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Original

The Role of Ultrasound in the screening of Young Patients for Breast Cancer

Sule A. Saidu[1], Oluwatosin H. Akinnibosun-Raji[2], Farouk K. Umar[2], Usman M. Aliyu[1], Umar Mohammed[3]

[1]Department of Radiology, Faculty of Clinical Sciences, College of Health Sciences, Usmanu Danfodiyo University Sokoto.
[2]Department of Radiology, Usmanu Danfodiyo University Teaching Hospital Sokoto.
[3]Department of Morbid Anatomy, Faculty of Basic Clinical sciences, College of Health Sciences Usmanu Danfodiyo University Sokoto.

Abstract

Background: Breast cancer is one of the leading malignancies worldwide. Early detection is key to good prognostic outcome. To achieve that feat, easy, non-expensive, reliable, readily available and non-invasive screening tool like ultrasonography is essential.

Objective: To determine the role of ultrasound in evaluating breast masses by determining the sensitivity and specificity of the imaging modality.

Materials and methods: One hundred and sixty young female patients presenting for breast ultrasound (BUS) in Radiology department of Usmanu Danfodiyo University Teaching Hospital Sokoto (UDUTHS) were recruited. They were scanned using a Mindray Digital Ultrasound machine (Model: DC-3) using the 7.5 – 10 MHz transducer. Masses, when present, were identified as solid, cystic or mixed. Ultrasound guided Fine needle aspiration of the masses were done and samples analysed in the Histopathology department. Data obtained was analysed using SPSS version 24. Relevant descriptive and inferential statistics were presented appropriately. The specificity, sensitivity, positive predictive value (PPV), negative predictive value (NPV) and accuracy of the ultrasound machine in detecting such masses were analysed.

Results: The age range of the participants is 16-35 years with the mean age of 25.4± 4.2 years standard deviation. Breast masses (Solid, cystic or mixed) were identified in 120 (75%) patients. Majority (44.0%) of the masses detected belong to BIRADS 2 category. Only 5 (4.4%) lesions were considered to be in BIRADS 5 category. Most of the lesions (78.3%) analysed were benign. Correlation between sonographic findings and histopathological diagnoses was found to be statistically significant ($p= 0.000$); with $r= 0.846$. The Sensitivity, Specificity, PPV, NPV and Accuracy of ultrasonography in detecting breast masses were found to be: 96.9%, 88.5%, 96.9%, 88.5%, 96.8% respectively.

Conclusion: The study showed high sensitivity, specificity and accuracy of ultrasound as a screening tool of young patients with breast masses.

Keywords: Breast cancer, ultrasound, young females

Corresponding author:
Prof. Sule Ahmed Saidu,

Department of Radiology,
Faculty of Clinical Sciences,
College of Health Sciences
Usmanu Danfodiyo University Sokoto
e-mail: sulesaidu@gmail.com
Phone: +2348035053381

Introduction

Breast cancer remains the commonest malignancy affecting women worldwide (1). It is an important public health issue (2). Recent explosion in knowledge about the basic sciences of the disease including its pathology and genetics have however, led to improvement in its management with a consequent positive impact on prognosis (2). The World Health Organization stated that more than one million women are diagnosed with breast cancer every year, and more than 410,000 will die from the disease, mostly in low- and middle-income countries (LMCs) where the infrastructure and resources for routine screening mammograhy are often unavailable (2). Recent observations show that the frequency of breast cancer has risen over that of non-Hodgkin's lymphomas and cervical cancer in Nigeria (3). It represents about 22.7% of new cancers and accounting for the highest proportion of all cancer types in the country (4). This trend was attributed to several factors: the acceptance of fine needle aspiration as an accurate diagnostic evaluation, increased awareness about breast cancer and usefulness of breast self-examination (5).

Breast lump was reported as the most common presentation (44.4%) among the patients studied in Zaria, North-western Nigeria, followed by breast pain (24.4%).5 It is a cause of anxiety when lump is felt thus making patients to seek medical attention. However, in Calabar, Southern Nigeria, routine evaluation was the major reason why the patients presented for breast evaluation, whereas pain was the main complaint in Lagos, Enugu, and Nnewi (6).

In resource poor setting where there is no established national screening program for breast cancer, late presentation has been consistently observed for decades (3). it is therefore pertinent to establish a simple, affordable, safe, and relatively inexpensive method of early screening and detection of breast cancer.

Self-breast examination, mammography, and ultrasound scan provide the tripod for the early detection of breast cancer (5,6). Ultrasound scan with high resolution alone can serve as the major screening tool, most especially in young patients and those with dense breasts. It is safe, non-invasive, does not use ionising radiation, readily available and relatively inexpensive.

The American College of Radiology (ACR) formulated the Breast Imaging Reporting and Data System (BI-RADS) to standardize breast imaging reporting. It contains a lexicon for standardized terminology for breast ultrasound and other modalities (6).

The ACR BI-RADS classification categorizes breast lesions from BI-RADS 0 to BI-RADS 6, based on increasing level of malignant tendency (6).

The objective of this study is to show the role of ultrasound in evaluating breast masses by determining the sensitivity and specificity of the imaging modality.

Methodology

Study area:

The study was descriptive and cross-sectional conducted in the Radiology Department of Usmanu Danfodiyo University Teaching Hospital Sokoto, Sokoto State. Sample size of 160 was obtained using the formula for prevalent studies (10). The study was conducted over one year (January- December 2021).

Study population

160 young women aged 16-35 years presenting to ultrasound clinic (Radiology department) of Usmanu Danfodiyo University Teaching Hospital for breast ultrasound.

Sampling method

Systematic random sampling was conducted to enrol the study participants.

Ethical approval

Ethical approval was obtained from the institutional review board of Usmanu Danfodiyo University Teaching Hospital Sokoto (Approval No; UDUTH/HREC/2021/1009).

Procedure

Participants were scanned using a Mindray Digital Ultrasonic Diagnostic Imaging System Model: DC-3 with serial number MU-23007340 manufactured in China in the year 2012. Breast masses were detected as fairly oval anechoic, hypoechoic, or mixed echogenic structures for cystic, solid and mixed consistency masses respectively. Ultrasound guided fine needle aspiration was done and the samples were analysed in the Histopathology laboratory for classification as either benign or malignant.

Data analysis

Data was analysed using SPSS version 24.0. Distribution of the variables was shown as means±standard deviation for normally distributed Data. Other data were presented in tabular form. Sensitivity, Specificity, Positive Predictive value (PPV), Negative predictive value (NPV) and accuracy of ultrasound in detecting breast masses were obtained.

Results

Socio-Demographic characteristics of Respondents

A total of 160 young patients were recruited during the study period. Their age ranges between 16 and 35 years with the mean of 25.4± 4.2 years standard deviation. The highest proportion of the study participants, 45 (28.1%) belonged to age group 26-30 years, followed closely by 16-20 years with 42 (26.3%), while the least number of patients, 35 (21.9%) were found in the age group 21- 25 years. Hausas constituted the majority ethnic group among the studied patients with 54 (33.8%) respondents. One hundred and twenty (76.3%) of the patients were Muslims and 38 (22.7%) were Christians. Most of them are unemployed, 90 (56.2%), while 39 (27.9%) are Civil Servants and 29 (20.7%) self-employed. These details are as shown in Table 1.

Types and distribution of breast masses

Table 2 shows the types of the identified breast masses (Solid, cystic or mixed) and the distribution of these masses (right, left or both breasts). No breast mass was identified in 40 (25%) of the participants.

BIRADS categorisation of breast masses.

Majority (44.0%) of the masses detected belong to BIRADS 2 category. Only 5 (4.4%) lesions were considered to be in BIRADS 5 category. Details is shown in Table 3.

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Table 1: Socio demographic characteristics of study subjects

Variables		N	(%)
Age (Years)	16 – 20	42	26.3
	21 – 25	35	21.9
	26 – 30	45	28.1.
	31 – 35	38	23.7
Occupation	Employed	70	43.8
	Unemployed	90	56.2
Marital Status	Married	93	58.1
	Single	63	39.3
	Divorced	2	1.3
	Widow	2	1.3
Tribe	Hausa	54	33.8
	Fulani	48	30.0
	Igbo	16	10.0
	Yoruba	20	12.5
	Others	22	13.7
Religion	Islam	122	76.3
	Christianity	38	23.7

Table 2: Types and distribution of breast masses

Lesion (Mass)	N (%)		
	Right	Left	Both
Solid	36 (22.5)	60 (37.5)	10 (6.3)
Cystic	18 (11.3)	20 (12.5)	3 (1.9)
Mixed	2 (1.3)	9 (5.6)	2 (1.3)
Normal		40 (25)	

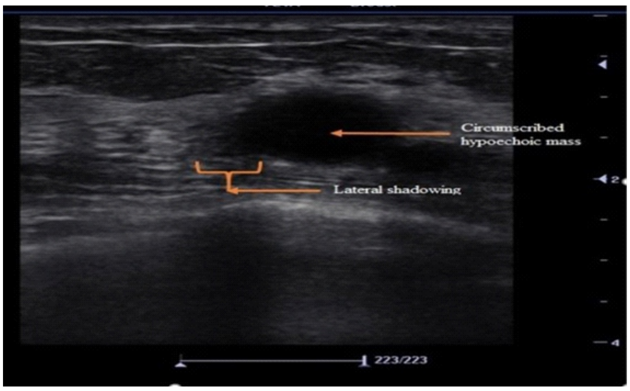

Fig 1: Ultrasound image showing a fairly oval hypoechoic mass with lateral shadowing in the left breast of one of the patients.

Table 3: BIRADS categorisation of breast Masses

BIRADS CATEGORY	N	%
1	40	25.0
2	70	44.0
3	27	16.9
4	16	10.0
5	7	4.4

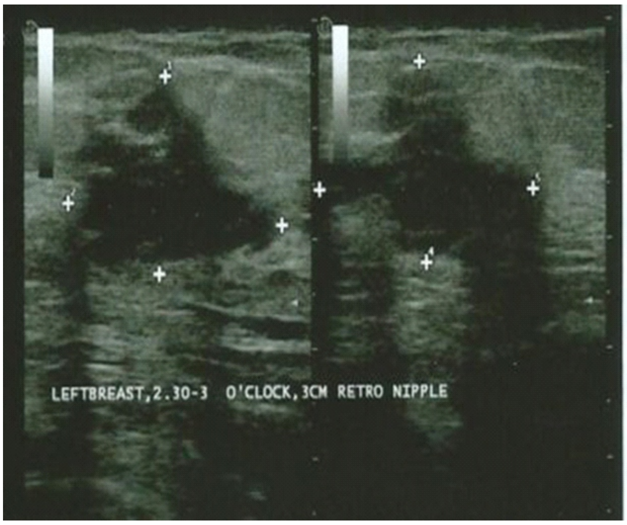

Fig 2: Ultrasound image showing irregular hypoechoic masses raises suspicion of malignancy, demonstrated in the right breast of one of the patients.

Histological finding

Table 4 shows that majority of the lesions (78.3%) analysed were benign.

Table 4: Histological findings

HISTOLOGICAL FINDINGS	N	%
Benign	94	78.3
Malignant	26	21.7

Table 5: Sonographic Findings with BIRADS Categorisation

SONOGRAPHIC FINDINGS	N	%
Benign (BIRAD 2 and 3)	97	80.8
Malignant (BIRADS 4 and 5)	23	19.2

Table 6: Distribution of Sensitivity, Specificity, PPV, NPV and accuracy for Sonographic and Histopathological Correlation of breast masses.

Variable	Sensitivity (%) 95% CI	Specificity (%) 95% CI	PPV (95%) CI	NPV (95%) CI	Accuracy (%) 95%CI	Test Sta tistics and P - value
Sonography correlation with histopathology (r = 0.821)	96.9	88.5	96.9	88.5	96.8	X2 = 0.1026 P= 0.0023

PPV= Positive predictive value, NPV= Negative predictive value, CI= Confidence Interval, X2= Chi-square test, p= p-value.
Correlation is significant p < 0.05(2- tailed), r= correlation co-efficient value.

Discussion

Ultrasound is a simple, safe, widely available, cost effective and time conserving imaging modality for evaluation of breast masses. It should be the first investigation to be done in young females or pregnant women where mammography which uses ionising radiation is not advisable (11).

High resolution ultrasound is the ideal imaging modality to identify breast cystic and solid masses and characterize the breast masses on reliable criteria of shapes, margins, echotexture, echogenicity and antero-posterior ratio. These criteria have been recognised to differentiate benign from malignant masses in palpable or non-palpable breast lumps and these features help in further evaluation (12).

The American College of Radiology (ACR) formulated the Breast Imaging Reporting And Data System (BI-RADS) to standardize breast imaging reporting to avoid ambiguity in communication and interpretation (13,14,15) The need for standardisation of reports of breast ultrasound in Nigeria has been suggested by Obajimi et al (16).

In this study the age of the participants ranged from 16-35 years with a mean age of 25.4± 4.2 years which is mainly the younger age group compared with what was obtained in the studies by Chandak et al (17) and Obajimi et al (16) where the age range of patients and mean age were 11-70 years and 38.54 years and 14-74 years and 38.91 ± 12.51 years respectively. This is likely due to differing age of puberty/menarche in the two different study locations, which in turn reflects on the age of presentation of breast symptoms.

Most of the breast masses in this study, 93(55.6%) were found in the left breast which is similar to finding in the study by Muddegowda et al (18) in India where they found the left breast to have 74.66% of the breast masses. This may be linked to the rich lymphatic networks associated with the breasts and their final drainage.

This study found that for the quadrants of the breast's majority of the masses 56/160 and 43/160 were located in the upper outer and upper inner quadrants respectively. This finding was similar to a great extent to the study on “Evaluation of Breast Masses by Sonomammography and X-ray Mammography” by Chandak et al (17) who also found most of the lesions in their study to be more in the upper quadrants. However, the masses were slightly more in the inner (upper inner) 21/50 than in the outer (upper outer) 19/50.

Generally benign breast diseases are commoner than their malignant counterparts (18,19,20) and fibroadenoma has been shown to be the commonest histologically proven benign breast disease (18,19). Our finding in this study, with 94 benign and 26 malignant lesions, agrees with the abovementioned general report.

In this study, the ratio of benign to malignant breast lesions was 3.6:1. This is similar to the finding by Anyikam et al (20) in Eastern Nigeria who reported a benign to malignant ratio of 2.3:1.

Correlation between sonographic findings and histopathological diagnoses was found to be statistically significant with strong positive correlation (p= 0.000); with r= 0.846. The Sensitivity, Specificity, PPV, NPV and Accuracy of the index study were found to be: 96.9%, 88.5%, 96.9%, 88.5% and 96.8% respectively. A similar finding was obtained in the study in Lagos, South-west Nigeria by Adeyomoye et al (21) when histology was correlated with ultrasound giving the overall sensitivity of diagnostic ultrasound as 83.9%, while PPV, Specificity, NPV and accuracy were 96.3%, 99.2%, 96.1% and 96.1% respectively.

Conclusion

This study found significant positive correlation between the sonographic findings and histopathological diagnoses of breast masses. It showed high sensitivity, specificity, and accuracy of ultrasound as a screening tool with values of 96.9%, 88.5% and 96.8% respectively.

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Conflict of interest: None

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