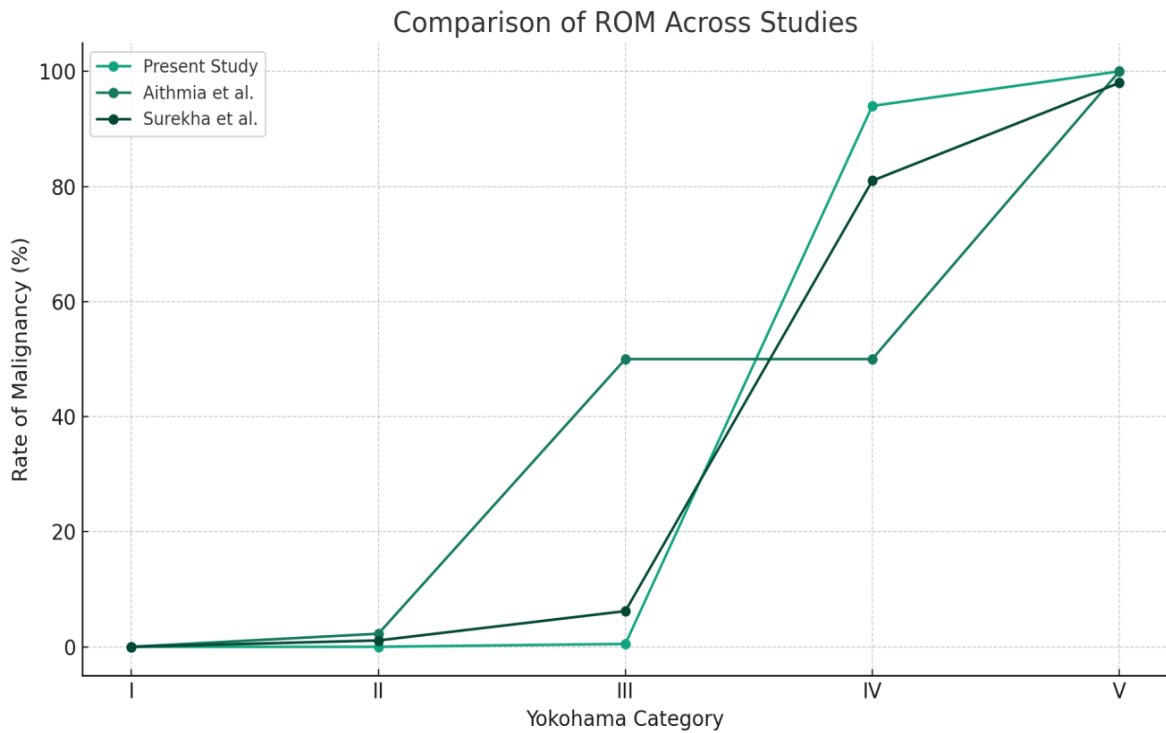**Chart 2: Distribution of Cases by Histopathology**

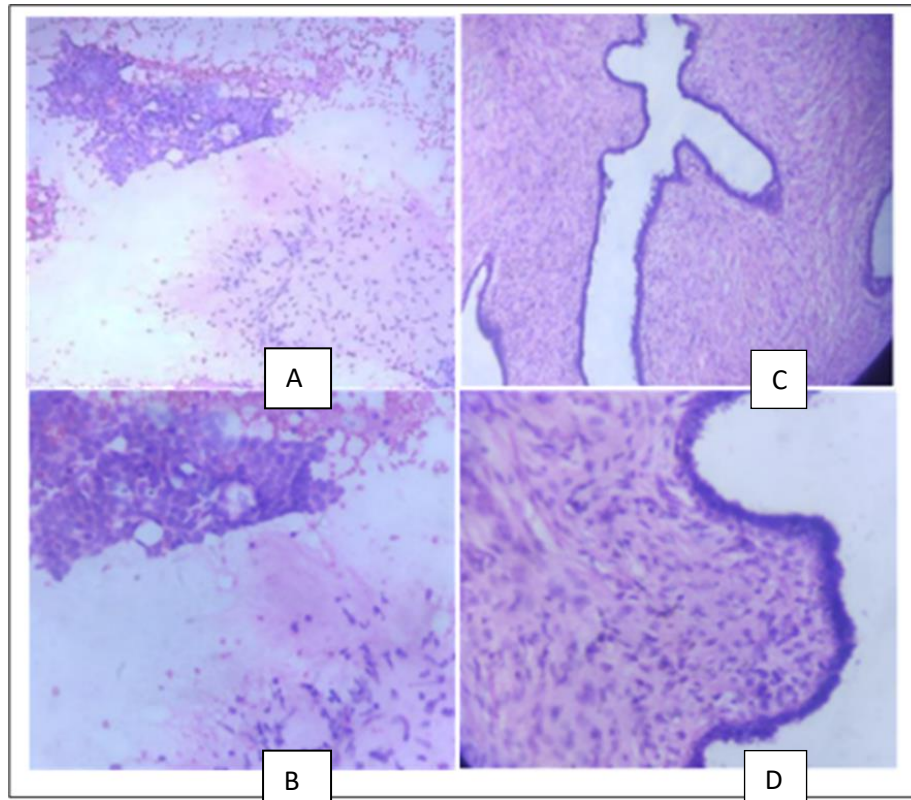**Chart 3: Comparison of ROM Across Studies**

Figure1: Category II, benign
A: Cytomorphology in 10X; B: Cytomorphology in 40X;C: Histomorphology in 10X; D: Histomorphology in 40X
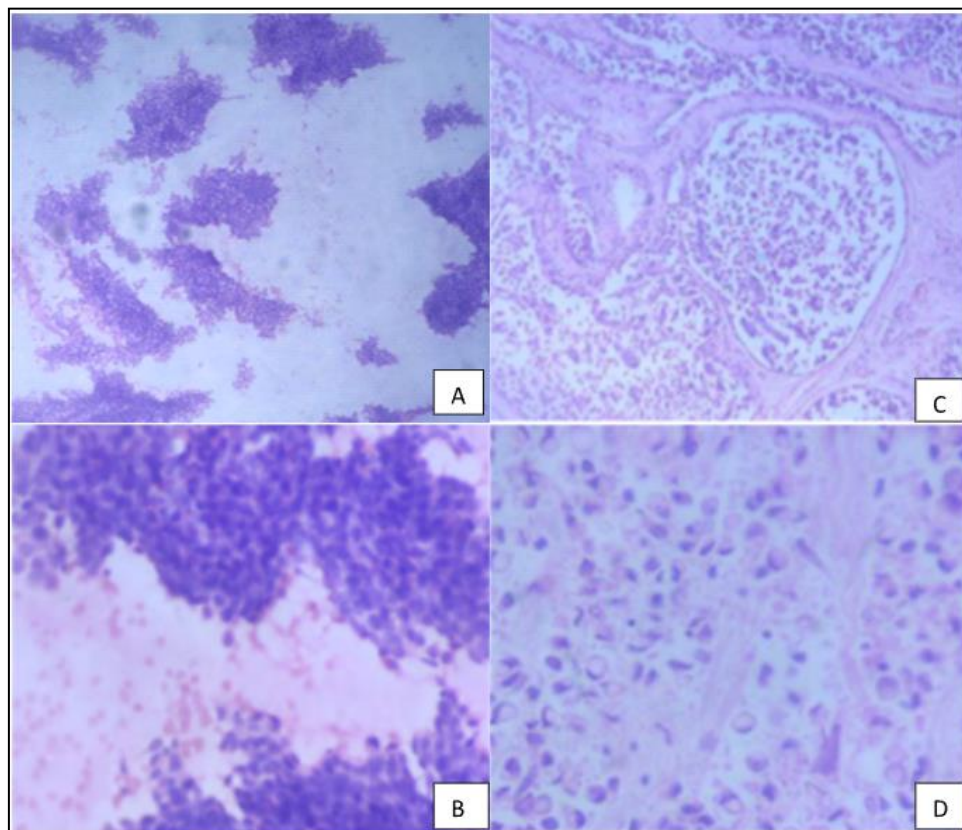

Figure2: Category V, Malignant
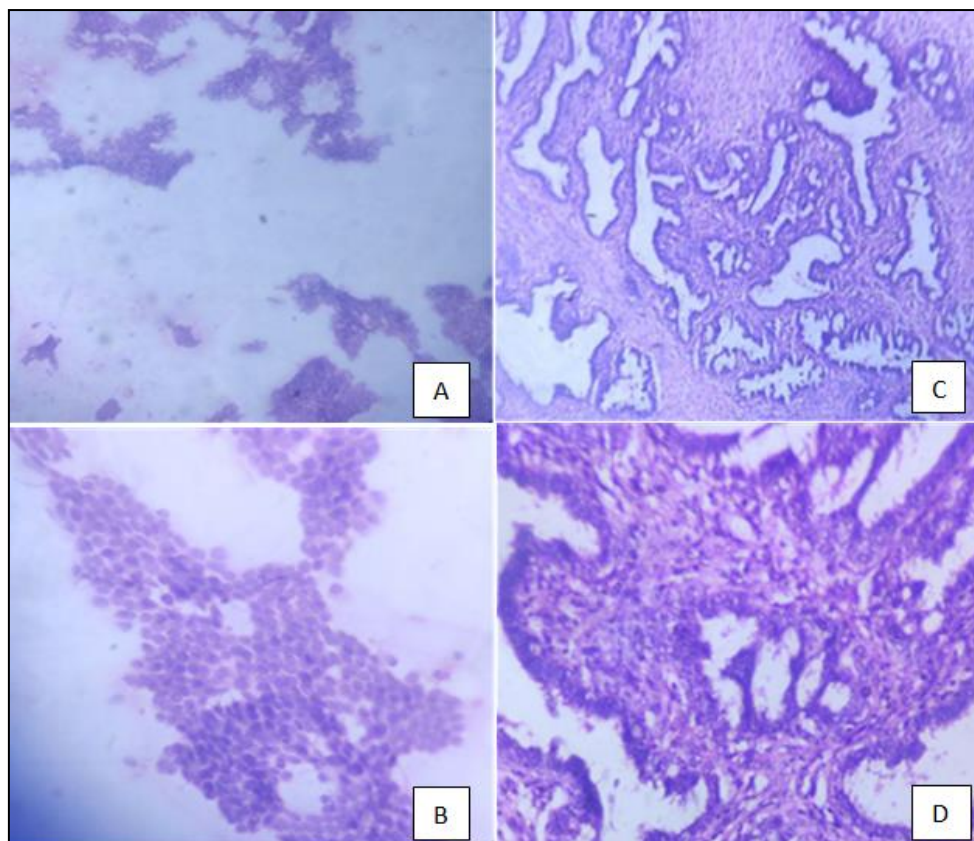**A: Cytomorphology in 10X; B: Cytomorphology in 40X; C: Histomorphology in 10X; D: Histomorphology in 40X**

Figure3: Category III: Atypical
A: Cytomorphology in 10X; B: Cytomorphology in 40X; C: Histomorphology in 10X; D: Histomorphology in 40X

DISCUSSION

The International Academy of Cytology's (IAC) Yokohama System for Reporting Breast Fine-Needle Aspiration Cytology (FNAC) was developed by a group of expert cytopathologists and clinicians specializing in breast pathology. It is crucial to emphasize that a successful FNAC procedure and definitive diagnosis require well-trained personnel for aspiration, smear preparation, and final interpretation.

The IAC Yokohama system classifies lesions into five categories: (1) insufficient/inadequate, (2) benign, (3) atypical, (4) suspicious for malignancy, and (5) malignant, to stratify the risk of malignancy (ROM) based on the most recent literature and suggested management (Chart 1). Seven epithelial groups, each consisting of at least 20 cells, are proposed as necessary for proper evaluation of cellular arrangement and myoepithelial cells.

In the current study, the IAC Yokohama system categorized breast lesions predominantly into benign Category II (49/103 cases), which included adenomas, fibrocystic disease of the breast, galactocele, proliferative breast lesions, acute inflammatory lesions, and granulomatous inflammation.

Category III typically represents cases that are "indeterminate" or "atypical," where the cytological features are not definitively benign or malignant. In our study, Category III cases were 8 out of 103. These cases include atypical cases that are probably benign, such as proliferative breast disease with atypia and atypical ductal hyperplasia.

Category IV (suspicious for malignancy) presented inherent diagnostic challenges due to their overlapping features with both benign and malignant entities. In our study, Category IV cases were 24 out of 103. We observed a high degree of cellular atypia and architectural disarray consistent with malignancy in these cases. However, despite these suggestive features, histopathological confirmation remains essential for an accurate diagnosis.

In our study, Category V cases were 20 out of 103. This category signifies cases where the cytological features are conclusive for malignancy, such as high-grade cellular atypia, malignant cells with characteristic features, and the absence of benign elements. These definitive diagnoses play a pivotal role in guiding immediate clinical management decisions and have significant prognostic implications.

The study by Dogra A et al. (2023) [6] aligns with the present study, as both focus on utilizing the International Academy of Cytology (IAC) Yokohama Reporting System for breast cytology, categorizing lesions into five groups, and assessing malignancy risk. Both studies evaluate sensitivity, specificity, positive and negative predictive values, and overall accuracy. The classification of cases includes benign, atypical, suspicious of malignancy, and malignant

categories. Both studies emphasize correlating FNAC findings with histopathological diagnoses, highlighting FNAC's clinical relevance. They also calculate the risk of malignancy associated with each Yokohama category, aiding in the accurate identification of malignant breast lesions. Overall, both studies support the efficacy of the IAC Yokohama system in accurately diagnosing breast lesions via FNAC.

A study by Nigam JS et al. (2021) [7] also demonstrated the importance of FNAC in the early detection and management of breast lesions, particularly in resource-limited settings like India. Both studies classify breast FNAC cases into benign, atypical, suspicious for malignancy, and malignant categories according to standardized reporting systems. This highlights the spectrum of lesions encountered in clinical practice and underscores the importance of accurately identifying malignancies to guide appropriate management decisions.

A study conducted by Amita K (2023) [8] demonstrated a cross-sectional observational analytical study involving 296 cases of breast lesions for FNAC over two years. This study revealed percentages of lesions across categories, with a high concordance rate (93.18%) between FNAC and histopathology, sensitivity (85.71%), and specificity (98.11%). The risk of malignancy varied across categories, emphasizing the importance of risk-based stratification for management decisions. Both studies emphasize the application of standardized reporting systems, such as the IAC Yokohama system, to categorize breast FNAC cases and evaluate malignancy risk.

Both studies demonstrate high concordance rates between FNAC and histopathology diagnoses, reaffirming the reliability of FNAC in diagnosing breast lesions. Evaluating FNAC's sensitivity, specificity, and risk of malignancy provides valuable insights into its diagnostic accuracy and clinical utility. This supports its role as a quick and inexpensive method for diagnosing palpable breast lesions.

The primary role of FNAC is to distinguish between benign and malignant cases for early treatment, reduce mortality rates, and improve quality of life. Breast lesions are more frequent in women due to estrogen's role in breast size proliferation during the reproductive period [9].

In the present study, the age range was 16 to 75 years, with the majority of cases falling into the 36–45 year range, consistent with the study by Ahamad et al. [10], where the majority of cases were in the 3rd and 4th decades [11]. Similar to the studies by DM Pangotra et al. (221/290, 76.4%) [12] and V. Chauhan et al. (342/468, 73.07%), the majority of cases in the current study were in the benign category, which includes 49/103 (47.57%) cases. The ROM for the malignant category in our study was comparable to

Aithmia et al. [5], where it was 100%, but not comparable to Surekha et al. [3], where it was 50%.

Limitation of study
The limitation of our study is that a smaller number of cases have histopathological follow-up, requiring more cases to accurately use the Yokohama system of reporting breast lesions. The study concludes that using the FNAC procedure is safe, cost-beneficial, and reports breast lesions using the Yokohama system for patient management.

IEC Statement
Ethical clearance is taken.

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