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COMPARATIVE EFFECTIVENESS OF COMBINED DIGITAL MAMMOGRAPHY AND ULTRASONOGRAPHY FOR WOMEN WITH DENSE BREAST OF CATEGORY B AND C'. A CROSS SECTIONAL STUDY

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ABSTRACT

Background and Introduction: Breast cancer is common among Asian countries affecting 1 in 9 women with the ratio of occurrence increasing every year. Utilization of best imaging modality based on breast density and characterization of lesions in women with various breast. To compare the effectiveness of combined mammography and ultrasonography for women with dense breast Category B & C. **Methods:** This was an observational comparative study done by using two modalities, Mammography and Ultrasonography, on 151 women with breast symptoms of age group 30-70 years and falling in Category B and C dense breasts. **Results:** Out of 151 females, 57 presented with category B breast, out of which23 patients were under the age group of 51-60 years. Whereas, 94 patients presented with category C breast, out of which 33 patients fell under the age group of 41-50 years. Characteristics of lesions such as shape (85.4%), lymph node enlargement (88.7%) and skin thickening (88.7%) were detected more accurately on ultrasound as compared to mammography. Whereas, calcification (25.1%) was detected better on mammography as compared to ultrasound. In category B patients, Mammography detected 37.3% lesions while detection improved to 54% by adding Ultrasonography (which alone detected 70.7% lesions). In category C patients, Mammography detected 28.3%lesions while detection improved to 48% by adding Ultrasonography (which alone detected 67.5% lesions). Mammography detected nipple retraction (90.1%) in 136 out of 151 while ultrasound detected ductal dilatation (72.8%) in 110 out of 151 patients. **Practical implication:** The purpose of this study was to confirm the comparative effectiveness of Digital Mammography and Ultrasonography for women with dense breast, Category B & C, because in women with dense breast, it is sometimes difficult to detect the lesion and its characteristics whether it is cystic or solid on Mammography alone. So, we combine it with Ultrasonography for better detection. **Conclusion:** According to the study, Mammography alone was not able to give better results in case ofdense breasts. Combining Ultrasonography to it improved detection of most of characteristics of lesions. Therefore, we cannot rely on a single modality and need to combine both modalities for improved detection.

KEYWORDS: Digital Mammography, Ultrasonography, Breast, cross sectional study.
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1. INTRODUCTION

One out of every nine Pakistani women now faces a lifetime risk of developingbreast cancer as a result of an elevated risk of the disease. Pakistan has one of the highest incidence rates of breast cancer amongst Asian nations. In 2018, there were 2.1 million new cases reported, with 627,000 deaths.[1] Breast cancer cannot be passed from person to person. The most significant risk factor for breast cancer is female gender. Women have no other possible risk factors for breast cancer besides gender (female) and age (over 40 years) in nearly half of all cases. Several additional elements, including as overweight, drinking, radiation exposure, and a family history of breast cancer,[2] The second-leading cause of

cancer-related death in women is breast cancer, which is the cancer in which women are most frequently diagnosed.[3] Breast cancer is a complex disease, meaning that many different things can cause it. Despite the fact that the illness is prevalent around the world, its incidence, death, and survival rates.[4] By the time people reach the age of 85, BC will still be the most common cancer-related cause of disease burden in high-income countries, affecting up to 1 in 8 people.[5] About 24.5% of all cancer cases and 15.5% of cancer deaths among women were due to breast cancer.[6]

Mammography is the gold standard imaging modality for screening breast cancer worldwide, and advances in treatment have resulted in lower mortality. However, scanning dense breasts is the most significant underlying issue of mammography, which can reduce sensitivity to just as low as 30-48% and impede early detection of breast cancer, needing the use of additional modalities. For patients over the age of 35, digital mammography is the modality of choice.[7]

Mammography is a reliable screening method for identifying and treating breast cancer in its earliest stages. Even for experienced radiologists, identifying and interpreting breast lesions is difficult. To help radiologists effectively diagnose and/or categorise breast cancer, a number of Computer-Aided Diagnosis (CAD) systems are being developed.[8]

Due to its great sensitivity for detecting parenchymal breast lesions, thickness, and augmentation of the skin, magnetic resonance imaging (MRI) may also assist in guiding skin punch biopsies. One of the most common imaging techniques used to diagnose IBC is mammography. Mammography reveals a breast mass or no breast mass, a palpable tumour mass, a significant area of calcification, parenchymal deformation, and thickening of the skin over the breast.[9]

Doppler ultrasound is the foundation for diagnosing breast lesions with ultrasound, but as new techniques are promoted and widely used, an increasing number of atypical lesions in 2-dimensional ultrasound can be accurately recognised in the differential detection of breast abnormalities.[10] It has been observed that 45% to 54% of women who were checked for breast cancer using MRI or ultrasonography had a personal history of breast cancer. This is despite the fact that there is limited information addressing the comparative efficiency of these screening methods.[11] The patient's arm should be relaxed and flexed behind the head, and gentle but strong transducer pressure is crucial. While lateral lesions, including the axilla, should typically be scanned with the patient in the contralateral oblique posture, medial lesions should typically be scanned with the patient supine.[12] It is unclear whether ultrasonography is beneficial as a supplemental test for women with normal mammograms and breasts that are not very thick. For women at average risk for breast cancer, this review intended to assess the data supporting and refuting the addition of ultrasonography screening to mammography. It's crucial to balance the benefits and drawbacks of screening because finding more tumours through screening does not guarantee that more women will have their lives saved.[13] The most reliable method of determining a breast cancer diagnosis is a pathology examination. However, pathological exams are intrusive, time- and resource-consuming. Imaging modalities can identify abnormalities in breast mass because the breasts are the body's most visible organs. Imaging methods are frequently employed in clinical settings to find breast cancer. Mammography is one of the most widely used imaging techniques for finding breast cancer. However, mammography's sensitivity is decreased in younger women with thick breasts.[14]

2. METHODOLOGY

This was an observational comparative study because it did not involve any treatment and the findings of mammography and ultrasound were compared. Consecutive one hundred and fifty-one (151) symptomatic women with breast disorders come to the radiology department of Inmol Hospital Lahore. Study comprises the patients coming to OPD of **Inmol Hospital department of radiology** with the following indications, Symptomatic patients of breast disorders in both younger less than 70 years and more than 30 years.

Inclusion criteria	**Exclusion criteria**
• Women of age 30 to 70 • Presenting with complaints of mastalgia, nipple discharge, breast lump, and breast CA. • The breasts of Category B and C density were included in the study.	• Pregnant women, those presenting for screening, male breasts, and those with fatty breasts (>70 years, Category A) or extremely dense

Bilateral MLO mammography was done utilising Fuji CR films within the same facility's mammography units (Siemens, Mammomat 1000). If required, additional views were taken, such as those with the breast in various positions, such as craniocaudal views, or those with magnification or spot compression techniques. Following mammography, professional breast radiologists who are acquainted with the mammographic findings performed grey scale sonography with a 7- to 12-MHZ broadband linear array transducer (Toshiba Medical Systems Corporation). The whole breast was inspected, with great focus on the area containing the discovered mammographic or clinical irregularities. The patients were positioned supine, with their ipsilateral arm behind their head, and rotated slightly to straighten the breast on the chest wall. The breast is observed as a clock face

while being scanned. Begin at 12 p.m. in a longitudinal plane with the probe's toe at the nipple. Scan the nipple by turning the probe around it. Based on the size of the breast, another pass a little farther aside from. the nipple may be needed. If an abnormality is found, rotate the probe 90 degrees in the 'anti-radial' plane by turning it around the nipple. The breast lobular system typically runs radially toward the nipple, and cancer that extends along the duct or breast are viewable in this plane. Any potentially problematic findings in this plane could be assessed in the antiradical plane, which was described at a right angle to the radial axis.

Ethical considerations

Consent was taken from 151 patients before acquiring their mammography and ultrasound reports. The consent form attached in appendix was used forthis purpose.

3. RESULTS

The study consisted of 151 patients who presented with breast symptoms and who had been evaluated by using both mammography and ultrasound. The age range was 30-70 years of Category B and C. Ultrasound showed better efficacyin the detection of characteristics of lesions in dense breast (Category B and C) as compared to Mammography.

In table 1, the age distribution of category B is shown. The age group of 51-60 is more common in category B with a frequency of 23, resulting in 40.4% of results out of a total of 57 patients presenting with Type B breast. Whereas in category C (table 2), the age group of 41-50 is more common. The frequency is 33 which shows 35.1% results out of 94 women presenting with type C breast.

Table 3 and 4 show the comparative analysis of mammography and ultrasonography for both B and C type Breasts.

Table 5 depicts the radiological findings in which mammography alone detected 37.3% of lesions, while combined mammography and ultrasonography, showed 54% better detection in type B breasts as calculated by mean. Moreover, in type C breasts, Mammography alone detected 28.3% of lesions, while combined mammography and ultrasonography, showed 48% better detection ascalculated by mean.

Table 1: Age Distribution in Category B.

Age Distribution in Category B					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-40	14	24.6	24.6	24.6
	41-50	15	26.3	26.3	50.9
	51-60	**23**	**40.4**	**40.4**	**91.2**
	61-70	5	8.8	8.8	100.0
	Total	57	100.0	100.0	

Table 2: Age distribution in Category C.

Age Distribution in Category C					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	30-40	19	20.2	20.2	20.2
	41-50	**33**	**35.1**	**35.1**	**55.3**
	51-60	23	24.5	24.5	79.8
	61-70	19	20.2	20.2	100.0
	Total	94	100.0	100.0	

Table 3: Comparative Analysis for Category B Breast.

COMPARATIVE ANALYSIS (MAMMOGRAPHY AND ULTRASONOGRAPHY) FOR "CATEGORY B BREASTS"				
	MAMMOGRAPHY		ULTRASONOGRAPHY	
	Detected (%age)	Not Detected (%age)	Detected (%age)	Not Detected (%age)
SHAPE	48.9	51.1	86.2	13.8
CALCIFICATIONS	31.9	68.1	18	81.9
LYMPH NODES	62.2	37.7	89.3	10.6
SKIN THICKENING	6.4	93.6	89.4	10.6
MEAN %	**37.3**	**62.6**	**70.7**	**29.3**

Table 4: Comparative Analysis for Category C Breast.

COMPARATIVE ANALYSIS (MAMMOGRAPHY AND ULTRASONOGRAPHY) FOR "CATEGORY C BREASTS"				
	MAMMOGRAPHY		ULTRASONOGRAPHY	
	Detected (%age)	Not Detected (%age)	Detected (%age)	Not Detected (%age)
SHAPE	59.7	40.4	84.3	15.8
CALCIFICATIONS	14	86	10.6	89.5
LYMPH NODES	37.7	62.2	87.7	12.3
SKIN THICKENING	1.8	98.2	87.7	12.3
MEAN %	**28.3**	**71.7**	**67.5**	**32.5**

Table 5: Radiological findings detected on Mammography and Ultrasound andcombined efficacy.

Radiological findings detected on Mammography and Ultrasound and combined efficacy			
	Mammography (%)	Ultrasound (%)	Combined (%)
Category B	37.3	70.7	54
Category C	28.3	67.5	48

4. DISCUSSION

In this study the age and breast density-based comparison of mammography and ultrasound accuracy in women with breast problem was done. The efficacy of mammograms inflated as female's breasts become less dense and fattier. Ultrasound seems to be additional correct than diagnostic procedure in young women with dense breasts and might be thought of as an appropriate initial imaging take a look at in these young women. The study indicates that the sensitivity and specificity of ultrasound were statistically considerably better than mammography in patients with breast symptoms for the detection of carcinoma and benign lesions significantly in dense breasts and in young girls.[15] In contrast, in our study, we tendto solely enclose dense breasts of class B and C. Moreover, we included women of 30-70 years. We tend to calculate the combined effectiveness of mammography in adjuvant to ultrasound in the B category (54%) as shown in Table 4 and C category (48%) as shown in Table 5.

Another study was conducted in 2019 to analyzed mammographic breast mass with completely automated technique and its risk for malignancy. In carcinoma there was found a positive association of mammographic breast density. The aim of the second study was to see the association between carcinoma and breast density during a case-control study when adjusting for clinical risk factors.[16] In contrast, we tend to organize a comparative observational study rather than randomized control trial study. We tend to obtain information by non-probabilityconvenience sampling consistent with our inclusive and exclusive criteria. Theaim of our study was to see the combined effectiveness of ultrasound and digital mammography imaging techniques to accurately locate the characteristics of the lesions in dense breasts according to class B and C as shown in Table. 46.

This study was conducted in 2021 for assessment of associated tomographic for breast cancer detection in women aged 40 to 49 of different breast density going through characteristic screening. For carcinoma screening in well girls aged forty to forty nine years despite breast density, supplemental ultrasonography ought to be thought-about as an acceptable imaging tool. USG should be thought- about as an important screening associated diagnostic adjunct to MG to reduce the probability of missing identification of any dense breast lesions.

In contrast, we tend to exclude cases of screening and solely considered diagnostic cases as an adjunct to mammography in the detection of dense breast lesions of class B and C.[17]

Another study was conducted in 2018 in order to detect the importance of ultrasound in screening dense breasts. Ultrasound is taken into account a lot of reliable in early detection of cancer in girls with dense breasts and who are insensitive to mammography. The findings of this study recommend that connected imaging has the potential to improve the detection of early-stage and invasive cancers across each dense and non-dense breast. In contrast, in our study, we used adjunctive ultrasound only to detect dense breast lesions of class B and C (Excluding non-dense breasts).[18]

In conclusion, we have done a comparative study on females with dense breasts of categories B and C within the age bracket of 30-70 years. We tend to calculate the combined effectiveness of mammography and ultrasound in the identification of breast lesions and its characters.

5. Limitations

Only the population of one district (Lahore) has been studied in this research. There was a lack of resources due to which we were unable to include biopsy. Multiple co-morbidities like diseases causing hormonal imbalance affected ourresults.

6. CONCLUSION

Breast ultrasonography is more effective than mammography at detecting characteristics of breast lesions in the dense breast; mammography alone had low efficacy as compared to ultrasound. Whereas, combined ultrasonography with mammography showed higher efficacy. These results imply that supplementary ultrasonography may enhance the detection of breast lesions, including category B and C lesions, in dense breast tissue. Additional ultrasonography needs to be taken into account as a suitable imaging technique for breast lesions in symptomatic women between the ages of 30 and 70.

7. Competing interests

There are no competing ideas declared by the authors.

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