Original Research Paper

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Radio Diagnosis

INCIDENCE OF BREAST CANCER IN SCREENING MAMMOGRAPHY WITH HISTOPATHOLOGICAL CORRELATION : A PROSPECTIVE STUDY IN A TERTIARY CARE CENTRE.

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ABSTRACT

INTRODUCTION: Breast cancer is the most frequently diagnosed cancer and the leading cause of cancer-related death among women worldwide. The incidence is rising in developing countries. Screening mammography is the primary imaging modality for early detection of breast cancer because it is the only method of breast imaging that consistently has been found to decrease breast cancer-related mortality

AIMS AND OBJECTIVES: To establish the role of screening mammography in asymptomatic women of age 40 and above, irrespective of risk factors. Early detection of breast cancer and to reduce mortality and morbidity in women.

MATERIAL AND METHODS: The present Prospective longitudinal study conducted from January 2020 to June 2020 for 6 months was carried out in 40 women who presented to the department of Radio-diagnosis, King George Hospital, Visakhapatnam for screening mammography without symptoms, were evaluated with full-field digital mammography (FFDM) Sonomammography (USG) and Digital Breast Tomosynthesis (DBT) when indicated.

RESULTS: A total of 40 women who came to our radiology department for screening mammography were enrolled. The majority were in between 40 to 49 yrs. Out of 40 examined 24 were diagnosed as benign (BI-RADS 2&3) and 1as malignant lesion. Imaging findings were evaluated, tabulated and correlated with histopathological findings. The findings were statistically analysed

CONCLUSION: Digital Mammography remains the gold standard for screening of early-stage breast cancer. The combination of mammography and Sonomammography significantly increased sensitivity, specificity and also increased the diagnostic confidence compared to the individual modality especially in dense breasts and high-risk participants decreasing the callbacks and unnecessary surgical interventions in selective cases.

KEYWORDS : Breast cancer, screening mammography, BI-RADS, high-risk participants.

INTRODUCTION

Breast cancer became the most common malignancy globally as of 2021, accounting for 12% of all new annual cancer cases worldwide, according to the World Health Organization[1]. In 2020, there were 2.3 million women diagnosed with breast cancer and 685 000 deaths globally[2]. It is the most common cause of cancer death in women from regions characterized by lower indices of development and/or income (14.3% of deaths), and the second most frequent from regions characterized by higher indices of development and/or income (15.4% of deaths), after lung cancer.

The effective early diagnosis & management of breast lesions involves a multidisciplinary approach to their assessment. Non-invasive techniques like mammography, is a well-defined & widely accepted radiologic procedure to evaluate clinically suspected breast lesions & as a tool to screen for breast cancer[3].The present study is to evaluate the breast lesions by using mammography with histopathological correlation. Sonomammography is also added wherever necessary. The gold standard diagnostic approach is through triple assessment that comprises of clinical examination, imaging, and needle biopsy[4]

INCLUSION CRITERIA

- All the Asymptomatic (without clinical breast disease) women of age 40 and above.
- Women of age <40 with high-risk history
- Valid informed consent for Mammography/HPE/Annual follow-up.

EXCLUSION CRITERIA

- Women of age below 40years
- Women with known/ diagnosed breast disease (who are referred from other medical-surgical units).
- Post Operative patients.

METHODOLOGY

Screening Mammography is done for asymptomatic women of 40 years or above. A detailed history was documented at the time of initial visit, date of initial visit, age of the patient and 'breast specific history was taken including menstrual history. Lactational history, history of mastalgia, past and family history of any breast problem. The procedure was explained and informed consent was taken from all women before the study. Lesions were characterized by using mammographic criteria as benign and malignant. Sonomammography was routinely performed as an additional imaging examination in all the cases. U/S guided FNAC was done wherever necessary. A standardized final assessment based on the American College of Radiology Breast imaging reporting and Data system (BI-RADS) was made. Thus the lesions were categorized as benign and malignant.

BI-RADS Category

A lexicon of Mammographic descriptors of breast masses with assessment categories (Breast Imaging and Reporting and Database System) BI-RADS has been developed by the American College of Radiology (ACR; Reston, VA) to improve the clinical efficacy of mammography and to standardize terms for lesion characterization and reporting. The mammographic BI-RADS lexicon includes descriptors for shape, orientation, margins, lesion boundary, density, and perifocal architectural distortions. Based on these descriptors, each lesion was assigned to a final assessment category[5]

- BIRADS 1&2 advised for routine screening mammography & annual follow up.
- BIRADS- 3 required short interval (6months) follow up.
- BIRADS- 4&5 aresubjected to biopsy and histopathological examination.

Imaging protocols:

Equipment: 1. Fujifilm Digital Mammography System AMULET Innovality.

- Low kVp technique-(18 to 24) and short exposure time (MQSA-
- Mammography Quality Standards Act of1992)
- High spatial resolution. High contrast film.
- Small focal spot (0.1mm)
- Compression to avoid movement artefacts / geometrical un-sharpness.

2. Sonomammography on Samsung RS 80A MODEL

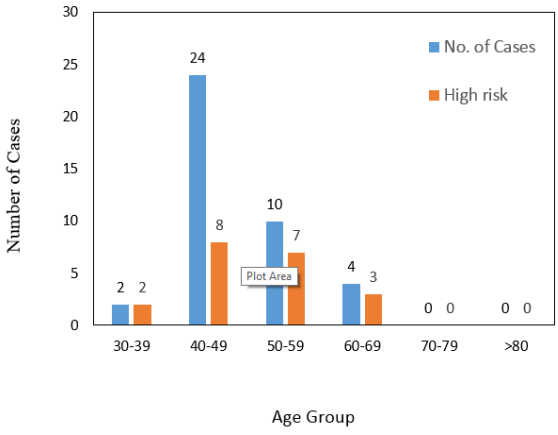
RESULTS

Screening Mammography was performed in 40 women. The age of the

women ranged from 40-80 years. Among 40 participants, 20(50%) were of high risk. 15(37.5%) were normal, 20(50%) were benign, 4(10%) were probably benign and 1(2.5%) participant was found to be malignant. Breast density grades were also categorized based on age. Among 40 cases 3 (7.5 %) had dense breasts, 24 (60%) had heterogeneously dense breasts, 13(32.5%) had scattered fibro glandular tissue and no fatty breasts. (Table1,2,3 & Graph 1,2,3.).

Table 1: Distribution of participants based on the Age group and High risk

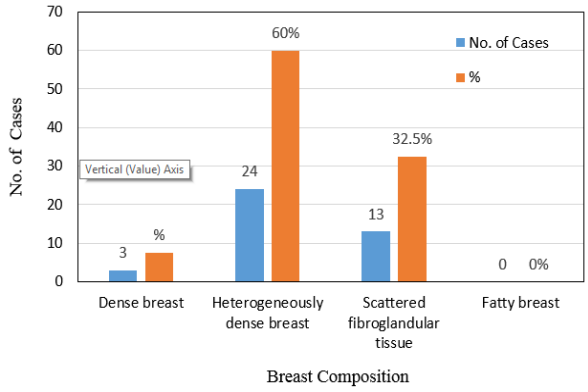
Age group	No of cases (N=40)	%	High risk (N=20)	%
30-39	2	5	2	100
40-49	24	60	8	33.3
50-59	10	25	7	70
60-69	4	10	3	75
70-79	0	0	0	0
>80	0	0	0	0



Graph 1: Distribution of participants based on the Age Group

Table 2: Distribution of Participants Based on the Breast Composition

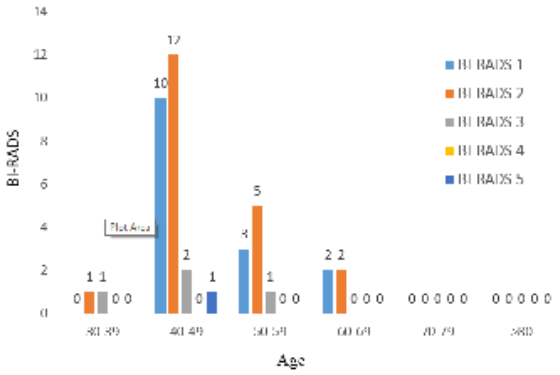
Breast composition	frequency	%
Dense breast	3	7.5
Heterogeneously dense breast	24	60
Scattered Fibroglandular tissue	13	32.5
Fatty breast	0	0



Graph 2: Distribution of Participants based on the Breast Composition

Table 3: BI-RADS grading of the Study Population based on Age

AGE	BI-RADS1	BI-RADS2	BI-RADS3	BI-RADS4	BI-RADS5
30-39	0	1	1	0	0
40-49	10	12	2	0	1
50-59	3	5	1	0	0
60-69	2	2	0	0	0
70-79	0	0	0	0	0
>80	0	0	0	0	0



Graph 3 BI-RADS Grading of Study Population-Based on Age

Benign lesions

Among the 20 benign cases, (BI-RADS 2) non-specific benign axillary lymph nodes being the commonest followed by benign calcifications, non-proliferative fibrocystic changes (FCC), IM nodes, breast lipoma. Among the 4 cases categorized as BI-RADS 3, the most common lesions were Fibroadenomas followed by, Proliferative FCC (sclerosing adenosis). Table 4&5

Table 4: Radiological Diagnosis of Benign Breast Lesions (BI-RADS2)

Radiological Diagnosis	No of Cases (N=20)	%
Benign lymph nodes	12	60
Benign calcifications	4	20
FCC	2	10
Intramammary (IM) nodes	1	5
Breast lipoma	1	5

Table 5: Radiological diagnosis of probably Benign breast lesions

Radiological diagnosis	No of cases (N=4)	%
Fibroadenomas	3	75
Sclerosing adenosis	1	25

Malignant lesion:

In this screening mammography, 1 case was diagnosed as highly suspicious of malignancy (BI-RADS5) in the age group of 40-49 years. A single lesion with irregular shape and spiculated margins showing pleomorphic micro-calcification distinctly visualised in magnified view and on Tomosynthesis. Significant enlarged left axillary lymph nodes are noted. No evidence of associated changes. Histopathological examination revealed invasive duct cell carcinoma. Table6

Table 6 Radiological diagnosis of malignant breast lesion

Radiological diagnosis & histopathology	Size	Shape	Margin	Quadrant	Side	Calcifications	LN	Architectural distortion	Single/ Multiple
BI-RADS5 (I) (DCC) Invasive	18 x17 mm	Irregular	Spiculated	Upper & Inner	Left	Pleomorphic micro-calcifications	+	+	Single

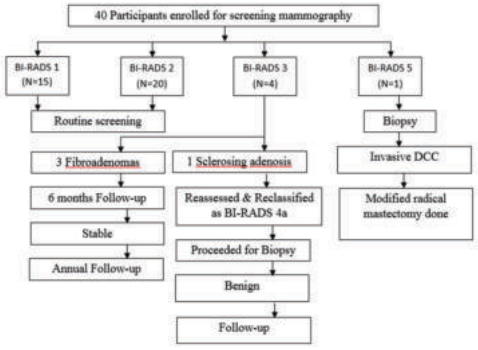
Mammography findings were correlated with USG and DBT wherever necessary and assigned BI-RADS grade. 1 malignant case (BI-RADS 5) and 1 upgraded probably benign case (BI-RADS 3) after reassessment/Reclassification were sent for histopathology. The results are tabulated (Table 7)

Table 7: Radiological diagnosis in correlation with Histopathology

Breast Imaging			Histo-Pathology	
Findings	Screening Mammography	Total No.of cases	Malignant	Benign
Malignant BI-RADS 5	1	1	1(true positive)	0 (false positive)
Probably benign BI-RADS3 (Suspicious After Reassessment)	1	1	0 (false negative)	1(true negative)

Using this data, the sensitivity, specificity, positive predictive value, and negative predictive value and diagnostic accuracy were calculated, The values were 100%, 100 %, 100%, 100% and 100% respectively.

Flow chart:



CASE STUDIES

1. Benign lesions (BI-RADS 2)

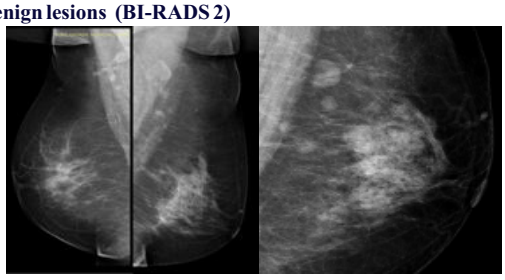


Fig.1(A) Benign axillary lymph nodes **Fig 1(B) Intramammary lymph nodes**

Benign calcifications

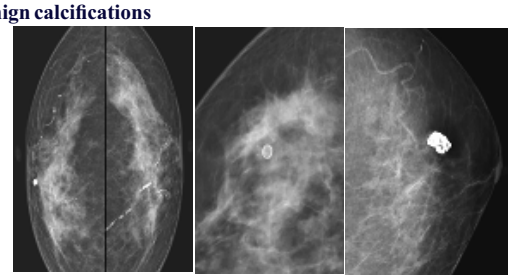


Fig.2(A): Vascular calcifications **(B) Egg shell calcification** **(C)Popcorn Calcifications**

Breast Lipoma

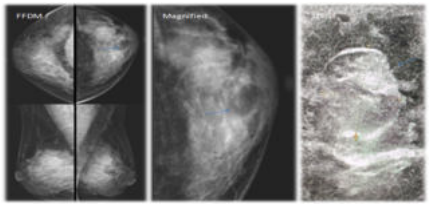


Fig.3 Digital Mammography Showing extremely Dense Breast with hypo Dense area in left Breast which is seen as an echogenic area on Sonomammography, confirmed as Lipoma

Fibrocystic changes

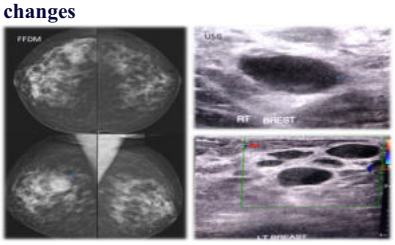


Fig.4. 40/F heterogeneously dense breast showing a small round well defined isodense lesion in the upper outer quadrant in the posterior portion of right breast whose margins are partially obscured by adjacent fibroglandular tissue. Ultrasound showing multiple bilateral FCC (Fibrocystic changes) largest is seen in the right breast.

2. Probably Benign Lesion (BI-RADS3)

Fibroadenoma:

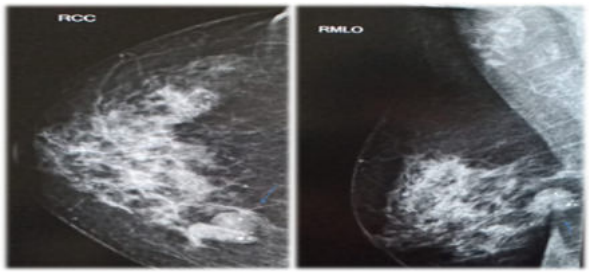


Fig 5. 53/F Heterogeneously dense breast showing small macrolobulated oval lesion with smooth margins involving inner lower quadrant of the right breast in the posterior portion showing coarse heterogeneous calcifications within. The lesion is showing 2 undulations. Right axillary benign lymph nodes are seen.

3.Malignant lesion (BI-RADS 5)

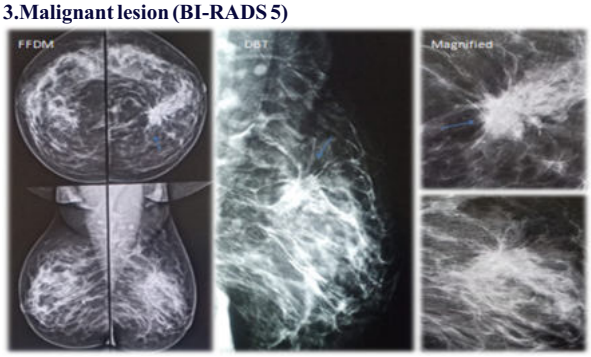


Fig 6. 42 /F Heterogeneously dense breast showing Irregular / ill-defined iso-hyperdense lesion with spiculated margins in the upper inner quadrant of the left breast in the mid portion at 11 0'clock position measuring 18x17mm (in correlation with ultrasound) and showing architectural distortion and pleomorphic micro-calcifications within. Significant enlarged left axillary lymph nodes noted.

DISCUSSION

Mammography is a technique that uses low energy x-rays to give high-resolution images of soft tissues of the breast. Filters made of Molybdenum, Rhodium are used. It has high Temporal and Spatial resolution to demonstrate microcalcifications (<100 μm). Its role in early breast carcinoma is signified by the fact that it senses roughly (75%) of breast cancer cases before they can be palpated. Its radiation may be harmful to the patient. Nevertheless, its beneficiary effects outweigh the risks and inconvenience. It's a preferred screening examination for breast cancer in females over 40 years. Women after forty years of age have the highest prevalence of breast cancer due to hormonal fluctuations. Various previous studies suggested that it's helpful even for older women[6]. Our work is in line with previous researches suggesting screening mammography above 35years.

The majority of women with abnormalities noted on screening mammograms (around 95%) do not have breast cancer with variability based on multiple factors including the radiologist's assessment and the woman's age. Because the risk of breast cancer increases with age, the likelihood of a woman with an abnormal mammogram result having cancer also increases with age. On the other hand, having a normal mammogram result does not rule out the possibility of having breast cancer, because false-negative mammography examination results do occur. In such cases, either the Cancer is not visible on mammography examination or the radiologist fails to notice the lesion prospectively[7].

A study conducted in Saudi Arabia stated that Screening mammography is the most common and widely practiced breast cancer screening modality across the world. The major merits of breast cancer screening programs are early diagnosis, sorting out and Prevention of risk factors, and timely treatment to lessen the morbidity and reduction in 20% of mortality rate. The major demerits of breast cancer screening are over diagnosis, high cost, ionizing radiation, and their consequences. Worldwide, most countries recommend biennial screening for breast cancer at 50–74 years of age. However, some countries recommend Screening mammography earlier, starting at the age of 40 years until 70–74 years, based on higher breast cancer incidence rate as well as in high-risk patients in those countries[8,9],

The study carried out in Iran stated that Mammography is the preferred modality in screening breast cancer patients. The use of complementary tests such as Ultrasonography is recommended, especially in dense breast and high-risk women[10]. Double-reading of films, where 2 or more radiologists interpret each film, is offered in some United States screening programs and in about half of the other countries that use mammography screening[7] Early screening and diagnosis of breast lesions and categorization into different groups using BIRADS is helpful in accurate management of the breast lesions. In our study on screening mammography, we diagnosed one malignant lesion out of 40 screening cases and differentiated it from benign lesions. We also did a complete diagnostic workup for all BI-RADS 3 cases.

Goswami KG et al., (2019) [11] conducted a study to find out the most accurate method of screening for cancer in females presenting with breast lumps. The sensitivity and specificity for cancer diagnosis by mammography was 77% and 98% respectively, as compared to 56% and 97% for Sonomammography. The sensitivity and specificity of both methods combined was 100% and 97% respectively. Their findings are comparable with our study. In younger patients with mammographically dense breasts, Sonomammography performs better for detection and diagnosis. We found that Digital Mammography along with Tomosynthesis when combined with Sonomammography yielded significant improvement in sensitivity and specificity with values of 100% each.

FOLLOW UP

BIRADS 1 and 2 are advised regular Annual follow up.

BIRADS3 are followed up and reassessed and reclassified by combined modality and Categorized as BI-RADS4a. Proceeded for biopsy and histopathology report suggestive of Benign Breast Lesion. The rest of 3 participants shows no significant Radiological changes.

BIRADS 5 participant proceeded for biopsy and post-operative histopathology revealed Duct cell carcinoma..

LIMITATIONS AND RISK-BENEFIT RATIO

Mean dose received by average women is approx. 0.2 Rad per exposure or 0.4 rad for a typical two-view examination in Screening mammography.

The lifetime risk of inducing fatal breast Carcinoma from 2 view mammography aged 45 yrs. at exposure is 1 in 1,00,000

The likelihood of saving a woman screened by mammography is 1 in 4400 to 1 in 13000 Benefit to risk ratio is 90:1 to 180:1

Screening mammography is effective only when regular periodic exams are performed.

According to latest ACR-BIRADS atlas, it is mandatory that mammographically dense breasts need additional imaging evaluation like Sonomammogram or MRI to pick up a likely lesion that can be missed within the dense breast diagnosis.

CONCLUSION

Breast cancer is a serious threat worldwide and is the number two killer of women in the United States. The key to successful management is screening and early detection. Screening Mammography proves to be an excellent tool in diagnosing non-palpable, clinically silent breast lesions. Digital Mammography along with Sonomammography are very useful diagnostic tools in detecting and differentiating Malignant and Benign breast masses.

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