Original Article

Investigation of Frequency Distribution of Breast Imaging Reporting and Data System (BIRADS) Classification and Epidemiological Factors Related to Breast Cancer in Iran: A 7-year Study (2010–2016)

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Abstract

Background: The first cause of women mortality due to cancer is breast cancer. Mammography plays a central part in early detection of breast cancers. The screening methods can play a major role to reduce the morbidity and mortality rate due to this malignancy. We sought the basic data in this study on our population because knowing about the baseline data is apt and vital. **Materials and Methods:** In this study, data were collected from a questionnaire, contained baseline bio data information, and mammographic imaging of the patients came during 7 years. Breast imaging reporting and data system (BIRADS) score, breast composition, presence of axillary lymph nodes, microcalcifications, and other incidental positive findings were determined by a radiologist and analysis was performed by SPSS package. **Results:** The most common indication for mammography was annual screening. The mean age of participants to the study was 55 ± 7.9 years. The majority (80%) of the patients with known breast cancer (BIRADS 6) had the extremely dense breast. The most common incidental findings in mammogram studies were focal asymmetry, architectural distortion, intramammary lymph node and accessory breasts, respectively. **Conclusion:** The frequency distribution of BIRADS classification in our society was clarified. It seems that the breast cancer risk is higher in women with dense breasts. Architectural distortion was also correlated to BIRADS score.

Keywords: *Breast cancer, breast imaging reporting and data system, mammography, BIRADS*

Introduction

Breast cancer continues to be a significant public health problem in the world. Worldwide, it comprises 22.9% of all cancers in women.[1] Approximately, 182,000 new cases of breast cancer are diagnosed and 46,000 women die of breast cancer each year in the United States. Although significant efforts are made to achieve early detection and effective treatment but scientists do not know the exact causes of most breast cancer, they do know some of the risk factors (i.e., aging, genetic risk factors, family history, menstrual periods, not having children, obesity).[2]

The first cause of women mortality due to cancer is breast cancer.[3] It is estimated that 1 woman in 8 will have breast cancer during her lifetime and 1 in 33 will die from breast cancer.[4] Based on studies in our society, Iran, the breast cancer affects women at least one decade younger than their counterparts in developed countries.[5]

A breast cancer diagnosis is a major life stressor compounded by surgery, chemotherapy, radiation, and hormonal treatments that impose significant psychological (such as depressed mood and elevated anxiety) and physical challenges for the patient.[6] Therefore, the screening methods and consequently the diagnosis at early stages can play a vital role to reduce the morbidity and mortality of breast cancer.

Conventional mammography is considered the modality of choice for the detection of breast cancer. Mammography is a specific type of image that uses a low-dose X-ray system to examine breasts. The dose is typically known to be around 0.7 mSv.[2]

Mammography plays a central role in early detection of breast cancers[7] because it can show changes in the breast up to 2 years before a patient or physician can feel them. Two types of mammography

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are known: screen-film mammography and digital mammography (DM). DM incorporates a new technique called computer-aided diagnosis which improves the radiologists' performance by indicating the sites of potential abnormalities.[2]

Current guidelines from the U. S. Department of Health and Human Services, the American Medical Association and the American College of Radiology (ACR) recommend screening mammography every year for women, beginning at age 40.[8]

Research has shown that annual mammograms lead to early detection of breast cancers when they are most curable, and breast-conservation therapies are available.

Until some years ago, mammography was typically performed with screen-film cassettes. Now, mammography is undergoing transition to digital detectors, known as DM or full-field DM (FFDM). The first FFDM system was approved by the Food and Drug Administration in the U. S in 2000.[9]

Diagnostic mammography is used to evaluate a patient with abnormal clinical findings – such as a breast lump or nipple discharge – that have been found by a woman or her doctor. Diagnostic mammography may also be done after an abnormal screening mammogram to evaluate the area of concern on the screening examination.[9] Other modalities are still under study. New screening modalities are unlikely to replace mammography in the near future for screening the general population. Newer screening tests such as magnetic resonance imaging and ultrasound have been studied in women at increased risk of breast cancer (e.g., carriers of BRCA 1 or BRCA 2 mutations). None of the newer tests has been evaluated for its effect on breast cancer mortality in the general population and no data support screening the general population with these technologies. Careful evaluation of newer modalities in the populations for which they will be used is critical, especially since these modalities are usually more expensive than current approaches and the risk of increased false positives is present.[10]

Mammography has also some disadvantages. Possible harms include pain especially during compression, anxiety about screening, both false-positive and false-negative results and theoretic concerns about radiation-induced cancers from repeated mammography. However, the potential benefits are thought to outweigh the risks.,[10-12]

Mammography can be performed for diagnostic purposes. It is recommended for women with:
1. Any breast abnormality, including unilateral spontaneous nipple discharge, lump, pain and skin thickening
2. History of breast cancer
3. Evaluation of an abnormality on screening mammogram[13]
4. Short interval follow-up (BIRADS 3)[14]

The American College of Radiologists-Breast Imaging Reporting and Data System (ACR-BIRADS) is a qualitative tool originally designed for use with Mammography. This system is established to standardize professional radiologic reporting with numerical scores (0–6) typically allows for understanding of patients records between multiple doctors and medical facilities.[14]

Breast composition is also categorized to four groups according to ACR-BIRADS classification. The new breast composition categories are as follows:
- The breasts are almost entirely fatty
- There are scattered areas of fibroglandular density
- The breasts are heterogeneously dense, which may obscure small masses
- The breasts are extremely dense, which lowers the sensitivity of mammography.[14,15]

The screening methods and consequently diagnosis at early stages of breast cancer can play a major role to reduce the morbidity and mortality rate due to this malignancy.[10]

A baseline data are apt and vital for collaborative studies. Thus, in this survey, we aimed to investigate the frequency distribution of BIRADS classification and epidemiologic factors related to breast cancer.

Materials and Methods

This study was a cross-sectional descriptive study with simple random sample. It has done on the patients came for at least a mammography during 7 years (2010–2016) in the biggest community-based referral Mammographic center in Isfahan, Iran. The cases were contained any levels of socioeconomic status to avoid a confounding bias in the survey.[16]

Data were collected from a questionnaire and mammographic imaging of the patients that filled the informed consent for the research at 2016. The questionnaire, apart from demographic characteristics, contained baseline biodata information such as reproductive history, menopausal status, family history in first-degree relatives, the use of exogenous hormonal supplements, symptoms, the reason of mammography (screening of diagnostic), and the history of prior breast surgery up to the time of the study mammogram. For the patients with several imaging, the latest findings were used for the analysis. In the cases with a history of unilateral breast cancer and mastectomy, mammographic image of contralateral breast was evaluated in analysis. The patients with incomplete or inaccessible profiles were excluded from the study. The next criteria for exclusion from the study were the individuals with a history of bilateral mastectomy. Total of 924 out of 1015 women were enrolled in the study finally.

Mammography was acquired with a film-screen machine using picture archiving and communication system before commencing this study within 7 years.

Table 1: Breast imaging reporting and data system categories and management recommendations

Assessment	Management	Likelihood of cancer
Category 0: Incomplete-need additional imaging evaluation and/or prior mammograms for comparison	Recall for additional imaging and/or comparison with prior examination (s)	N/A
Category 1: Negative	Routine mammography screening	Essentially 0% likelihood of malignancy
Category 2: Benign	Routine mammography screening	Essentially 0% likelihood of malignancy
Category 3: Probably benign	Short-interval (6-month) follow-up or continued surveillance mammography	>0% but ≤2% likelihood of malignancy
Category 4: Suspicious	Tissue diagnosis	>2% but <95% likelihood of malignancy
Category 5: Highly suggestive of malignancy	Tissue diagnosis	≥95% likelihood of malignancy
Category 6: Known biopsy-proven malignancy	Surgical excision when clinically appropriate	N/A

N/A: Not available

Mammography films were evaluated by a well-trained radiologist and the radiologist determined BIRADS score, breast composition as one of the four standard categories, presence of axillary lymph nodes, microcalcifications (either benign or malignant view in mammograms), and other incidental positive findings such as accessory nipples.

BIRADS or "BI-RADS" stands for BIRADS and was established by the ACR. BIRADS is a scheme for putting the findings from mammogram screening (for breast cancer diagnosis) into a small number of well-defined categories. The following table is about concordance between BIRADS categories and management recommendations according to ACR [Table 1].[14]

Statistical methods

Crude data were acquired, and statistical analysis such as mean, mean rank, and correlation coefficient was performed by ANOVA test and Kruskal–Wallis test using social statistical package (SPSS) version 19 (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp).

Results

The mammograms of 924 patients were evaluated during this study (924 out of 1015 which indicates a response rate of around 91%). Their age ranged from 34 to 78 years with a mean age of 55 ± 7.9 years. The most common indication for mammography was annual screening (98.8% were for screening and 1.2% taken for diagnostic purposes). The frequency distribution of BIRADS, breast composition, and other biodata information were shown in Tables 2, 3 and Figure 1.

The most common positive findings in mammogram studies were focal asymmetry, architectural distortion, intramammary lymph node, and accessory breast, respectively. Likelihood ratio, Chi-square test, has showed that there was a significant relationship between these positive findings and breast density in mammogram ($P < 0.0001$). There was also a significant relationship between these positive findings and BIRADS ($P < 0.001$).

Table 2: Breast imaging reporting and data system frequency distribution

BIRADS score	Frequency, *n* (%)
0	163 (17.6)
1	524 (57.6)
2	192 (20.8)
3	18 (1.9)
4	9 (1)
5	8 (0.9)
6	5 (0.5)

BIRADS: Breast imaging reporting and data system

Table 3: Biodata frequency distribution

Biodata	*n* (%)
Family history*	
Positive	82 (8.9)
Negative	842 (91.9)
Mass palpation	
Positive	26 (2.8)
Negative	898 (97.3)
Exogenous hormone	
Positive	53 (5.7)
Negative	871 (94.3)
Microcalcification	
Positive	
Benign appearance**	86 (9.3)
Malignant appearance**	19 (2.1)
Negative	819 (88.6)
Prior breast surgery	
Positive	15 (1.6)
Negative	909 (98.4)
Incidental positive finding	
Intramammary lymph node	66 (7.1)
Accessory breast	22 (2.4)
Mastitis	1 (0.1)

*Family history of breast cancer in first-degree relatives, **Appearance in mammographic view

Kruskal-Wallis test showed the highest BIRADS score in the mammography-reported Architectural distortion and the lowest BIRADS score in the accessory breasts (mean rank of 80% in comparison with 40%).

Table 4: Breast imaging reporting and data system and breast composition

BIRADS score	Breast composition			
	Fatty (%)	Scattered fibroglandular (%)	Heterogeneously dense (%)	Extremely dense (%)
BIRADS 0	18 (4.6)	29 (7.5)	36 (76.6)	80 (80)
BIRADS 1	304 (77.7)	218 (56.5)	1 (2.1)	6 (6)
BIRADS 2	63 (16.1)	119 (30.8)	4 (8.5)	6 (6)
BIRADS 3	4 (1)	12 (3.1)	1 (2.1)	1 (1)
BIRADS 4	2 (0.5)	5 (1.3)	1 (2.1)	1 (1)
BIRADS 5	0	3 (0.8)	3 (6.4)	2 (2)
BIRADS 6	0	0	1 (2.1)	4 (4)
Total count	391 (100)	386 (100)	47 (100)	100 (100)

Test statistics: χ^2=185.926, df=3, P<0.001

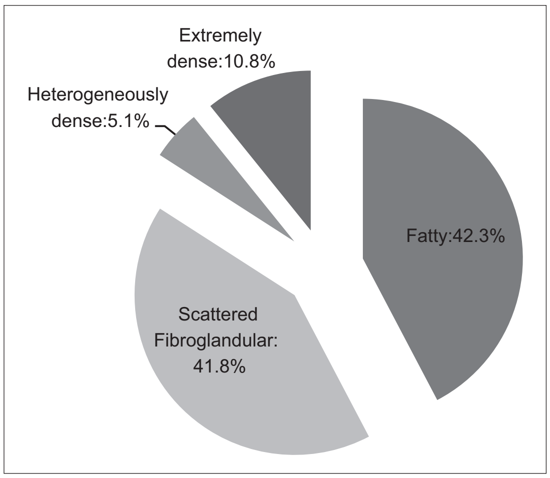

Figure 1: Breast composition frequency distribution

Discussion

According to Spearman's rank, correlation coefficient showed no significant relationship between BIRADS score and age (r = 0.055, P = 0.095).

The most BIRADS category of 0 was seen in dense and then, heterogeneously dense breast compositions (49%, 22%). It showed that 80% of the patients with known breast cancer (BIRADS 6) had the extremely dense breast. Only 0.5% of the patients with fatty breast density were placed in BIRADS 4–6. It was also shown that 57% of normal individuals (BIRADS 1) had a fatty breast composition [Table 4].

After removing the BIRADS score of 0, Kruskal–Wallis test showed that there was a significant relationship between BIRADS score and breast composition (P < 0.001). The least BIRADS score was related to fatty breast category, and the most BIRADS score was related to heterogeneously dense breast group [Table 4].

The breast density was decreased by aging (47% of people older than 60 had fatty breast composition, and only 5.5% of them were categorized in extremely dense breast compositions). ANOVA test also showed that there was a significant relationship between breast composition and age (P = 0.01).

Conclusion

In this study, we evaluated the frequency distribution of BIRADS classification and epidemiologic factors related to breast cancer in a community-based mammography center in Isfahan, Iran. About 57.3% of all cases were categorized as BIRADS 1 and 20.8% as BIRADS 2. It shows that the mammography examination can give enough assurance to the majority of women after one screening spot. 17.6% were categorized under BIRADS 0, in which the majority had the higher density of breast.

No significant relationship was found between BIRADS score and age. It was shown that there was a significant relationship between BIRADS score and breast composition. As a result, it seems that the breast cancer risk is higher in women with higher density of breast.

It was also seen a reverse correlation between breast density and age. A couple of findings in mammogram studies such as architectural distortion were also correlated to BIRADS score.

The academic knowledge of breast cancer and the importance of screening are quite good in Iranian society. It seems this modality is using as a routine first-step examination for screening of breast cancer. The other modalities for screening need still more investigations.

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Conflicts of interest

There are no conflicts of interest.

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