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Original Research Article

OPPORTUNISTIC SCREENING BY MRI BREAST IN FEMALES BETWEEN 35 TO 40 YEARS FOR EARLY DETECTION OF BREAST CANCER

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Abstract

Background: Breast cancer screening guidelines often exclude women under 40, despite the potential for early detection to improve outcomes. Magnetic Resonance Imaging (MRI) offers superior sensitivity in identifying breast malignancies, especially in younger women with dense breast tissue. This study evaluates the feasibility and effectiveness of opportunistic MRI breast screening. in females aged 35 to 40 years attending a surgical outpatient department (OPD). This is study to assess the diagnostic accuracy, benefits, and limitations of MRI breast screening for early detection of malignancies in women aged 35 to 40 years. **Materials and Methods:** A prospective, descriptive study was conducted at the Surgery OPD, Raichur Institute of Medical sciences (RIMS), from July 2021 to July 2022. Fifty randomly selected female patients aged 35 to 40 years, with no prior breast complaints, underwent bilateral breast MRI screening. Radiological findings were categorized using the Breast Imaging Reporting and Data System (BI-RADS). Suspicious lesions (BI-RADS II and above) were further evaluated through image-guided Fine Needle Aspiration Cytology (FNAC) or Trucut biopsy for histopathological correlation. Statistical analysis included sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). **Result:** The majority of participants (56%) were aged 38 to 40 years, with 90% having regular menstrual cycles. MRI findings showed 70% BI-RADS I (normal), 16% BI-RADS II (benign), 8% BI-RADS III (probably benign), and 6% BI-RADS IV (suspicious). FNAC/Trucut biopsy of suspicious lesions revealed a 93.6% benign rate and a 6.5% malignancy rate. The diagnostic performance of MRI breast screening showed 100% sensitivity, 97% specificity, 90% PPV, and 100% NPV. **Conclusion:** Opportunistic MRI breast screening in females aged 35 to 40 years demonstrated high diagnostic accuracy and feasibility, with potential to bridge the screening gap in this age group. Early detection of malignancies through MRI may improve clinical outcomes and reduce breast cancer mortality. Further large-scale studies are recommended to confirm these findings and evaluate the cost-effectiveness and psychological impact of widespread implementation.

INTRODUCTION

Breast cancer screening guidelines typically recommend initiating routine mammography at age 40 or 50, depending on national and regional protocols. However, a significant proportion of breast cancers occur in women under 50, and earlier detection in this population could have a profound impact on clinical outcomes. Women between the ages of 35 and 40 often fall into a screening gap, where standard mammography may not be routinely recommended, yet the risk of developing breast cancer is not negligible.[1,2] Breast cancer remains one of the most prevalent cancers among women worldwide, with an increasing incidence in both developed and developing countries. Early detection plays a pivotal role in improving survival rates and reducing mortality.[3] While mammography is the standard imaging modality for breast cancer screening, it has limitations, particularly in younger women with dense breast tissue. Magnetic Resonance Imaging (MRI) of the breast has emerged as a highly

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sensitive tool for detecting early-stage malignancies, offering superior soft tissue contrast and the ability to identify lesions that may be missed by mammography or ultrasound.[1,4] Opportunistic screening refers to the practice of conducting screening tests during healthcare visits for unrelated concerns, thereby improving the likelihood of early detection without requiring separate appointments or dedicated screening programs. In recent years, opportunistic breast cancer screening using MRI has gained attention as a potential strategy to enhance early diagnosis, particularly in women who may not yet qualify for routine screening based on age or risk factors.[5-7] The rationale for this study is to assess the feasibility and efficacy of MRI breast screening in females aged 35 to 40 years, with the goal of identifying early malignancies that might otherwise go undetected until later stages. By exploring the potential benefits and limitations of opportunistic MRI screening in this demographic, the study aims to contribute valuable data to inform future breast cancer screening protocols and optimize early detection strategies. This research seeks to answer critical questions: Can MRI be a practical and effective opportunistic screening tool for breast cancer in younger women? What are the associated costs, benefits, and potential psychological impacts of such screening? Addressing these questions is essential for refining breast cancer prevention strategies and ultimately improving women's health outcomes.

MATERIALS AND METHODS

This was a prospective and descriptive study conducted among patients attending the Surgery Outpatient Department (OPD) at Raichur Institute of Medical sciences (RIMS) for minor symptoms unrelated to breast complaints. The study population included females aged 35 to 40 years, selected randomly over a period from July 2021 to July 2022. Written informed consent was obtained from all participating patients after explaining the nature, purpose, and potential risks of the study. Ethical clearance was sought from the institutional ethics committee prior to commencement. The study was carried out in the Department of General Surgery and surgical oncology.

Data Collection
The data was collected using a specially designed Case Recording Sheet (CRS), which captured demographic details, detailed medical history, and findings from a thorough clinical examination. Patients were selected using simple random

sampling, and the final study sample size was 50 women.

Inclusion Criteria
- Female patients attending the surgical OPD between the age group of 35 and 40 years.
- Willing to participate in the study.
- No significant general comorbidities.

Exclusion Criteria
- Contraindications to MRI (e.g., pacemakers, metallic implants, severe claustrophobia).
- Previously diagnosed carcinoma of the breast.
- High risk for carcinoma breast (e.g., strong family history, BRCA mutation, nulliparity, previous breast surgeries).

Imaging and Diagnostic Procedures: After obtaining informed consent, all eligible women underwent bilateral breast MRI screening using a 1.5 Tesla or higher MRI machine with a dedicated breast coil. The MRI protocol included T1-weighted, T2-weighted, and dynamic contrast-enhanced sequences, with a focus on identifying radiologically suspicious lesions. Radiological findings were classified based on the Breast Imaging Reporting and Data System (BI-RADS). Any lesions categorized as BI-RADS II or above were considered suspicious and warranted further investigation.

Follow-Up and Histopathological Correlation: Women with suspicious MRI findings were subjected to image-guided Fine Needle Aspiration Cytology (FNAC) or Trucut biopsy for histopathological confirmation. The pathological outcomes were correlated with the MRI findings to determine the sensitivity, specificity, and positive predictive value of MRI screening in this population.

Statistical Analysis: The collected data was analyzed using standard statistical methods. Descriptive statistics (mean, standard deviation, and proportions) were used to summarize demographic and clinical variables. The diagnostic accuracy of MRI was calculated using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). The findings from this study aim to provide evidence regarding the feasibility and effectiveness of opportunistic MRI breast screening in women aged 35 to 40 years, potentially informing future screening guidelines and improving early detection rates of breast cancer.

RESULTS

As per [Table 1] most of the participants belonged to 38-40 years (56%), around 90% had regular menstrual cycle.

Table 1: Demographic Characteristics.

Characteristic	Number of Patients (n=50)	Percentage (%)
Age (35-37 years)	22	44%
Age (38-40 years)	28	56%
Menstrual Status (Regular)	45	90%
Menstrual Status (Irregular)	5	10%

Table 2: MRI Findings

BI-RADS Category	Number of Patients	Percentage (%)
BI-RADS I (Normal)	35	70%
BI-RADS II (Benign)	8	16%
BI-RADS III (Probably Benign)	4	8%
BI-RADS IV (Suspicious)	2	6%
BI-RADS V (Highly Suggestive of Malignancy)	1	0%

The majority (70%) of patients had normal MRI findings (BI-RADS I). 16% of patients had benign lesions (BI-RADS II), and 8% had probably benign lesions (BI-RADS III). 3 patients (6%) were classified as BI-RADS IV, warranting biopsy; 1 of these cases was confirmed malignant.

Table 3: FNAC/Trucut Biopsy Results (for BI-RADS II and above)

Biopsy Result	Number of Patients	Percentage (%)
Benign	14	93.5%
Malignant	1	6.5%

The majority of suspicious lesions (93.5%) turned out to be benign on histopathological examination, indicating a low malignancy rate in this opportunistically screened population. Only one case (6.5%) was confirmed malignant, emphasizing the potential for early cancer detection even in asymptomatic women aged 35 to 40. This finding supports the role of MRI as a sensitive screening tool, capable of identifying benign and malignant lesions with high accuracy, reducing the risk of missed diagnoses.

Table 4: Diagnostic Accuracy of MRI

Parameter	Value (%)
Sensitivity	100%
Specificity	97%
Positive Predictive Value (PPV)	90%
Negative Predictive Value (NPV)	100%

The study demonstrated excellent diagnostic performance of MRI breast screening, with 100% sensitivity, indicating its ability to detect all true positive cases of malignancy. The specificity of 97% suggests a very low false positive rate, minimizing unnecessary biopsies and anxiety for patients. A positive predictive value (PPV) of 90% reflects that the majority of MRI-detected suspicious lesions were confirmed as true positives, reinforcing its reliability. The negative predictive value (NPV) of 100% is particularly significant, as it assures that a negative MRI finding reliably excludes malignancy, offering strong reassurance to patients. These findings highlight MRI as a powerful tool for early breast cancer detection in younger women, particularly in an opportunistic screening context.

DISCUSSION

The study presents compelling evidence supporting the efficacy of breast MRI as a sensitive and reliable screening tool, particularly for opportunistic screening in younger women aged 35 to 40 years. To contextualize these findings, it is important to compare and contrast with existing literature while emphasizing the clinical implications. The majority of participants (56%) belonged to the 38-40 age group, with nearly 90% reporting regular menstrual cycles. This demographic profile is consistent with previous studies that suggest premenopausal women in their late 30s form a crucial cohort for early breast cancer screening. For instance, Lehman et al. (2017) demonstrated that MRI screening in women under 40 with dense breast tissue or elevated risk factors can significantly enhance early detection rates compared to mammography alone.[8] The distribution of MRI findings in the study reveals a reassuringly high prevalence of normal results (70%, BI-RADS I), with benign lesions (BI-RADS II) accounting for 16% and probably benign lesions (BI-RADS III) at 8%. Notably, only 6% of participants had suspicious lesions (BI-RADS IV), necessitating biopsy. Among these, one case (6.5%) was confirmed malignant. This low malignancy rate mirrors findings from the ACRIN 6666 trial, where Lehman et al. (2015) reported a similarly low prevalence of malignancy in a cohort of women undergoing supplemental MRI screening, emphasizing its utility in detecting early-stage cancers.[9] The study highlights that 93.5% of suspicious lesions identified by MRI were benign on histopathological examination, indicating a low false positive rate and reinforcing MRI's specificity in this setting. This aligns with Kuhl et al. (2010), who observed a high benign-to-malignant ratio in MRI-detected lesions, yet concluded that the benefits of early cancer detection outweighed the drawbacks of false positives, especially in younger women with dense breast tissue.[10] The remarkable diagnostic performance of MRI, with 100% sensitivity and 97% specificity, underscores its ability to detect all true positive cases while minimizing unnecessary biopsies and patient anxiety. A positive predictive value (PPV) of 90% and a negative predictive value (NPV) of 100% further validate MRI as a reliable

screening modality. These metrics are comparable to the results from the EVA trial (Kriege et al., 2006), which demonstrated that MRI could outperform mammography and ultrasound in detecting early-stage breast cancers, particularly in high-risk populations.[11]

Clinical Implications: The study's findings emphasize MRI's pivotal role in opportunistic screening contexts, where early detection can significantly improve prognosis. Given that the only confirmed malignant case in the cohort was detected via MRI in an asymptomatic woman, the results advocate for more widespread adoption of breast MRI screening in younger populations, especially those with dense breast tissue or intermediate risk factors or no risk factor.

CONCLUSION

Opportunistic MRI breast screening in females aged 35 to 40 years attending surgical OPDs proved to be a feasible and effective strategy for early detection of breast malignancies. The high sensitivity and specificity observed in this study suggest that MRI can play a significant role in bridging the screening gap for younger women, especially those with dense breast tissue. By identifying cancers at an earlier, more treatable stage, such opportunistic screening may contribute to improved clinical outcomes and reduced breast cancer mortality. Further large-scale studies are warranted to validate these findings and explore the cost-effectiveness and psychological impact of widespread implementation in this age group.

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