Original Research Article

Effectiveness of mammogram and ultra-sonogram in the diagnosis of breast cancer in asymptomatic women at Central Karnataka

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ABSTRACT

Background: Breast cancer is one of the most common cancers among women around the world. Some occult breast cancers can be missed when using ultrasound or mammogram alone. Considering this background, the study was performed to highlight the improved diagnostic efficacy of identifying breast cancer when using both ultrasound and mammogram as a combined modality.
Methods: A total of 150 cases of suspected breast cancer were studied over a period of 2 years. Ultrasonography, and mammography were done by two independent radiologists and the results were analyzed. The patients were tested for BRCA1/2 gene mutations. Histopathology was done finally to confirm the diagnoses.
Results: The 39 cases out of 150 asymptomatic women screened for breast cancer showed that they were positive for breast cancer by histopathology and 38 were positive by mammogram and ultra-sonogram. Cancer was prominently diagnosed in the age group of more than 40 years (92.3%) and 82.1% of women were in premenopausal stage. High BMI had a statistically significant correlation with breast cancer. The 71.7% of breast cancer cases were obese and 25.6% were overweight individuals. 89.7% of breast cancer cases were from the urban population. Detection of mutation in the BRCA gene showed 28 cases with a mutation in the BRCA-1 gene and 4 cases with a mutation in the BRCA-2 gene.
Conclusions: The study confirms that mammography in addition to ultrasonography improves the sensitivity of detection of occult breast cancer in asymptomatic women.

Keywords: Ultrasonography, Mammography, Breast cancer, Histopathology

INTRODUCTION

The incidence of breast cancer is on rising among young women in India. An estimated 2.3 million females were diagnosed with breast cancer in the year 2020, accounting for approximately 24.5% of all the cancer cases worldwide.[1]

Breast cancer is more common in the younger age group. Almost 50% of all stages of the diseases are in the age group of 25-50. Breast cancer survival in the advanced stage of the disease becomes difficult and around 50-55% of women in India suffer from stage 3 and 4 compared to 75% of women in developed World have poor survival and high mortality.[2-4]

The only way to bring down the incidence of breast cancer among young adults is by increasing awareness and emphasizing that breast cancer is a treatable disease and chances of survival are higher if it's detected in time. Diagnosing the disease at a primitive stage increases the chances of cure and also reduces morbidity and mortality.[5-7] The aim of the study was to screen asymptomatic women for breast cancer using mammogram and ultrasound and comparing it with the histopathology reports and to recognize any diagnostic gains that might be available when both the diagnostic tools are used complementary to one another.

METHODS

Study design

This is a prospective cross-sectional study. Patients who come to the outpatient department of the oncology unit of S. S. institute of medical sciences and research centre, Basaveshwara medical college and research centre, and Sukshema hospital, Davangere were included in the study. SPSS Statistics version 26 with build 1.0. 0.1275 was used to analyze data.

Ethical approval

The study protocol was approved by institutional ethics review board, S. S. institute of medical sciences and research centre.

Number of samples

The 150 cases of suspected breast cancer were included in the present study over the period of 2 years from April 2020 to March 2022.

Demographic features

Demographic features such as employment status, body mass index, times of pregnancy and delivery, history of breastfeeding, menstrual history, smoking, insomnia, diets and alcohol, medication history, and hormone replacement were taken.

Inclusion criteria

The 150 asymptomatic women referred for routine breast examination were included in the study.

Exclusion criteria

Women who were diagnosed with breast cancer and who refused to consent to the study were not considered not included in the study.

Investigations done

Mammography: Mammography was performed using dedicated equipment, mammographic cassettes, and radiographic films, and standard craniocaudal, mediolateral and oblique projections were taken. Immediately after the examination, the mammograms were evaluated separately by 2 radiologists, both experts in the field of breast examination.[9,10]

Ultrasonography: Ultrasonographic examination was performed using Samsung 730 Pro, with a linear 10-13 MHz probe. The patients were examined in the supine position with their arms raised above their head. All four quadrants of the breast as well as the nipple were studied, and the examination included classification of the parenchymal structures according to the presence of hypoechoic glandular tissue or hyperechoic fibrous tissue.[10,11] The lesions were identified due to the presence of nodular masses, posterior shadowing or anomalies/distortions in the breast structure, and they were further characterized by the evaluation of the form, margins, vascularization and changes in the surrounding echo structure.

BRCA gene test

The BRCA gene test is a blood test that uses DNA analysis to identify mutation in either one of the two breast cancer susceptibility genes-BRCA1 and BRCA2.[4-6]

Histopathological evaluation

Biopsies were sent from all 150 asymptomatic cases for histopathological evaluation for histological type, stage, grade, lymphovascular invasion, and lymph node involvement by microscopic examination of hematoxylin and eosin-stained tissue sections.[5,7,11]

Statistically tool

Descriptive statistics was used for the analysis of the result using SPSS 20 software.

RESULTS

Demographic features

Among 150 asymptomatic patients, 55 women were of the age 30-40 years, 48 women were of the age 41-50 years, 32 women were of the age >50 years and 15 women were of the age <30 years. The 120 women were from the city and 30 women were from rural backgrounds. The body mass index of 150 women revealed that 110 women were obese, 35 were overweight and 5 women were normal. The 105 (70%) were premenopausal and 45 (30%) were postmenopausal (Table 1). The average age at menopause in the postmenopausal subjects was 46.4 years (SD=0.48). The average age for menarche in all subjects was 14.2 years (SD=1.06). There were 148 (98.67%) subjects who had at least one child during enrollment for the study and who had breastfed at least 12 months.

**Table 1: Demographic features of the study population.**

Characteristics	Numbers (%)
Age (Years)	
<30	15 (10.0)
30-40	55 (36.7)
41-50	48 (32.0)
>50	32 (21.3)
Background	
Rural	30 (20.0)
Urban	120 (80.0)
Body mass index (BMI)	
Obese	110 (73.3)
Overweight	35 (23.3)
Normal	5 (3.4)
Menopausal status	
Pre-menopause	45 (30.0)
Post-menopause	105 (70.0)

Mammography study

Out of the 150 asymptomatic women examined by mammogram, 38 women showed breast lesions and 112 asymptomatic women did not show any lesion by mammogram.

Ultrasonography

150 asymptomatic women were examined by ultrasonography. Thirty-eight cases showed the typical signs of malignancy (Figure 1).
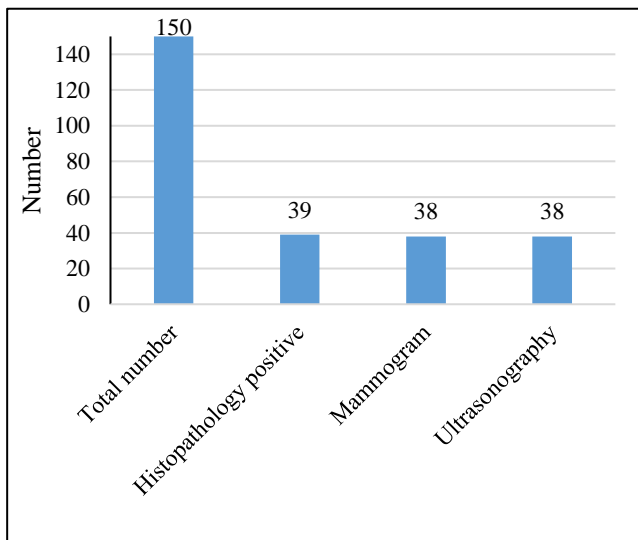

Figure 1: Incidence of breast cancer by histopathology, mammogram and ultrasonography.

Histopathological study

In our study, invasive ductal carcinoma was observed in 36 cases and carcinoma with medullary was seen in 3 cases (Figure 1).

BRCA gene test

Out of 150 asymptomatic women tested for the BRCA gene, 28 women showed a mutation in the BRCA-1 gene and 4 women showed a mutation in the BRCA-2 gene (Figure 2).
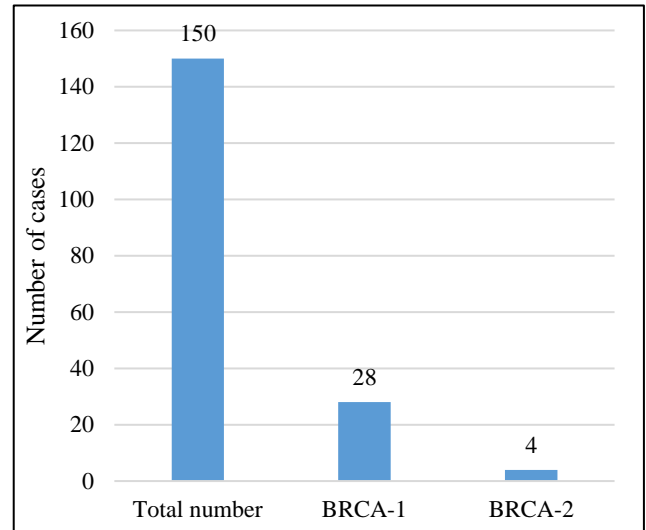
Figure 2: Incidence of BRCA 1 and 2 among asymptomatic women.

Comparison of histopathological findings with mammogram, ultra-sonogram, and BRACA genes

Among 39 cases that showed histopathological changes, both mammogram and ultra-sonogram was positive in 38 cases, and negative in one histopathological positive case. Among 39 histopathological positive cases, 22 showed mutation for the BRCA-1 gene and 1 woman showed mutation for the BRCA-2 gene.

DISCUSSION

A total of 39 cases of breast cancer were identified in this study. None of the cases were symptomatic. Demographic data revealed that the breast cancer cases identified in this study were primarily diagnosed in the age group of more than 40 years (92.3%). There were 32 premenopausal cases accounting for 82.1% of the identified breast cancer cases and 7 postmenopausal cases accounting for 17.9%. Our finding corroborates with the finding of Li et al which showed that premenopausal cases accounted for a higher prevalence of breast cancer.[8]

This study found that a high BMI had a statistically significant correlation with breast cancer. The 71.7% of breast cancer cases were obese and 25.6% were overweight individuals. With the changes in lifestyle and improvements in living conditions in India, overweight and obese people account for a large proportion of the population. Increasing urbanization and westernization associated with changing lifestyle and food habits has led breast cancer to attain the top position in the urban

population. The 35 breast cancer cases were from urban population accounting for 89.7%.

Among the investigations done, Histopathologically proved breast cancer cases were 39 out of 150 cases. Mammogram and ultra-sonogram were positive in 38 cases. Out of 150 cases subjected to a blood test for detection of mutation in the BRCA gene revealed 28 cases showed a mutation in the BRCA-1 gene and 4 showed a mutation in the BRCA-2 gene. Among 32 cases positive for the BRCA gene, 18 of the cases were positive for breast cancer by mammogram, ultrasonogram, and by histopathology. Furthermore, early-onset breast cancer patients in the Indian population were found to have BRCA1/2 mutations. Notably, the occurrence rates of BRCA2 mutations were lower than those of BRCA1 in India.

Breast cancer is the second most prevalent cancer in the world and the most frequent among women, therefore it is crucial to diagnose the disease efficiently.[9] Currently, two modalities namely mammography and ultrasonography are primarily used for the initial diagnosis of breast cancer.[10] Mammography is the method of choice in the study of breast carcinoma in asymptomatic women over 40 years of age, and it is considered the most sensitive instrumental examination in the early diagnosis of clinically occult carcinoma.[11] The sensitivity of mammography is higher in the evaluation of breasts consisting mainly of fat tissue (80-98%) as compared to very dense breasts (30-48%). In the present study, 38 cases out of 39 cases were diagnosed having breast cancer.[12] The sensitivity is as high as 97.43%. The false negative was noted in one case out of 39 cases. One reason for false negative results is high breast density. The breast contains both dense tissue and fatty tissue. Fatty tissue appears dark on a mammogram, whereas fibro-glandular tissue appears as a white area. Because fibro-glandular tissue and tumors have similar densities, tumors can be harder to detect in women with denser breasts. Breast ultrasonography is a second-line diagnostic tool, which is useful in the analysis and characterization of specific areas considered suspicious at clinical or mammographic examination.[13] Due to the improved spatial and contrast resolution of modern equipment and as the patient's age has little influence on the diagnostic accuracy of ultrasonography, it is an important tool in the early detection of mammographically occult malignant lesions in women with greater mammographic density.[14] Adjunct (supplemental) screening with ultrasound has the potential to detect breast cancers that may not be visible on mammography. The use of adjunct ultrasonogram is thought to be a safe and inexpensive approach to improve the sensitivity of breast cancer screening along with mammography alone.

The total number of participants in this study was 150, which may not precisely represent the outcome in a larger population. We consider this as a limitation of the present study. Including more samples in the study will increase the power and credibility this study.

CONCLUSION

In this study, we have encountered high diagnostic efficacy when using mammogram and ultra-sonogram in the diagnosis of breast cancer in asymptomatic women. We would like to emphasize that the protocol of using mammogram and ultra-sonogram complementing each other should be the standard of care in the screening of breast cancer in women.

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