

Evaluation of Cytological Scoring and Comparison with Histopathological Finding in a Palpable Breast Lump

MARGARET THERESA JOSEPH¹, FATHIMA JACKIA BANU², GERARD RAKESH³

ABSTRACT

Introduction: Breast cancer is the commonest malignancy worldwide in women. Preoperative evaluation of breast lump plays a major role in the early diagnosis and management of the breast lesions. This study helps in subgrouping the breast lesions into various categories and provides the line of management of each category accordingly.

Aim: To evaluate the cytomorphology of various breast lesions, to compare with histopathological findings and to assess the usefulness of Modified Masood's Scoring Index (MMSI) in palpable breast lumps.

Materials and Methods: This was a cross-sectional study done in 61 female patients who presented with palpable breast lump between March 2019 and February 2021 at the Pathology Department, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry, India. Cytological examination along with MMSI was applied on Fine Needle Aspiration Cytology (FNAC) aspirates, followed by histological confirmation. Under MMSI, the breast lesions

were categorised into four groups: Non Proliferative Breast Disease (NPBD), PBD without atypia, PBD with atypia, and carcinoma breast. The data were collected and compiled in Microsoft Excel programme, appropriate graphs were made and percentages were calculated.

Results: Total of 61 cases were analysed, females with age range of 23 to 64 years, mean age of 38 years. Majority of the cases presented with unilateral breast lump (92.5%). In MMSI, 15/61 (24.5%) were found with a score of 6 followed by 12/61 (19.6%) with a score of 8 which fell under NPBD. Of the total number of cases, 2/61 (3.2%) had a score of 24, while 3/61 (4.9%) had a score of 23, which fell under carcinoma breast category. Overall concordance observed between MMSI and histopathology was 59/61 (96.72%) cases, which indicates the high degree of concordance with histopathological diagnosis.

Conclusion: MMSI is a simple and reliable scoring system and can be applied on FNAC aspirates. MMSI increases the diagnostic accuracy and provides better concordance with histopathology.

Keywords: Benign tumour, Breast mass, Cytomorphology, Fine needle aspiration cytology, Malignant tumour, Modified masood's scoring index

INTRODUCTION

Breast cancer is the commonest malignancy worldwide among women [1]. Preoperative evaluation of breast lump plays a major role in the early diagnosis and management of breast lesions [2]. It is difficult to determine whether a suspicious lump is benign or malignant only through clinical examination. Hence, triple test analysis are usually followed. Triple test comprises of clinical, radiological and pathological assessment, which is essential to approach a breast lump. Most countries have adopted this triple assessment approach to breast cancer diagnosis [3].

Fine Needle Aspiration Cytology (FNAC) of breast lump is a widely accepted and established method to determine the nature of the lump. FNAC can be performed as an outpatient procedure, with minimal morbidity and has high patient acceptance [4]. Masood introduced a scoring system in FNAC of breast lump that categorises the breast lesion into IV groups: Non Proliferative Breast Disease (NPBD), Proliferative Breast Disease (PBD) without atypia, PBD with atypia, and carcinoma breast, based on six cytological parameters: cellular arrangement, anisonucleosis, cellular pleomorphism, presence of myoepithelial cells, nucleoli and clumped chromatin. Mridha AR et al., later modified the scoring system named as Modified Masood's Scoring Index (MMSI) [5].

In MMSI, the scores were rearranged in category I and II to obtain more accurate diagnosis, since they had significant prognostic variations. There are several grading systems available to evaluate benign and malignant lesions of the breast, but MMSI facilitates to evaluate and categorise all lesions of breast [6]. Preoperative

diagnosis of breast cancer is essential and useful in treatment plans, which are made based on FNAC. Neo-adjuvant therapy on breast can minimise the morbidity and enhance the prognosis status of the breast cancer. Hence, it necessitates the grading system in cytological aspirates [7]. In the present study, the authors aimed to evaluate the cytomorphology of various breast lesions, to compare with histopathological findings and to assess the usefulness of MMSI in a palpable breast lumps.

MATERIALS AND METHODS

The present study was a cross-sectional study on evaluation of cytological scoring and comparison with histopathological findings in palpable breast lumps. This study was conducted on 61 cases of palpable breast lumps from March 2019 to February 2021, at the Department of Pathology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry, India, after obtaining the Ethics Committee approval (Ref.no:33/SVMCH/IEC/1120).

Inclusion criteria: All the patients who underwent FNAC followed by trucut biopsy/lumpectomy or mastectomy for palpable breast lump were included in the study.

Exclusion criteria: Those patients who underwent FNAC but subsequently did not undergo histopathological examination were excluded from the study.

Procedure

The FNAC was performed on palpable breast lump by following standard technique using 23-G needle, fixed to a 10-mL syringe.

Modified Masood's Scoring Index (MMSI)						
Cellular arrangement	Cellular pleomorphism	Myoepithelial cells	Anisonucleosis	Nucleoli	Chromatin clumping	Score
Monolayer	Absent	Many	Absent	Absent	Absent	1
Nuclear overlapping	Mild	Moderate	Mild	Micronucleoli	Rare	2
Clustering	Moderate	Few	Moderate	Micro and/or rare macronucleoli	Occasional	3
Loss of cohesion	Conspicuous	Absent	Conspicuous	Predominantly macronucleoli	Frequent	4

[Table/Fig-1]: Modified Masood's Scoring Index (MMSI) [8].

The aspirate was expressed on two to three clean, dry glass slides and smeared using a cover slip. Smears were immediately fixed in 80% isopropyl alcohol (fixative) in a Coplin jar. The slides were subsequently stained with Haematoxylin and Eosin (H&E) and Papanicolaou (Pap) stain as routine. Criteria for adequacy, was the presence of four or five clusters of ductal epithelial cells, each made up of five to six cells with presence of bare nuclei in the background. The cytomorphology of all breast lesions were studied based on MMSI which enclose six parameters, with total score ranging between 6 to 24. [Table/Fig-1] and classified into four categories [Table/Fig-2]. Following the cytological examination, biopsies were taken for all the cases who were included in the present study. Histopathology slides were evaluated to reach the confirmatory diagnosis. Correlation and concordance analyses between cytological diagnosis of MMSI and histopathological examination were conducted and documented.

Modified Masood's Scoring Index (MMSI) Category	
Modified Masood's Scoring Index Category	Total score
Category-I: Non Proliferative Breast Disease (NPBD)	6-8
Category-II: Proliferative Breast Disease (PBD) without atypia	9-14
Category-III: Proliferative Breast Disease (PBD) with atypia	15-18
Category-IV: Carcinoma in-situ and invasive cancer	19-24

[Table/Fig-2]: Modified Masood's Scoring Category [9].

STATISTICAL ANALYSIS

The data were collected and compiled in Microsoft Excel programme and analysed. The appropriate graphs were made and percentage was calculated.

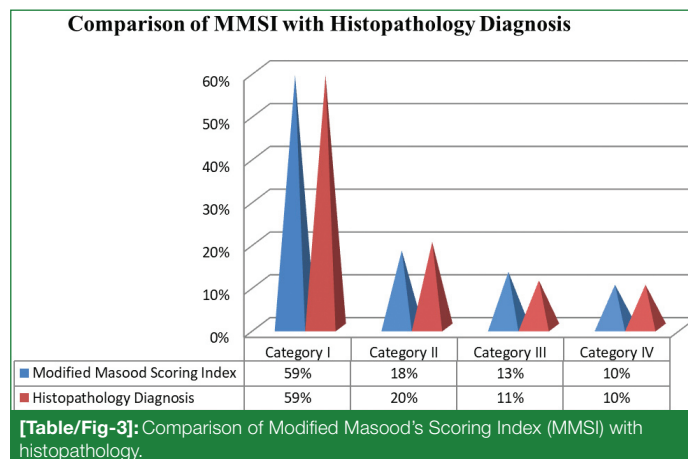
RESULTS

A total of 78 patients underwent FNAC of which 61 cases were selected for the present study, which met the above-mentioned inclusion criteria. All patients included in the study were females with age range of 23 to 64 years. Maximum number of cases were in the age group of 35-45 years with the mean age of 38 years. All the patients presented with the major complaint of palpable breast lump and some also presented with tenderness, nipple discharge, discolouration over the lump, and retraction of nipple. Majority of the cases presented with unilateral breast lump (92.5%), while the rest (7.5%) of the patients presented with multiple breast lumps. Cytomorphology of various breast lesions were compared with MMSI and histopathological findings [Table/Fig-3].

Category I: In NPBD, the cytological features are uniformly sized cells arranged in monolayered sheets with mild pleomorphism and numerous myoepithelial cells. The nuclear features like anisonucleosis nucleoli and chromatin clumping are absent. Background is fibromyxoid. Based on the cytological findings, 36/61 (59%) cases were diagnosed as NPBD. MMSI score ranged from 6-8. All cases were correlated with histopathology.

Category II: In PBD without atypia, the cytological features are mild pleomorphism with anisonucleosis, decreased number of myoepithelial cells, minimal nuclear over-riding, clustering, chromatin clumping with micronucleoli, and the background shows occasional bare nuclei and apocrine cells. Based on the cytological findings, 11/61 (18%) cases were diagnosed as PBD.

MMSI score ranged from 9-14. One case was not correlated with histopathology.

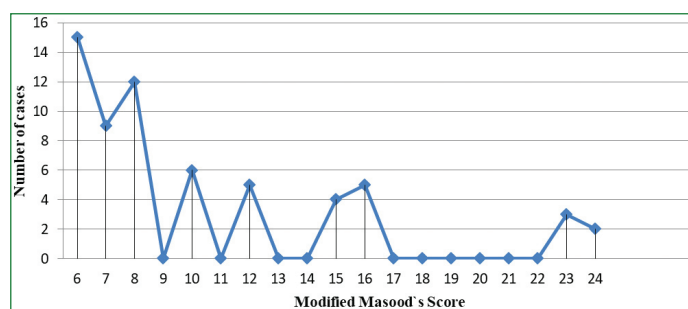


[Table/Fig-3]: Comparison of Modified Masood's Scoring Index (MMSI) with histopathology.

Category III: In PBD with atypia, cytological features are moderate to high degree of cellularity, moderate degree of cellular pleomorphism and anisonucleosis. The nuclear features include significant increase in the number of micronucleoli and chromatin clumping along with few myoepithelial cells and decrease in the number of bare nuclei. Based on the cytological findings, 8/61 (13%) cases were diagnosed as PBD with atypia. MMSI score ranged from 15-18. One case was not correlated with histopathology.

Category IV: Carcinoma breast is diagnosed using FNAC, based on cytological features characterised by loosely arranged cellular pattern, high cellularity, nuclear pleomorphism, chromatin clumping with frequent macronucleoli and absence of myoepithelial cells. Background shows necrosis. Based on the cytological findings, 6/61 (10%) cases were diagnosed as carcinoma breast. MMSI score ranged from 19-24. All the cases were correlated with histopathology.

In MMSI: The minimum score is 6 and maximum score is 24. In the present study, maximum number of cases 15/61 (24.5%) were found with the score of 6, followed by 12/61 (19.6%) were found with the score of 8, which fell under category I. The minimum number of cases 2/61 (3.2%) with the score of 24 was followed by 3/61 (4.9%) with the score of 23, which were in category IV. The frequency of distribution of score of the breast lesions is shown in [Table/Fig-4].



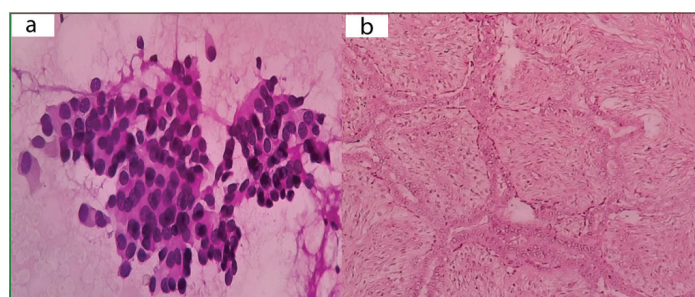
[Table/Fig-4]: Frequency distribution of MMSI score of the breast lesions.

The overall sensitivity, specificity, Positive Prediction Value (PPV) and Negative Prediction Value (NPV) of MMSI in various breast lesions is shown in [Table/Fig-5]. In the present study, overall concordance observed between MMSI and histopathology was 59/61 cases which

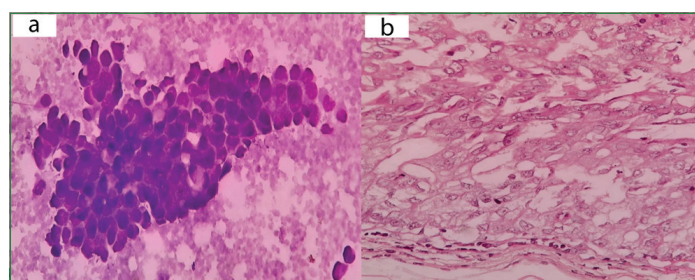
is 96.72% indicates the high degree of concordance between MMSI and histopathology. [Table/Fig-6a,b] depicts the histopathological features of cases of NPBD at 40X magnification. [Table/Fig-7a,b] depicts the histopathological features in cases of carcinoma breast at 40X magnification.

Modified Masood's Scoring Index (MMSI)	Sensitivity	Specificity	PPV	NPV
NPBD	100%	100%	100%	100%
PBD without atypia	85.71%	100%	100%	91.66
PBD with atypia	100%	88.8%	85.71%	100%
Carcinoma	100%	100%	100%	100%

[Table/Fig-5]: Sensitivity, specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV) between Modified Masood's Scoring Index (MMSI) and histopathology result in breast disease.



[Table/Fig-6]: Haematoxylin and Eosin (H&E) a) Non Proliferative Breast Disease (NPBD): Duct epithelial cells arranged in monolayered sheets (40X); b) Corresponding histopathology section showing features of fibroadenoma (40X).



[Table/Fig-7]: Haematoxylin and Eosin (H&E) a) Carcinoma: Highly pleomorphic tumour cells arranged in sheets, exhibit nuclear enlargement, clumped chromatin and prominent nucleoli. Myoepithelial cells are absent (40X); b) Corresponding histopathology section showing features of carcinoma of breast (40X).

DISCUSSION

The FNAC is a useful screening tool, which helps in early diagnosis and management of breast lesions [10]. In FNAC, it is essential to apply the scoring system in categorising the breast lesions into different groups, since each group differs in their risk for development of carcinoma. Several studies have been done on cytological scoring system of breast lesions. The present study was conducted on 61 cases of palpable breast lumps to demarcate various entities of breast lesions using the scoring system proposed by Mridha AR et al., known as MMSI [5]. In MMSI, the breast lesions are categorised into four different groups based on the six cytological parameters; cellular arrangement, cellular pleomorphism, presence of myoepithelial cells, anisonucleosis, presence of nucleoli, and chromatin clumping. The values ranging from 1 to 4 were assigned to each of the parameters and lesions were scored by adding up the values. MMSI score of 6-8 for NPBD comes under category I, 9-14 for PBD without atypia under category II, a score of 15-18 for PBD with atypia falls under category III, and a score of 19-24 for carcinoma comes under category IV [11,12].

In the present study, the authors observed the six cytological parameters to score the cytomorphology of breast lesions. The results showed that 36/61 cases fell under NPBD (category I) on cytological aspirate in MMSI. All the cases correlated with

histopathology, having a sensitivity, specificity, PPV and NPV of 100%. Similar result was observed by Mridha AR et al., and Abraham B and Sarojini TR [5,9] who also observed 100% concordance under this category. A total of 11/61 cases (18%) fell under PBD without atypia (category II). On further evaluation with histopathology, 12/61 cases were confirmed under this category II. One case was over diagnosed by MMSI which fell under the category PBD with atypia. The concordance between MMSI and histopathology was 91.6%. Sensitivity was 85.7%, specificity, and PPV were both 100% and NPV was 91.66% in MMSI under category II. Under category III, 8/61 cases fell under PBD with atypia in MMSI. On histopathology, 7/61 cases came under category III. One case was not in concordance with histopathology which was under-diagnosed by MMSI and fell under PBD without atypia (category II). The overall concordance between MMSI and histopathology was 87.5%. The sensitivity was 100%, specificity was 88.8%, PPV was 85.7% and NPV was 100% in category III. Similar findings were observed by Cherath SK and Chithrabhanu SM who studied 207 cases, with an overall concordance between MMSI and histopathology of 60% [13]. Also, discrepancy was noted under this category III. In category IV, 6/61 cases came under carcinoma of breast. On confirmation with histopathological examination, all the cases (100%) exhibited concordance with histopathology, showing a sensitivity, specificity, PPV, and NPV of 100%. Similar observation was noted by Agrawal M et al., who studied 69 cases with palpable breast lump and observed 100% concordance between MMSI and histopathology [14]. MMSI improves the diagnostic accuracy and increases the concordance between cytological and histopathological findings in palpable breast lumps [15].

In the present study, concordance between MMSI and histopathology findings showed 100% in category I and IV. Overall concordance observed between MMSI and histopathology was 59/61 cases (96.72%), which is a very high degree of concordance. MMSI plays a major role in treatment and prognostic status of the patients. MMSI delineates the various histological entities of the breast and reduces the morbidity and mortality [14].

Limitation(s)

Relatively smaller number of samples were observed in the category PBD with atypia in comparison to other categories.

CONCLUSION(S)

The FNAC is an important diagnostic tool in the management of patients with palpable breast lumps. It is an easy, reliable, repeatable, fast, and accurate simple diagnostic test with high diagnostic accuracy. The results show a high degree of correlation with histopathology. FNAC with MMSI of breast is a highly sensitive and specific modality for distinguishing various benign and malignant lesions of the breast.

Acknowledgement

The authors acknowledge greatly the scholars whose articles are cited and included in references of this manuscript and also to authors, editors and publishers of all those articles, journals and books from where the literature for this article has been reviewed and discussed. We are sincerely indebted to all the patients who made this study possible.

Author's contributions: Dr. J. Margaret Theresa helped in designing the study, protocol writing and manuscript preparation, Dr. J. Gerard Rakesh helped with manuscript review and guided the research work, Dr. Fathima Jackia Banu did the sample collection and protocol writing.

REFERENCES

- [1] Sekhar C, Prasad DN, Prasad DB, Venkata A. Study of the validity of expanded Masood cytologic index for breast carcinoma. IOSR J Dent Med Sci. 2019;18(8):60-63.

- [2] Arul P, Masilamani S. Application of National Cancer Institute recommended terminology in breast cytology. *J Can Res Ther.* 2017;13(1):91-96.
- [3] Muddegowda PH, Lingegowda JB, Kurpad M, Konapur PG, Shivarudrapa AS, Subramaniam PM. The value of systemic pattern analysis in FNAC of breast lesions: 225 cases with cytohistological evaluation. *J Cytol.* 2011;28(1):13-19.
- [4] Tiwari M. Role of fine needle aspiration cytology in diagnosis of breast lumps. *Kathmandu Univ Med J (KUMJ).* 2007;5(2):215-17.
- [5] Mridha AR, Iyer VK, Kapila K, Verma K. Value of scoring system in classification of proliferative breast disease on fine needle aspiration cytology. *Indian J Pathol Microbiol.* 2006;49(3):334-40.
- [6] Manoli SN, Ulle AR, Nandini NM, Rekha TS. Classification of breast lesions using Modified Masood Score and neural network. *Biomed Pharmacol J.* 2018;11(3):1745-48.
- [7] Masood S, Frykerberg ER, McLellan GL, Scalapino MC, Mitchum DG, Bullard JB. Prospective evaluation of radiologically directed fine needle aspiration biopsy of nonpalpable breast lesions. *Cancer.* 1990;66(7):1490-97.
- [8] Nandini NM, Rekha TS, Manjunath GV. Evaluation of scoring system in cytological diagnosis and management of breast lesion with review of literature. *Indian J Cancer.* 2011;48(2):240.
- [9] Abraham B, Sarojini TR. Cytological scoring of breast lesions and comparison with histopathological findings. *J Cytol.* 2018;35(4):217.
- [10] Yong WS, Chia KH, Poh WT, Wong CY. A comparison of trucut biopsy with fine needle aspiration cytology in the diagnosis of breast cancer. *Singapore Med J.* 1999;40(9):587-89.
- [11] Agarwal C, Chauhan V, Pujani M, Singh K, Raychaudhari S, Singh M. Masood's and Modified Masood's Scoring Index: An evaluation of fine needle aspiration cytology of breast lesions with histopathological correlation. *Acta Cytologica.* 2019;63(3):233-39.
- [12] Srivastava P, Kumar B, Joshi U, Bano M. To evaluate the applicability of parameters of cytological grading systems on aspirates of breast carcinoma. *J Cytol.* 2018;35(1):15-21.
- [13] Cherath SK, Chithrabhanu SM. Evaluation of Masood's and Modified Masood's Scoring systems in the cytological diagnosis of palpable breast lump aspirates. *J Clin Diagn Res.* 2017;11(4):EC06-EC10.
- [14] Agrawal M, Khan N, Agrawal A. Masood's cytological scoring of breast lumps and it's histopathological comparison. *Int J Contemp Med Res.* 2020;7(12):L1-L4.
- [15] Jayaram N, Harini VR, Shivarudrappa AS. Significance of Masoods scoring in Dec in cytological diagnosis of palpable breast lumps: A 3 years retrospective studies. *Indian J Pathol: Res Pract.* 2018;7(10):1069-72.

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Pathology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Cuddalore OT (NM), Tamil Nadu, India.
2. Postgraduate Student, Department of Pathology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Cuddalore OT (NM), Tamil Nadu, India.
3. Associate Professor, Department of Microbiology, Sri Venkateshwaraa Medical College Hospital and Research Centre, Cuddalore OT (NM), Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Gerard Rakesh,
KK Nagar, Cuddalore OT (NM), Tamil Nadu, India.
E-mail: margitheresa@gmail.com

PLAGIARISM CHECKING METHODS: ^[Lain H et al.]

- Plagiarism X-checker: Aug 28, 2021
- Manual Googling: Feb 01, 2022
- iThenticate Software: Feb 24, 2022 (18%)

ETYMOLOGY: Author Origin**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Aug 27, 2021**
Date of Peer Review: **Dec 27, 2021**
Date of Acceptance: **Feb 26, 2022**
Date of Publishing: **Jul 01, 2022**