

# COMPARISON OF EFFICACY OF MODIFIED MASOOD SCORING INDEX IN CYTOLOGICAL DIAGNOSIS OF BREAST LESIONS WITH ITS HISTOPATHOLOGY

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## ABSTRACT

### Introduction

Palpable breast lumps represent a frequent clinical concern requiring accurate diagnostic evaluation. Fine Needle Aspiration Cytology (FNAC) serves as a rapid, minimally invasive, and cost-effective diagnostic modality for the assessment of breast lesions. The Modified Masood Scoring Index (MMSI) further enhances cytological evaluation by categorizing lesions into non-proliferative breast disease, proliferative breast disease without atypia, proliferative breast disease with atypia, and carcinoma.

### Aim and Objectives

To classify breast lesions using the Modified Masood Scoring Index, correlate cytological findings with histopathological diagnosis, and assess the applicability, diagnostic efficacy, reliability, reproducibility, and sensitivity of MMSI in breast lesion evaluation.

### Materials and Methods

This observational study was conducted on 200 female patients aged 12–90 years presenting with palpable breast lumps measuring more than 1 cm. All patients underwent FNAC followed by histopathological examination. Cytological smears were evaluated using the MMSI scoring system (maximum score: 24), and the results were correlated with corresponding histopathological findings.

### Results

The majority of patients belonged to the 30–39 years age group (37%), followed by the 20–29 years group (33.5%). Breast lump was the most common presenting complaint (84%). Based on MMSI scoring, 64% of cases were categorized as non-proliferative breast disease, 5.5% as proliferative breast disease without atypia, 1.5% as proliferative breast disease with atypia, and 29% as carcinoma. Histopathological examination revealed 60% benign and 29.5% malignant lesions. A high histo-cytological concordance rate of 86.5% was observed, which was statistically significant ( $p < 0.0001$ ).

### Conclusion

The Modified Masood Scoring Index is a reliable, reproducible, and effective cytological scoring system for the evaluation of breast lesions. It demonstrates excellent concordance with histopathological diagnosis and provides accurate differentiation between benign and malignant breast lesions, thereby facilitating standardized cytological reporting and improved diagnostic precision.

**Keywords:** Modified Masood Scoring Index, breast lesions, FNAC, histopathological correlation, cytological diagnosis, breast carcinoma.

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### Introduction:

Breast lesions, both benign and malignant, are a major health concern due to their high prevalence and diagnostic challenges. Benign lesions such as fibroadenoma and fibrocystic changes are more common, especially in younger women, but often require careful evaluation because they can

clinically and radiologically mimic malignancy. Malignant lesions, particularly invasive ductal and invasive lobular carcinoma, remain significant causes of morbidity and mortality due to their aggressive nature and metastatic potential when diagnosis is delayed (1).

Breast cancer is currently the most commonly diagnosed cancer among women worldwide and

represents the leading cause of cancer-related mortality in females. According to GLOBOCAN 2020, breast cancer accounted for 11.7% of all newly diagnosed cancers globally, with approximately 2.3 million new cases and more than 685,000 deaths annually. Although incidence rates are higher in developed countries, mortality rates remain disproportionately elevated in low- and middle-income countries because of delayed diagnosis, limited screening facilities, and inadequate access to treatment services. Furthermore, the global burden of breast cancer is projected to rise substantially over the coming decades (2-4).

Benign breast diseases are common causes of breast-related consultations. Fibrocystic disease is particularly frequent in women aged 30–50 years, while fibroadenoma commonly occurs in younger women. Although most benign lesions are non-malignant, proliferative lesions with atypia carry an increased risk of developing breast cancer and therefore require careful evaluation and follow-up (5).

In India, breast cancer is the most common malignancy among women, with patients often presenting at a younger age and advanced stage due to limited awareness and screening facilities. Benign breast lesions also contribute significantly to the diagnostic burden, with fibroadenoma being the most common benign breast lump in young women (6–8).

Early and accurate diagnosis of breast lesions is crucial for improving prognosis, guiding treatment, and reducing morbidity and mortality. It also helps differentiate benign from malignant lesions, avoiding unnecessary surgery and anxiety. Diagnostic methods such as mammography, ultrasonography, FNAC, and histopathology are essential in breast lesion evaluation. (9-12).

FNAC is widely used for breast lesion evaluation because it is rapid, minimally invasive, and cost-effective, especially in resource-limited settings. However, conventional cytology may show subjective variability in borderline lesions. The Modified Masood Scoring Index (MMSI) was developed to improve objectivity by assessing specific cytomorphological features and categorizing lesions into non-proliferative, proliferative without atypia, proliferative with atypia, and carcinoma. (13,14).

The structured and reproducible nature of MMSI enhances diagnostic consistency and improves communication between cytopathologists and clinicians. Previous studies have demonstrated its usefulness in reducing interobserver variability and improving the sensitivity and specificity of FNAC in breast lesion assessment. Additionally, MMSI has shown considerable clinical applicability in identifying high-risk proliferative lesions that may

require further histopathological evaluation and close follow-up (15-17).

Therefore, the present study was undertaken to categorize breast lesions using the Modified Masood Scoring Index, correlate cytological findings with histopathological diagnosis, and evaluate the applicability, diagnostic efficacy, reliability, reproducibility, and sensitivity of MMSI in the assessment of breast lesions.

#### **Review of literature:**

Breast lesions comprise a broad spectrum of pathological conditions ranging from benign non-proliferative disorders to invasive malignant neoplasms. These lesions may arise from ductal, lobular, stromal, or epithelial components of the breast and commonly present as palpable lumps, nipple discharge, localized pain, or incidental radiological findings. With advances in mammography, ultrasonography, and magnetic resonance imaging, the detection of breast lesions has increased considerably, emphasizing the importance of accurate diagnosis and classification for appropriate clinical management (18).

Benign breast lesions such as fibroadenoma, fibrocystic disease, cysts, and intraductal papilloma form the majority of breast pathologies and usually have a good prognosis. However, atypical proliferative lesions may increase the risk of future malignancy, while malignant lesions like invasive ductal and lobular carcinoma remain major causes of cancer-related morbidity and mortality worldwide (1).

Breast cancer is currently the most frequently diagnosed malignancy among women globally and represents a significant public health challenge. In India, breast cancer has surpassed cervical cancer to become the most common cancer among women, highlighting the growing need for early detection and effective diagnostic strategies (19).

The evaluation of breast lesions requires a multidisciplinary approach involving clinical examination, imaging techniques, cytological assessment, and histopathological confirmation. Fine Needle Aspiration Cytology (FNAC) is widely used as an initial diagnostic modality because of its simplicity, rapidity, and cost-effectiveness. However, conventional cytology may be limited by subjective interpretation and difficulty in categorizing borderline proliferative lesions (20).

The Modified Masood Scoring Index (MMSI) was developed to improve diagnostic accuracy and reproducibility in breast cytology. By assessing specific cytological features, MMSI categorizes lesions into non-proliferative, proliferative without atypia, proliferative with atypia, and carcinoma, thereby enhancing diagnostic consistency and reducing interobserver variability. (16).

The available literature suggests that MMSI serves as a reliable and effective adjunct to FNAC in the evaluation of breast lesions. By facilitating more

objective cytological interpretation and better correlation with histopathological findings, MMSI contributes to improved diagnostic precision and clinical decision-making in breast pathology (21).

#### **Epidemiology**

Breast lesions comprise a wide spectrum of benign and malignant disorders affecting women globally. Breast cancer is currently the most commonly diagnosed cancer among women worldwide, accounting for approximately 2.3 million new cases and 685,000 deaths annually, with incidence expected to rise further by 2050 (22, 23). Higher incidence rates are observed in developed countries, whereas lower rates are reported in parts of Asia and Africa (24, 25).

Benign breast lesions such as fibroadenoma and fibrocystic disease are highly prevalent, particularly among younger women, and contribute significantly to breast-related clinical consultations (26). In India, breast cancer has become the leading female malignancy, with increasing incidence in both urban and rural populations. Indian women commonly present at a younger age and often at advanced stages due to delayed diagnosis, limited screening facilities, and poor awareness (27-29).

#### **Breast Lesion Causes and Pathophysiology**

Breast lesions develop due to complex interactions among hormonal, genetic, environmental, and lifestyle-related factors. Hormonal influences during puberty, menstruation, pregnancy, and menopause play an important role in breast tissue proliferation. Genetic mutations involving BRCA1, BRCA2, TP53, and related genes significantly increase the risk of malignant transformation (30-31).

Benign lesions such as fibroadenoma and fibrocystic changes are usually associated with hormonal and proliferative alterations, whereas malignant lesions arise through progressive genetic mutations, uncontrolled cellular proliferation, stromal invasion, and metastatic spread (32-35).

#### **Diagnostic Modalities in Breast Lesions**

The diagnosis of breast lesions requires a multidisciplinary approach including clinical examination, imaging, cytology, and histopathology. Mammography and ultrasonography are important imaging techniques for lesion detection and characterization. Fine Needle Aspiration Cytology (FNAC) is widely used as a rapid, minimally invasive, and cost-effective diagnostic modality, especially in resource-limited settings (36-37).

However, conventional FNAC has limitations due to the absence of tissue architecture and variability in interpretation. Histopathological examination remains the gold standard for definitive diagnosis and classification of breast lesions (38).

#### **Modified Masood Scoring Index**

The Masood Scoring Index and its modified version were developed to improve the objectivity and reproducibility of breast cytology. The

Modified Masood Scoring Index (MMSI) evaluates cytomorphological parameters such as cellular arrangement, pleomorphism, myoepithelial cells, chromatin pattern, and nucleolar features, categorizing lesions into non-proliferative, proliferative without atypia, proliferative with atypia, and carcinoma groups (39-40).

Several studies have demonstrated high concordance between MMSI-based cytological diagnosis and histopathological findings, with improved diagnostic accuracy, sensitivity, and specificity compared to conventional cytology (13, 14, 16, 41-43).

#### **Reproducibility and Clinical Significance**

MMSI has shown good reproducibility with reduced interobserver variability due to its structured scoring system. It assists in standardizing cytological reporting and improves communication between pathologists and clinicians (16, 44-46).

The application of MMSI is particularly valuable in resource-constrained settings, where it enhances the diagnostic utility of FNAC and supports appropriate clinical management and early intervention in breast lesions (47-50).

#### **MATERIALS AND METHODS**

##### **Study Design**

The present study was conducted as a prospective observational study to evaluate the diagnostic utility of the Modified Masood Scoring Index (MMSI) in the cytological assessment of breast lesions and to compare its diagnostic efficacy with histopathological findings.

##### **Study Area**

The study was carried out in the Department of Pathology, Maharishi Markandeshwar Institute of Medical Sciences and Research (MMIMSR).

##### **Sample Selection**

All patients presenting with palpable breast lesions and undergoing Fine Needle Aspiration Cytology (FNAC) in the Department of Pathology from July 2023 onwards were considered for inclusion in the study. Relevant clinical history, physical examination findings, and hematological parameters were recorded using a predesigned proforma. Cytological smears were stained with Hematoxylin and Eosin stain, while special stains were applied whenever required. Histopathological correlation was performed in all available cases.

##### **Inclusion Criteria**

1. Female patients with clinically palpable breast lumps measuring more than 1 cm.
2. Patients aged between 12 and 90 years.
3. Patients who provided informed consent for participation in the study.
4. Cases with available subsequent histopathological findings.

##### **Exclusion Criteria**

1. Patients without clinically palpable breast lumps.

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2. Male patients with breast lesions.
3. Patients unwilling to provide consent for the study.

### Sample Size Calculation

The sample size was calculated based on the expected concordance between MMSI and histopathological diagnosis using the formula for diagnostic accuracy studies:

$$n = \frac{Z^2 \times p \times (1 - p)}{d^2}$$

Where:

- $Z = 1.96$  for 95% confidence interval
- $p = 0.85$  (expected concordance rate based on previous studies)
- $d = 0.05$  (margin of error)

The calculated sample size was approximately 196 patients. Considering feasibility and adequate statistical power, a total of 200 patients were included in the study.

### Study Method

#### Processing of FNAC Material

After explaining the procedure and obtaining informed consent, FNAC was performed under strict aseptic precautions using a 22-gauge needle attached to a 2 mL syringe. The lesion was localized and stabilized prior to aspiration. A minimum of three to four smears were prepared from each aspirate. Two smears were immediately wet-fixed in alcohol for Papanicolaou staining, while the remaining smears were air-dried for Leishman, Giemsa, and Hematoxylin and Eosin staining.

The cytological smears were evaluated using the Modified Masood Scoring Index based on the following parameters:

- Cellular arrangement
- Cellular pleomorphism
- Presence or absence of myoepithelial cells
- Degree of anisonucleosis
- Nucleolar prominence
- Chromatin pattern

Each parameter was scored from 1 to 4, and the cumulative score was used for lesion categorization.

#### Processing of Biopsy Specimens

Biopsy specimens were examined grossly and fixed in 10% neutral buffered formalin for 24 hours. Routine histopathological processing was subsequently performed, followed by paraffin embedding, sectioning, and Hematoxylin and Eosin staining. Histopathological diagnosis was considered the gold standard for comparison.

#### Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of Maharishi Markandeshwar Institute of Medical Sciences and Research prior to commencement of the study (IEC Reference Number: MMIMSR/IEC/2023/42). The study was conducted in accordance with the Declaration of Helsinki and the ICMR National Ethical Guidelines for Biomedical Research

involving Human Participants. Written informed consent was obtained from all participants.

#### Pilot Study

A pilot study was conducted during July–August 2023 on 20 consecutive cases to standardize FNAC procedures, optimize MMSI application, and assess interobserver agreement. The pilot study demonstrated excellent concordance among observers and helped refine the data collection protocol.

#### Validity and Reliability

Internal validity was ensured through prospective study design, consecutive sampling, standardized staining techniques, and blinded assessment of cytological and histopathological findings. Cytopathologists were blinded to histopathological diagnosis, while histopathologists were blinded to cytological interpretation.

Interobserver reliability was assessed by independent evaluation of randomly selected cases by two cytopathologists using MMSI criteria. Intraobserver reliability was assessed by repeat evaluation of selected cases after a washout period. Standardized MMSI criteria and uniform reporting methods improved reproducibility and minimized observer variability.

#### Data Collection Procedure

Data collection was performed using a structured protocol that included:

1. Patient screening according to inclusion and exclusion criteria.
2. Obtaining written informed consent.
3. Recording demographic and clinical details in a predesigned proforma.
4. Review of radiological findings including mammography and ultrasonography where available.
5. Performance of FNAC and cytological evaluation using conventional cytology and MMSI criteria.
6. Histopathological examination of biopsy or surgical specimens.
7. Entry and verification of collected data in a standardized database.

#### Statistical Analysis

Data were analyzed using SPSS version 25.0 and GraphPad Prism version 9.0. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean  $\pm$  standard deviation or median with interquartile range, wherever appropriate.

Histopathological diagnosis was considered the reference standard for evaluating diagnostic performance of MMSI. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated with 95% confidence intervals. Concordance between cytological and histopathological findings was assessed using Cohen's kappa coefficient. Chi-

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square test and McNemar's test were applied for comparison of categorical variables, and a p-value of less than 0.05 was considered statistically significant.

Results:

The present study evaluated the age distribution of 200 patients with breast lesions. Most patients belonged to the younger age groups, with the highest proportion observed in the 30–39 years age group (37%), followed by the 20–29 years group (33.5%). Collectively, these groups constituted 70.5% of the study population, indicating a higher prevalence of breast lesions among younger women. The frequency of cases gradually decreased with increasing age, with only a small proportion of patients above 50 years and very few cases in individuals older than 70 years as shown in table 1.

**Table 1: Age Distribution of Patients**

Age Group	Number of patients	Percentage (%)
<20	9	4.5
20-29	67	33.5
30-39	74	37
40-49	34	17
50-59	6	3
60-69	6	3
70-79	3	1.5
80+	1	0.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Chi-square (<math>\chi^2</math>)=164.48, p-value=&lt;0.0001</b>		

Statistical analysis showed the age distribution to be highly significant ( $\chi^2 = 164.48, p < 0.0001$ ), suggesting that the observed pattern was unlikely to have occurred by chance. The predominance of younger women in the study may be related to the higher incidence of benign breast lesions, particularly fibroadenoma, in the reproductive age group, along with greater health awareness and earlier healthcare-seeking behavior.

Breast lump was the most common presenting complaint in the present study, observed in 84% of patients. Breast pain without lump accounted for 5.5% of cases, while breast lump associated with pain was seen in 4.5% of patients. Other less common complaints included breast swelling, nipple discharge, and miscellaneous symptoms. The predominance of palpable breast lump as the chief complaint was statistically highly significant ( $\chi^2 = 451.62, p < 0.0001$ ), indicating that breast lump remains the primary clinical presentation of breast lesions in the studied population as shown in table 2.

**Table 2: Distribution of Patients by Chief Complaint Category**

Chief Complaint Category	Number of Patients (n)	Percentage (%)
<b>Breast Lump (all types)</b>	168	84
<b>Breast Lump with Pain</b>	9	4.5
<b>Breast Pain (without lump)</b>	11	5.5
<b>Nipple Discharge</b>	2	1
<b>Breast Swelling</b>	7	3.5
<b>Others (trauma, mixed, rare presentations)</b>	3	1.5
<b>Chi-square (<math>\chi^2</math>)=451.62, p-value=&lt;0.0001</b>		

Most patients in the study had no significant family history of breast or ovarian disease. A positive family history was reported in a smaller proportion, with breast lumps in sisters being the most common association, while maternal breast cancer and ovarian cancer history were infrequent. This indicates that the majority of breast lesions in the study population were sporadic rather than hereditary in nature. However, positive family history remains clinically important due to its association with increased malignancy risk and the need for closer follow-up. The distribution was found to be statistically highly significant as depicted in table 3. ( $\chi^2 = 304.75, p < 0.0001$ ).

**Table 3: Distribution of Patients by Family History**

Family History	Number of patients	Percentage (%)
No family history	155	77.5
Sister had breast lump	35	17.5
Mother had breast cancer	5	2.5
Family history of ovarian cancer	5	2.5
<b>Chi-square (<math>\chi^2</math>)=304.75, p-value=&lt;0.0001</b>		

The obstetric profile of the study population showed a predominance of women with lower parity, particularly G1P1A0, which accounted for more than half of the cases (53%). Multiparous women in the G4P3A1 category formed the second

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largest group (25.5%), while nulliparous and other parity groups were less common as shown in table 4. These findings suggest that breast lesions were more frequently observed in women during the early reproductive years, likely due to the higher occurrence of benign breast conditions in this age group. Statistical analysis demonstrated a highly significant distribution pattern ( $\chi^2 = 137.84$ ,  $p < 0.0001$ ), indicating that primiparity was more commonly associated with breast lesions in this cohort.

**Table 4: Distribution of Patients by Obstetric History**

Obstetric History	Number of patients	Percentage (%)
G1P1A0	106	53
G4P3A1	51	25.5
Nulliparous	21	10.5
G2P2A0	11	5.5
G3P2A1	11	5.5
<b>Chi-square (<math>\chi^2</math>)=304.75, p-value=&lt;0.0001</b>		

Most patients in the study had no history of hormonal drug intake (90%). Among those with exposure, oral contraceptive pills were the most commonly used, followed by thyroxine and post-menopausal hormone replacement therapy as shown in table 5. These findings suggest that the majority of breast lesions in this cohort were not directly associated with exogenous hormonal therapy. The low prevalence of hormonal medication use may also reflect local prescribing patterns and sociocultural factors which can be easily seen in table 5. Statistical analysis showed a highly significant distribution pattern ( $\chi^2 = 522.36$ ,  $p < 0.0001$ ).

**Table 5: Distribution of Patients by Hormonal Drug Intake**

Hormonal Drug Intake	Number of patients	Percentage (%)
No use of drug	180	90
OCP use	10	5
Thyroxine	5	2.5
Post-menopausal HRT	4	2
Irregular menstrual cycle	1	0.5
<b>Chi-square (<math>\chi^2</math>)=522.36, p-value=&lt;0.0001</b>		

Physical examination findings predominantly suggested benign breast lesions, with 65.5% of patients showing features such as mobile, well-

defined, and non-tender lumps. Suspicious or malignant characteristics, including hard and irregular masses with lymph node involvement, were observed in 30% of cases as depicted in table 6. A small proportion presented with inflammatory or non-specific findings. The distribution was statistically highly significant ( $\chi^2 = 208.64$ ,  $p < 0.0001$ ), supporting the predominance of benign breast lesions in the study population while highlighting the need for further evaluation in suspicious cases.

**Table 6: Distribution of Patients by Physical Examination Findings**

Physical Examination Category	Number of Patients (n)	Percentage (%)
Benign features (mobile, well-defined, cystic, non-tender)	131	65.5
Suspicious / malignant features (hard, irregular, immobile, lymph node involvement)	60	30
Tender inflammatory lesions	5	2.5
Non-specific descriptive findings	4	2
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Chi-square (<math>\chi^2</math>)=208.64, p-value=&lt;0.0001</b>		

Cytological evaluation predominantly showed benign proliferative patterns, observed in 49.5% of cases, commonly associated with fibroadenoma and other benign breast conditions. Malignant cytological features were identified in 28% of patients, while benign non-proliferative or cystic changes accounted for 14% of cases. Inflammatory lesions and inadequate smears were less frequent as seen in table 7. The distribution of cytological categories was statistically highly significant ( $\chi^2 = 120.62$ ,  $p < 0.0001$ ), indicating a predominance of benign proliferative breast lesions in the study population.

**Table 7: Distribution of Patients by Cytological Features**

Cytological Feature Category	Number of Patients (n)	Percentage (%)
Malignant cytological features (pleomorphism, nucleomegaly, irregular nuclei,	56	28

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mitosis)		
<b>Benign proliferative features</b> (bimodal population, ductal + myoepithelial cells, staghorn pattern, fibroadenoma features)	99	49.5
<b>Benign non-proliferative / cystic features</b> (cystic macrophages, apocrine change, fibrocystic changes)	28	14
<b>Inflammatory / granulomatous lesions</b>	7	3.5
<b>Paucicellular / inadequate smears</b>	11	5.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Chi-square (<math>\chi^2</math>)=120.62, p-value=&lt;0.0001</b>		

Cytomorphological diagnosis showed a predominance of benign proliferative breast lesions, with fibroadenoma being the most common diagnosis, accounting for 54% of cases. Carcinoma formed the second largest category (28.5%), indicating a considerable proportion of malignant lesions as shown in table 8. Benign non-specific breast diseases, inflammatory lesions, and proliferative lesions with atypia were less common, while rare entities such as galactocele and duct ectasia were infrequently observed. The distribution of diagnostic categories was statistically highly significant ( $\chi^2 = 161.92$ ,  $p < 0.0001$ ), supporting the predominance of benign breast pathology in the study population.

**Table 8: Distribution of Patients by Cytomorphological Diagnosis**

Cytomorphological Diagnosis Category	Number of Patients (n)	Percentage (%)
<b>Fibroadenoma / Benign proliferative lesions</b>	108	54
<b>Carcinoma (all types)</b>	57	28.5
<b>Benign breast disease (non-specific / fibrocystic)</b>	18	9

<b>Inflammatory lesions (abscess, granulomatous, mastitis)</b>	9	4.5
<b>Proliferative lesions with/without atypia</b>	4	2
<b>Others (galactocele, duct ectasia, rare entities)</b>	3	1.5
<b>Inadequate / descriptive</b>	1	0.5
<b>Total</b>	<b>200</b>	<b>100</b>
<b>Chi-square (<math>\chi^2</math>)=161.92, p-value=&lt;0.0001</b>		

Histopathological evaluation predominantly as observed in table 9 shows involved lumpectomy specimens, which accounted for the majority of cases, followed by mastectomy specimens, while core biopsy samples were infrequent. The high proportion of lumpectomies suggests widespread use of breast-conserving surgery for localized lesions, whereas the considerable number of mastectomies reflects the presence of advanced disease in a significant subset of patients. The distribution of specimen types was statistically highly significant ( $\chi^2 = 112.94$ ,  $p < 0.0001$ ).

**Table 9: Distribution of Patients by Type of Histopathological Specimen**

Histopathological Category	Number of Patients (n)	Percentage (%)
<b>Benign lesions (Fibroadenoma, Fibroadenosis, Fibrocystic disease)</b>	120	60
<b>Malignant lesions (Invasive carcinoma, DCIS)</b>	59	29.5
<b>Chi-square (<math>\chi^2</math>)=20.79, p-value=&lt;0.0001</b>		

The present table illustrates the distribution of histopathological categories among 179 patients. Benign lesions, including fibroadenoma, fibroadenosis, and fibrocystic disease, constituted the majority with 120 cases (67.0%), whereas malignant lesions, such as invasive carcinoma and ductal carcinoma in situ (DCIS), accounted for 59 cases (33.0%). This indicates that benign breast conditions are more prevalent than malignant ones in the studied population as shown in Table 10.

**Table 10: Distribution of Patients by Histopathological Diagnosis**

Histopathological Category	Number of Patients (n)	Percentage (%)
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<b>Benign lesions (Fibroadenoma, Fibroadenosis, Fibrocystic disease)</b>	120	60
<b>Malignant lesions (Invasive carcinoma, DCIS)</b>	59	29.5
<b>Chi-square (<math>\chi^2</math>)=20.79, p-value=&lt;0.0001</b>		

Detailed MMSI categorization showed a predominance of non-proliferative breast disease, accounting for 63.5% of cases, followed by carcinoma/CIS in 29% of patients as shown in table 11. Proliferative breast disease with or without atypia was relatively less common but remained clinically significant due to its potential for malignant transformation. The distribution of MMSI categories was statistically highly significant ( $\chi^2 = 152.73$ ,  $p < 0.0001$ ), confirming the predominance of benign breast lesions in the study population.

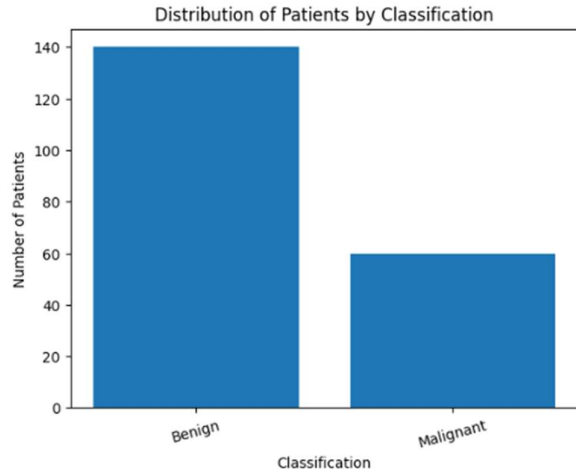
**Table 2: Distribution of Patients by MMSI Score Categories**

MMSI Category	Number Patients (n)	Percentage (%)
Non-proliferative breast disease	127	63.5
Carcinoma / CIS	58	29
Proliferative breast disease with atypia	8	4
Proliferative without atypia	5	2.5
Proliferative breast disease with mild atypia	2	1
<b>Chi-square (<math>\chi^2</math>)=152.73, p-value=&lt;0.0001</b>		

The classification of breast lesions in the present study showed a predominance of benign cases. Out of 200 patients, 140 cases (70%) were benign, while 60 cases (30%) were malignant. This indicates that most breast lesions in the study population were 3 which can be observed in Figure 1.

Statistical analysis demonstrated a highly significant difference in the distribution of benign and malignant lesions ( $\chi^2 = 32.00$ ,  $p < 0.0001$ ), confirming the predominance of benign cases in the study population.

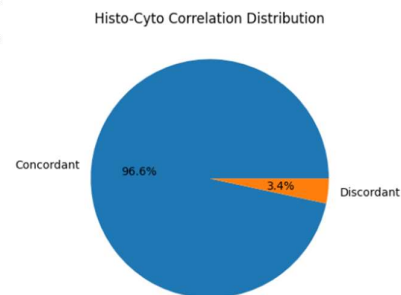
**Figure 1: Distribution of Patients by Final Classification (Benign vs Malignant)**



The histo-cytological correlation in the present study showed a high level of agreement between cytological and histopathological diagnoses. Concordant results were observed in 173 cases (86.5%), while only 6 cases (3%) showed discordance, indicating strong diagnostic reliability of FNAC in evaluating breast lesions.

Statistical analysis demonstrated a highly significant difference in the distribution of concordant and discordant cases ( $\chi^2 = 155.80$ ,  $p < 0.0001$ ), confirming the strong histo-cytological correlation in the study population as shown in figure 2.

**Figure 2: Histo-Cytological Correlation of Breast Lesions**



The distribution of breast lesions across MMSI categories showed a strong association between MMSI classification and malignancy. Most benign cases were found in the non-proliferative category, with 107 benign cases and no malignancy, indicating that these lesions are predominantly benign. In contrast, all 58 cases in the carcinoma/CIS category were malignant, showing a clear correlation with malignancy as shown in Table 13.

Proliferative lesions with or without atypia demonstrated mixed patterns, though benign cases remained more common. Proliferative lesions without atypia included 4 benign and 1 malignant case, while proliferative lesions with atypia showed

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7 benign and 1 malignant case. Mild atypia was observed only in benign lesions. These findings suggest increasing malignant potential with progression from non-proliferative to carcinoma categories.

Statistical analysis using the chi-square test demonstrated a highly significant association between MMSI categories and lesion type ( $\chi^2 = 171.6$ ,  $df = 4$ ,  $p < 0.000001$ ).

Table 13: Comparison of MMSI Categorization with Histopathological Diagnosis

MMSI Category	Benign (n)	Malignant (n)
Non-proliferative	107	0
Proliferative w/o atypia	4	1
Proliferative with mild atypia	1	0
Proliferative with atypia	7	1
Carcinoma / CIS	0	58
<b>Total</b>	<b>119</b>	<b>60</b>
<b>Chi-square (<math>\chi^2</math>) = 171.6, p-value = &lt;0.0001</b>		

**Discussion:**

Breast lesions comprise a wide spectrum of benign, proliferative, atypical, and malignant conditions, making accurate and early diagnosis essential for appropriate management and improved prognosis (18). Fine needle aspiration cytology (FNAC) remains an important first-line diagnostic tool because it is rapid, minimally invasive, economical, and associated with minimal morbidity (51). However, conventional cytological interpretation may show overlap between benign proliferative lesions, atypical lesions, and low-grade carcinoma, leading to variability in diagnosis (52). To improve diagnostic objectivity and reproducibility, the Modified Masood Scoring Index (MMSI) was developed as a structured cytomorphological scoring system that classifies breast lesions into non-proliferative disease, proliferative disease without atypia, proliferative disease with atypia, and carcinoma (53). Histopathology remains the gold standard for final diagnosis and is essential for validating the diagnostic efficacy of MMSI (54).

In the present study, breast lump was the most common presenting complaint, observed in 84% of cases, which is consistent with previous studies reporting palpable breast lump as the predominant clinical presentation of breast lesions (55, 56). The majority of patients had no significant family history and were predominantly parous women, indicating that most lesions represented sporadic

rather than hereditary disease patterns (57). Most patients also had no history of hormonal drug intake, suggesting limited association with exogenous hormonal exposure in this cohort (58).

Benign proliferative lesions formed the largest cytological category in the study, with fibroadenoma being the most common diagnosis, while carcinoma represented a substantial but smaller proportion. These findings are comparable to studies by Doshi et al. and Shah et al., who also reported fibroadenoma as the predominant benign lesion and demonstrated high diagnostic accuracy of MMSI with strong cytohistological correlation (55,59). Histopathological evaluation similarly showed a predominance of benign lesions, confirming the known epidemiological trend that benign breast diseases are more common than malignant lesions.

The MMSI categorization in the present study demonstrated that non-proliferative breast disease constituted the largest group, followed by carcinoma/CIS, while proliferative lesions with atypia formed only a small proportion. This distribution supports the ability of MMSI to effectively stratify lesions according to malignant potential. Comparable findings have been reported by Khan et al. and Bal et al., who demonstrated increasing risk of malignancy across MMSI categories along with high sensitivity, specificity, and diagnostic accuracy (13, 60).

Radiological evaluation showed predominance of BIRADS II lesions, though a significant number of BIRADS V lesions were also observed. Final classification revealed 70% benign and 30% malignant lesions, supporting the usefulness of combining radiological assessment with MMSI and histopathological confirmation for accurate lesion characterization (98, 99).

A major finding of the present study was the high histo-cytological concordance rate of 86.5%, with very few discordant cases. All non-proliferative lesions were benign on histopathology, while all carcinoma/CIS cases were confirmed malignant, indicating excellent reliability of MMSI at both benign and malignant extremes. Similar high concordance and diagnostic performance have been reported in recent studies, confirming that MMSI is a dependable, reproducible, and clinically valuable tool for breast lesion stratification and preoperative cytological diagnosis (13, 60).

**Conclusion:**

Breast lesions remain one of the most common clinical problems in women, with breast cancer contributing significantly to female cancer-related morbidity and mortality in India. Fine Needle Aspiration Cytology (FNAC) is widely used for preliminary evaluation because it is rapid, minimally invasive, economical, and reliable. However, overlapping cytological features between

benign proliferative lesions, atypical lesions, and carcinoma may reduce diagnostic accuracy. The Modified Masood Scoring Index (MMSI) was developed to provide a more objective and standardized approach for categorizing breast lesions cytologically. The present study evaluated the diagnostic utility of MMSI and correlated its findings with histopathology.

In the present study, the majority of patients belonged to the younger age groups, particularly 30–39 years (37%) and 20–29 years (33.5%), together accounting for 70.5% of cases. Similar observations have been reported in previous studies where benign breast lesions, especially fibroadenoma, predominated in reproductive-age women. Breast lump was the chief presenting complaint in 84% of patients, confirming that palpable lump remains the most common clinical presentation of breast lesions. These findings support previous literature showing that FNAC and MMSI are especially useful in evaluating palpable breast masses.

Most patients had no significant family history of breast or ovarian malignancy (77.5%), suggesting that the majority of lesions were sporadic rather than hereditary. Primiparous women formed the largest obstetric group (53%), while hormonal drug intake was absent in 90% of cases. These findings indicate that MMSI was predominantly applied in women without strong hereditary or hormonal risk factors, highlighting its utility in routine clinical breast lesion assessment.

On physical examination, benign clinical features such as mobile, well-defined, and non-tender lumps predominated (65.5%), whereas suspicious or malignant features were observed in 30% of patients. Cytological evaluation similarly demonstrated a predominance of benign proliferative lesions (49.5%), while malignant cytological features were seen in 28% of cases. Cytomorphological diagnosis revealed fibroadenoma and other benign proliferative lesions as the commonest category (54%), followed by carcinoma (28.5%). These findings are consistent with established epidemiological patterns where benign breast lesions occur more frequently than malignant lesions.

Histopathological evaluation confirmed the predominance of benign lesions, while malignant lesions constituted a substantial proportion of cases. Lumpectomy specimens formed the majority of histopathological samples, reflecting the frequent use of breast-conserving procedures. MMSI categorization showed non-proliferative breast disease as the most common category (64%), followed by carcinoma (29%), proliferative lesions without atypia (5.5%), and proliferative lesions with atypia (1.5%). The predominance of non-proliferative lesions is in accordance with previous

studies demonstrating that most breast lesions are benign in nature.

Radiologically, BIRADS II lesions were the most frequent (54.5%), while BIRADS V lesions accounted for 29% of cases, indicating a substantial burden of lesions highly suspicious for malignancy. The radiological findings correlated well with cytological and histopathological diagnosis, emphasizing the importance of the triple assessment approach combining clinical examination, imaging, and cytology.

One of the most important findings of the present study was the high histo-cytological concordance rate of 86.5%, indicating strong agreement between MMSI-based cytological diagnosis and histopathology. Furthermore, all carcinoma/CIS cases categorized by MMSI were confirmed malignant on histopathology, while non-proliferative lesions were overwhelmingly benign. The proliferative categories showed occasional overlap, reflecting the known diagnostic gray zone in atypical proliferative breast lesions. Statistical analysis demonstrated a highly significant association between MMSI categories and malignancy ( $\chi^2 = 171.6$ ,  $p < 0.000001$ ), confirming the reliability of MMSI in predicting histopathological outcomes.

The present study demonstrates several strengths, including its prospective design, adequate sample size, and comprehensive clinicopathological correlation. The high concordance between MMSI and histopathology supports the practical applicability of MMSI as a reliable cytological scoring system. However, certain limitations must be acknowledged. The study was conducted at a single center, limiting generalizability. Inter-observer variability was not assessed, and the small number of proliferative lesions with atypia restricted detailed evaluation of intermediate-risk categories. Additionally, comparison with other reporting systems such as the Yokohama or Robinson grading systems was not performed.

Overall, the findings of the present study support the usefulness of the Modified Masood Scoring Index as an effective, objective, and reproducible method for cytological assessment of breast lesions. Its strong correlation with histopathology suggests that MMSI can improve diagnostic accuracy, facilitate early risk stratification, and aid clinical decision-making, particularly in resource-limited settings where FNAC remains widely practiced.

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