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Research Article

Agreement of Breast Lesions Description Using Breast Imaging Reporting and Data System (BIRADS) Lexicon for Mammography

Fatma Fowzi Abd El Salam[1]*, Ebtsam Fraj Eljbaly[2], Nadeia Mohammed Elbagermi[2], Fatma Yousuf M Ziuo[3], Seham Ibrahim M El-Badri[4], Hawa MR Hawla[5] and Abdulhakim Cariani[5]

[1]*Lecturer At El -Marj, Faculty of Medicine, University of Benghazi, and Radiologist at Department of Radiology, Al-Hawari General Hospital, Benghazi, Libya*

[2]*Assistant Professor, Radiology Department, Faculty of Medicine, University of Benghazi, Libya*

[3]*Associate Professor, Family and Community Medicine Department, Faculty of Medicine, University of Benghazi, Libya*

[4]*Radiology Department, Al-Hawari General Hospital, Benghazi, Libya*

[5]*Lecturer, Radiology Department, Faculty of Medicine, University of Benghazi, Libya*

***Corresponding Author:** Lecturer At El -Marj, Faculty of Medicine, University of Benghazi, and Radiologist at Department of Radiology, Al-Hawari General Hospital, Benghazi, Libya.

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Abstract

Background: Mammography has been proven to be a successful method for identifying early signs of breast cancer. However, their effectiveness is dependent on how their Readers interpret the images. The Breast Imaging Reporting and Data System (BI-RADS) lexicon was created by the American College of Radiology (ACR) and mammography specialists to standardize mammographic reporting. Terms for breast density, lesion characteristics, or impression have been created. Interpretation of mammograms plays a significant role in the final diagnosis, follow-up, and treatment of breast lesions.

Aim of the Study: To assess breast imaging reporting and data system (BIRADS) agreement with the interpretation in breast lesions description.

Subjects and Methods: A cross-sectional study was conducted at the Department of Radiology in Benghazi Medical Center (BMC) with digital mammographic units during January 2018 to March 2019. The study included 200 mammographic images for women aged 40 years and older. The mammographic lesions were categorized using the Breast Imaging Reporting and Data System (BI-RADS) then the images were evaluated according to the BIRAD to define the degree of agreement between them. The Kappa value was used to assess the degree of agreement.

Results: The study revealed that there was a moderated agreement between Reader 1 and Reader 2 kappa value (K) = 0.42, a moderate agreement between Reader 1 and Reader 3 kappa value (K) = 0.46, and an agreement between Reader 2 and Reader 3 kappa value (K) = 0.43 was moderate agreement.

Conclusion: BI-RADS is moderately successful in providing a standardized language for physicians to describe lesion morphology. Efforts to reevaluate specific terms.

Keywords: Mammography; BI-RADS; Kappa Value

Introduction

A mammogram (MG) scan can detect changes inside the breast as long as two years before a patient or physician could indeed feel them; mammography has been proven to be a successful method for identifying early signs of breast cancer. However, their effectiveness is probably dependent on how their readers interpret the images (2.4). The Breast Imaging Reporting and Data System (BI-RADS) lexicon was created by the American College of Radiology (ACR) and mammography specialists to standardize mammographic reporting [1,5]. Terms for breast density, lesion characteristics, or impression have been created (1.5). The assessment and reporting of breast lesions found on mammograms have been

standardized by the American College of Radiology's Breast Imaging Reporting and Data System (BI-RADS), describing the lesion and managing it. The American College of Radiology classify the breast tissue in to 5 categories: category 1, normal; category 2, benign; category 3, indeterminate/equivocal; category 4, suspicious; and category 5, radiologically malignant,2 with BIRADS 3, 4 and 5 having a likelihood of 2%, 2% to 90%, and more than 95 percent, respectively.

There is a need to improve early diagnosis methods in our hospitals and medical centers in order to reduce breast cancer mortality [2,25]. According to recent research there has been a marked rise in the incidence of breast cancer in young Libyan women, and the majority of were in advanced stage before they were diagnosed [2]. The current research intends to standardize mammographic findings and improve physician-radiologist communication. This lexicon provides an outline of final assessment categories and recommendations in complement to a lexicon of terms for features description (4.7.8).

Aim of the Study

To measure the Inter-observer Agreement of radiologists' descriptions of mammographic breast lesions with the use of BI-RADS standardized lexicon.

Materials and Methods

A cross-sectional study with timing of data collection between January 2018 - March 2019 in Department of Radiology in Benghazi Medical Center (BMC).

Sample selection

There are two hundred cases were randomly selected for patients who underwent MG and imaging with female forty years of age or older (as referring from physician for diagnostic or screening MG).

Procedure

The American College of Radiology-Breast Imaging Reporting and Data System (ACR -BIRADS)

American College of Radiology (Breast Imaging Reporting and Data System) are designed to standardize breast imaging reporting to reduce confusion in breast imaging interpretations. It contains a lexicon for standardized terminology for MG, breast USS and MRI. The use of approved terminology is key to the production of an understandable breast imaging report. The BIRADS approach to reporting imaging examinations categorizes the overall composition of the breast and then describes non-calcified lesions by their basic shape, border characteristics and density. Calcifications are described according to size, morphology and distribution. The findings are then evaluated, and an assessment is rendered that includes the degree of suspicion for malignancy at imaging. Finally, the report indicates the management recommendations.

Estimated overall breast density pattern on mammograms was categorized into four categories using a four level density scale of BI-RADS classification of density; type A (less than twenty five percent fibro glandular tissue), entirely fat, type B (twenty five to fifty percent), scattered fibro glandular, type C (fifty to seventy five percent), heterogeneously dense and type D, extremely dense (more than seventy five percent). The imaging interpretation was based on the American College of Radiology (ACR) BIRADS (Breast Imaging Reporting and Data System) lexicon [6]. Breast lesions were classified into six categories according to the lesion imaging feature:

- BIRADS 0 = unsatisfactory imaging and additional imaging evaluations are needed
- BIRADS 1 = negative, no abnormality on imaging
- BIRADS 2 = benign findings, presence of definite benign lesions without any signs of malignancy.
- BIRADS 3 = probably benign lesion and a follow-up in a short time is suggested.
- BIRADS 4 = suspicious abnormality without typical signs of malignancy and biopsy should be considered.
- BIRADS 5 = highly suggestive of malignancy and appropriate actions should be taken.
- BIRADS6 = patient with biopsy proven cancer [7,8,22].

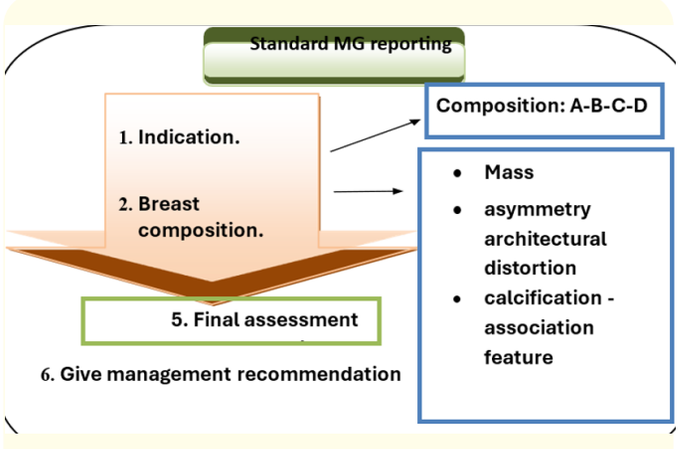

Figure 1: Standard mammogram (MG) reported [8].

S. no.	BIRADS	Management	Likelihood of Cancer
0	Need additional imaging or wait previous Examination	Recall for additional imaging.	Not available
1	Negative	Routine screening	Essentially 0%
2	Benign	Routine screening	Essentially 0%
3	Probably benign	Short interval- follow up 6months	>0%but ≤2%
4	Suspicious	Tissue diagnosis	4a. Low suspicion for malignancy (>2%to≤10%) 4b. moderate suspicion for malignancy (>10%to≤50%) 4c. high suspicion for malignancy (>50%to<95%)
5	Highly suggestive of malignancy	Tissue diagnosis	≥ 95%
6	Known of proven	Surgical excision when clinically appropriate	N/A

Table 1: Final Assessment Categories.

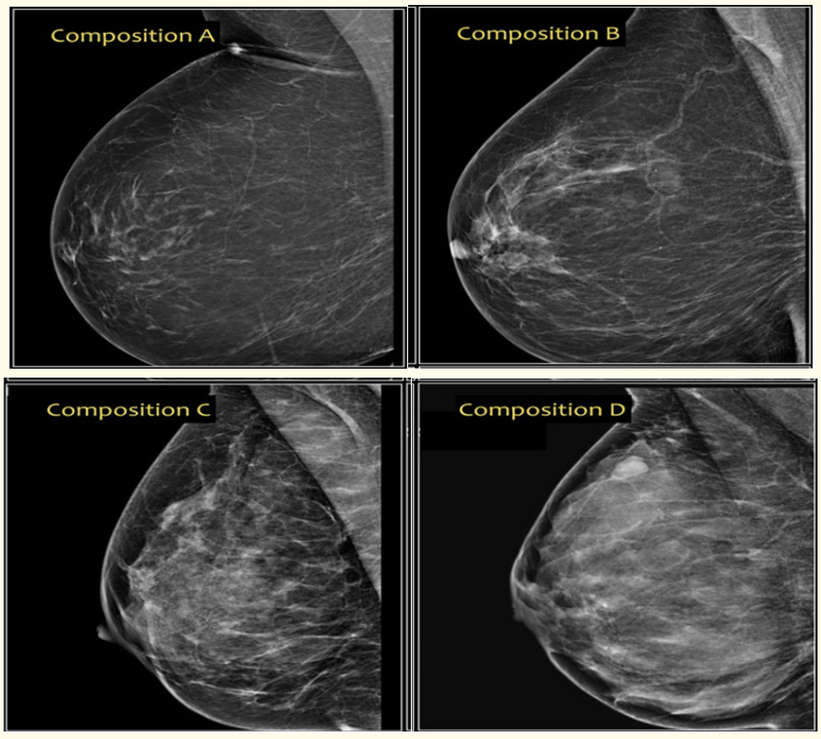

Figure 2: Breast composition.

Mammography

We using Siemens digital mammography machine with Cranio-caudal (CC) and Medio-Lateral Oblique (MLO) views as standard view and spot compression and magnification views are typically obtained of the area of clinical concern as additional view.

Data collection

Data was obtained from standardize reported by three radiologists from mammography unit in medical Benghazi center (BMC). There was no time limit to the film reading. The observers reported the finding independently and without knowledge of the final diagnosis, with added patient examination number, age and family history in reporting.

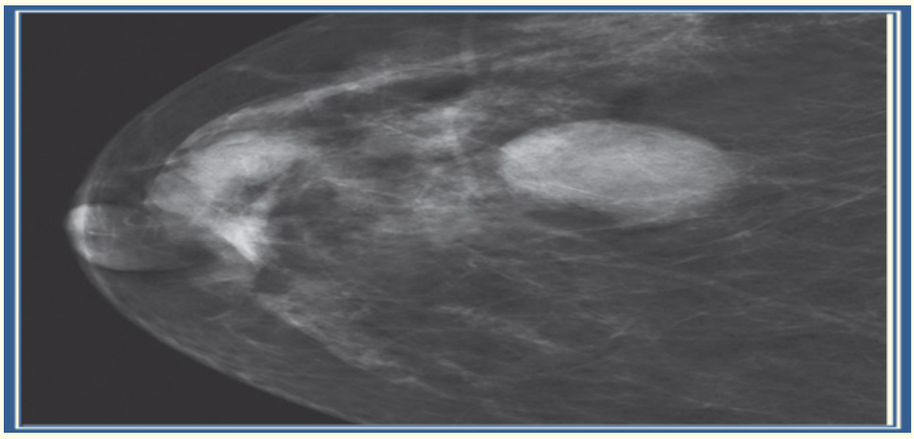

Figure 3: Equal-density oval mass with mostly circumscribed borders [7].

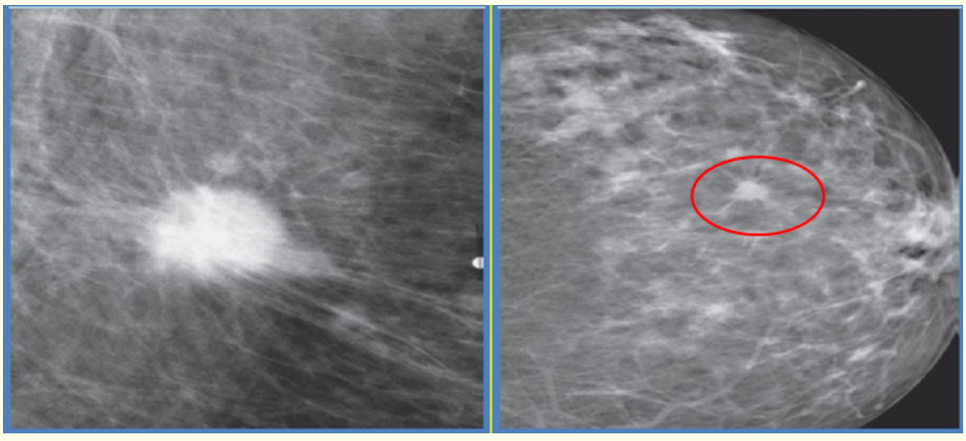

Figure 4: Round Mass with Spiculated Borders in the Mid-Breast on Cranio-Caudal (CC) View and compression view.

Ethical considerations

We have got an approval from mammography unit in medical Benghazi center (BMC), and verbal consent from the patient has been taken.

Data analysis

Data presentation: mean; frequency distribution table and cross tabulation; were used to describe and compare variables.

Statistics testing

Significance testing such as Chi-square test was used to examine relationships of variables and Cohen's kappa statistic is a statistical measure designed to assess agreement between two or more observations for categorical or nominal data 6;a kappa (κ) value of equal to or less than 0.20 indicated a poor agreement; values from 0.21-0.40, fair agreement; 0.41-0.60, moderate agreement; 0.61-0.80, good agreement; and 0.81-1.00, very good agreement ;P value significantly (if >0.05).

Data analysis was performing using the Statistics Package Social Science (SPSS) program version 20.

Estimated overall breast density pattern on mammograms was categorized into four categories using a four level density scale of BI-RADS classification of density; type A (less than twenty five percent fibro glandular tissue), entirely fat, type B (twenty five to fifty percent), scattered fibro glandular, type C (fifty to seventy five percent), heterogeneously dense and type D, extremely dense (more than seventy five percent) [7,8]. The imaging interpretation was based on the American College of Radiology (ACR) BIRADS (Breast Imaging Reporting and Data System) lexicon [6].

Results

200 cases coming for mammography were included.

Agreement between reader 1 and reader 2 category of BIRADs: According to a ACR BI-RADS Standardized category classification in breast MG imaging data, the study reported that MG was 0 in 26(54%) cases, category 1 in 22(59.5%), category 2 in 15(60%), category 3 in 3(11.1%), category 4 in 8(33.3%), category 5 in 29(74.4%), Where kappa value was (0.420) (table 2).

	(Count 1x2)2						Total
	0	1	2	3	4	5	
0	26	5	6	3	8	0	48
1	5	22	1	3	4	2	37
2	0	7	15	0	3	0	25
1	5	2	8	3	7	2	27
3	3	2	0	3	8	8	24
4	0	0	0	0	10	29	39
5	39	38	30	12	40	41	200
Total							

Table 2: Agreement between reader 1 and reader 2 category of BIRADs.

Agreement between reader 1 and reader 3 category of BIRADs.

	(Count 1x3) 3						Total
	0	1	2	3	4	5	
0	35	12	1	0	0	0	48
1	4	32	1	0	0	0	37
2	0	12	12	0	1	0	25
1	12	10	0	2	3	0	27
3	10	4	0	0	8	2	24
4	4	0	0	0	11	24	39
5	65	70	14	2	23	26	200
Total							

Table 3: Agreement between reader 1 and reader 3 category of BIRADs.

According to a ACR BI-RADS Standardized category classification in breast MG imaging data, the MG was 0 in 35(72.9%) cases, category 1 in 32(86.5%), category 2 in 12(48%), category 3 in 2(7.4%), category 4 in 8(33.3%), category 5 in 24(61.5%). Measuring of kappa value was 0.46.

Agreement between reader 2 and reader 3 category of BIRADs.

	2 * 3 Cross tabulation Count 2x3 3						Total
	0	1	2	3	4	5	
0	28	10	1	0	0	0	39
1	5	32	1	0	0	0	38
2	7	11	10	2	0	0	30
2	4	5	1	0	2	0	12
3	15	9	1	0	13	2	40
4	6	3	0	0	8	24	41
5	65	70	14	2	23	26	200
Total							

Table 4: Agreement between reader 2and reader 3 categories of BIRADs.

Discussion

Females frequently develop breast tumors, and malignant tumors are the most dreaded of all breast tumors [5]. Because breast cancer is the leading cause of death for women in Libya, early identification is crucial to lowering breast cancer mortality.

We employed the ACR BI-RADS (Breast Imaging Reporting and Data System), which includes a lexicon for standardized terms for description in USS, MG, and MRI.

Women who present with breast lesions need to be diagnosed by readily available, inexpensive, and accurate procedures, which are USS and MG. The breast lesions are appropriate according to ACR: In addition to be being typically more expensive than MG and USS, there's little evidence to support the use of breast MRI, either without or with contrast, as the next step in the evaluation of breast lesions [1].

MG and USS used the BI-RADS lexicon to classify the lesions during the clinical examination, which allows the observer determine if a breast lump is malignant, benign, or indeterminate [5,10,11]. Our results show a moderated agreement between reader 1 and reader 2 kappa value (K) = 0.42, readers 1 and 3 were in moderate agreement, with a kappa value of (K) = 0.46, and readers 2 and 3 were in agreement, with a kappa value of (K) = 0.43 was moderate consensus.

The study has a number of limitations, including the lack of hospital data archives and the very varied patient follow-up due to the patients' frequent partial or complete treatment outside the hospital that performed the histopathological diagnosis, in other parts of Libya, or abroad [12]. By 2020, Mayson W., Mahasin G., Ikhlas A., and Lubna B. will show how BIRADS can find agreement with the conventional interpretation based on the Kappa (K) value.

Each value was below 1. It follows that there wasn't complete agreement. According to this study, the mass's existence showed a very strong agreement. Despite the high degree of agreement, the patient's life might be impacted by the disagreement between the presence and lack of mass.

Regarding the mass's form and boundary, there was some agreement between the two ideas. The outcome showed that BI-RADS and routine interpretation utilized different terms to define bulk form. Therefore, Kappa values for shape and margin were less than mass presence and density because the old method of radiologists showed substantial variability.

The density indicated that the methodologies had a good level of agreement. Although there may be some perceptual differences in classifying a mass density as hyper, iso, or hypo, this is not necessarily cause for concern [30].

When cancer was present, radiologists reported findings with moderate agreement (k = 0.54) and excellent agreement (k = 0.62) when cancer was not present, the agreement was average when deciding which of the five evaluation categories to place a patient in, but it was statistically substantially lower when a patient had cancer than when they didn't (k = 0.46 versus 0.56). For exams with less dense breasts, there was a twofold increased likelihood of agreement for reporting the presence of a finding and mammographic evaluation.

Repeat readings by the same radiologists had a higher degree of agreement than readings by different radiologists [19,20,32].

The Korean Society of Radiology demonstrated inter-radiologist consensus in 2019. (kappa value of 0.27–0.34). There was a considerable amount of agreement among the twelve radiologists, and as a result, radiologists who read more than 3000 screening mammogram each year often performed better than those who did not [33].

In the current study, experienced breast imagers had fair to moderate inter-observer agreement for all categories of the BI-RADS 4th edition, which was quite comparable to the results published by Lazarus., *et al*. [5].

A recent systematic review of adjunct ultrasonography in women at high risk for breast cancer, defined by increased breast density or other risk factors, demonstrated that supplemental screening with ultrasonography can increase the detection rates of cancer at the cost of a high false positive rate. These examples of possible indications include supplemental screening after mammography for women aged 40 to 74 with dense breasts [2].

New sonography and mammography are frequently used in conjunction to address breast lesions. The imaging results are unquestionably benign, characterizing the lesions and preventing needless procedures. Negative results on combined mammographic and sonographic imaging are extremely precise, comforting to the patient, and help avoid needless biopsies [4].

New Double reading has been adopted in several nations since it was discovered to enhance the efficiency of mammographic assessment [13], which shows that there is still potential for development in mammography evaluation beyond double reading, multiple readings can further increase diagnostic performance up to more than 10 readers [19,22].

Conclusion

BI-RADS is only moderately helpful in giving doctors a basic terminology to characterize lesion morphology. The promise of good quality with the BI-RADS standardized mammography lexicon may be preserved by making an effort to reassess specific terms and the diagnostic value given to descriptors.

Recommendations

Complementary sonographic imaging improves the diagnostic value.

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