The Journal of Global Radiology

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ORIGINAL RESEARCH

Breast Cancer Prevalence Among Patients Referred for Ultrasound-Guided Biopsy at Kenyatta National Hospital, Kenya

Angeline Anyona Aywak[1]*, Timothy Musila Mutala[1], Purity Ndaiga[1], Callen Onyambu[1], Sughra Raza[2]

1 University of Nairobi (Nairobi, Kenya)
2 Department of Radiology, Brigham & Women's Hospital (Boston, MA, USA)

***Corresponding author.** Current address: University of Nairobi, School of Medicine, Kenyatta National Hospital, Box 19676, Code 002002, Nairobi, Kenya; angeline.aywak@uonbi.ac.ke

OPEN ACCESS

DOI: 10.7191/jgr.2018.1037

Published: 9/17/2018

Citation: Aywak AA, Mutala TM, Ndaiga P, Onyambu C, Raza S. Breast cancer prevlance among patients referred for ultrasound-guided biopsy at Kenyatta National Hospital, Kenya. J Glob Radiol. 2018;4(1):Article 4.

Keywords: Breast cancer, ultrasound biopsy, global radiology

Word count: 2,754

This article is a result of our Scholar Twinning program, which facilitates collaboration between international radiologist researchers and faculty radiologists in North America or the UK.

Abstract

Purpose: To establish the prevalence of cancer in patients referred for breast ultrasound-guided biopsy at Kenyatta National Hospital, Nairobi, Kenya.

Methods and Materials: A total number of 115 patients were included after approval from the local ethical review committee. The patients were referred by clinicians for ultrasound-guided biopsy for palpable breast lesions confirmed by imaging as solid masses. Detailed ultrasound examination per American College of Radiology (ACR) guidelines was performed before core biopsy or fine needle aspiration (FNA). Histological diagnosis was made and prevalence of cancer analyzed.

Results: Of the 115 patients, final histology was available for 112 lesions; two cases could not be traced and one was inconclusive. Females accounted for 96.5% of cases; median age 28 years (range of 15-79 years). Median age of patients with cancer was 48 years (range 28-79 years). Cancer was diagnosed in 28 (25%) specimens, the remaining 84 revealing benign histology, with 74/84 (88%) fibroadenomas. There were 32/112 patients aged > 40 years (28.6%), of which 22 (78.6%) had cancer ($p < 0.0001$). BIRADS final assessment categories were assigned prior to biopsy; all solid masses in BI-RADS 2 and BIRADS 3 were histologically benign. One of 11 lesions in BIRADS 4 category, and 2 of 20 in BIRADS 5 were histologically benign. Elastography assisted in identifying all cancers in these groups as suspicious, based on strain ratio.

Conclusion: Most breast masses in our cohort (75%) were benign. Patients with a breast lump, especially young ones, need not assume it is cancer until thorough clinical and imaging evaluation has been done to characterize lesions and biopsy performed when indicated. Of the 25% of patients with cancers in this study, almost 79% were > 40 years of age; younger women had benign lesions, mostly fibroadenomas.

Introduction

Breast cancer is the most common cancer in women worldwide (1,2). Locally in Kenya, breast cancer accounts for 23.3% of cancer mortality amongst women (3,4). It affects young to middle-aged women in the 35- to 55-year age group and has a prevalence of 34/100,000 (3,5). In the 2014 World Health Organization (WHO) report

ISSN 2372-8418

on causes of death and population dynamics, breast cancer in Kenya accounted for 0.56% of all deaths. The Kenyan age standardized rate (ASR) incidence of breast cancer between 2004 and 2008 was 51.7 per 100,000 (6). Kenya does not have a national breast cancer screening program, but cancer awareness is created through media and medical forums that encourage self-breast examination and advise women to seek medical attention if a mass is found or suspected. Voluntary annual mammographic screening from 40 years of age is also advocated in many of these forums. The risk of breast cancer is higher in developed countries than in low-income countries, with the highest number of cases being found in Western Europe and North America (8,9). Studies estimate that 1 in 8 American women (about 12%) will develop invasive breast cancer over the course of their lifetime (10). The etiological factors leading to high risk of breast cancer in the developed world compared to poorly resourced countries (PRCs) is not known; however, lifestyle and reproductive factors are thought to play a role (9). In Kenya, there has been an increase in breast cancer which may in part be attributed to changes in lifestyle habits, including adoption of known cancer-causing behaviors such as smoking and diets that may lead to obesity (7).

There is also the issue of low utilization of screening, and inadequate documentation of breast cancer cases in PRCs which may be a contributing factor to the assumed and possibly false "lower" incidence and risk in these regions (11,12). Other known risk factors for development of breast cancer include female gender, older age, family history, BRCA and other gene mutations, as well as obesity (9). However, documentation of some of these factors is not available in PRCs; specifically, BRCA testing is not established in most countries within Africa (13,14).

Since there is no national screening program in Kenya, breast cancer usually presents as a palpable lump, raising great concern and sometimes leading to extensive investigations, including invasive procedures such as biopsies. Kenya Ministry of Health guidelines published in 2012 advocate for triple assessment of palpable and mammographically detected breast masses (11). The triple assessment combines clinical breast examination, mammography or other imaging such as US, and tissue sampling using fine needle aspiration (FNA) cytology or biopsy (15). While diagnostic ultrasound (US) evaluation may help characterize masses as possibly benign and not requiring biopsy, most cases undergo image-guided core needle biopsy (US-CNB), FNA, or surgical excision, limiting the potential benefit of diagnostic US. We have encountered in our practice and experience such cases where some clinicians and patients want all masses to be subjected to FNA or core biopsy to allay patient anxiety. Such experiences motivated us to carry out this study and assess the prevalence of breast cancer among patients presenting with breast masses and referred for US-guided biopsies or FNA.

The purpose of this study was to determine the prevalence of histologically diagnosed cancers in patients with palpable solid breast masses referred for US-guided biopsies at Kenyatta National Hospital (KNH), Nairobi, Kenya.

Methods and materials

This was a prospective study carried out from May to December 2014. Subjects were all patients with known or suspected breast masses, referred to the Radiology Department for US-CNB. Most patients came from clinics within Nairobi and neighboring counties. Approval was sought from the KNH/University of Nairobi (UON) ethical committee and granted before the study commenced. Patients who had known histology and/or declined consent to participate in the study were excluded. A total number of 118 patients were recruited. After adequate explanation of the study and procedure, 115 consented. Prior to tissue sampling, detailed US evaluation of both breasts was performed to scout for any additional masses, all masses were characterized as likely benign or malignant, and final assessment categories were assigned using the ACR BI–RADS lexicon. Correlation was made with final histology.

Breast US was performed per American College of Radiology (ACR) guidelines (16) to confirm masses, find any additional masses and characterize the masses based on US features. All exams were performed and interpreted by one of three radiologists, one of whom had 10 years' experience and the other two 5 years each. Two of 115 patients had no mass, while one patient had an additional mass in the same breast, and two had an additional mass in the contralateral breast. All US exams were performed using a GE (General Electric, Boston, MA, USA) Logiq S7 machine with B mode, color Doppler and elastography, utilizing a high frequency 8-13 MHz transducer. All scans were performed by qualified sonologists experienced in breast ultrasound, and included bilateral whole breast and axillary examination. The lead researcher (AAA) in this study had completed her ultrasound fellowship training at Thomas Jefferson University (Philadelphia, PA, USA). Although all solid masses had been referred for tissue sampling, we classified the lesions using the ACR BI-RADS final assessment categories. Evaluation included sono-elastography recording the elastography strain scores for each mass with the ratio cut-offs of 3 and 4.2, respectively.

All tissue sampling procedures were performed using standard aseptic technique and real-time US guidance, under local anesthesia.

BIOPSY PROCEDURE:

Informed free consent was obtained from each patient, after the need for the study and technique of the procedure was clearly explained to each patient.

Core biopsy of breast masses has low incidence of complications and generally requires no pre-biopsy laboratory tests, except in patients with known coagulopathy or those on anticoagulant medications. None of the study patients had such history, obviating the need for laboratory work or withdrawal of medications. All procedures were performed under strict asepsis. No antibiotics were administered after biopsy.

A free-hand biopsy technique was used where the ultrasound transducer was held with one hand, while the biopsy device attached to a 16-18 gauge needle, in the other. Core biopsies were performed after a tiny nick in the skin, and using a spring-loaded 16-gauge Bard biopsy system. FNA were performed using a 23-gauge needle.

In most cases, four samples were obtained from different areas of the lesion: center, 12, 6, 3, and 9 o'clock positions. After biopsy the area was checked sonographically to check for any complication, hemorrhage or injury to the chest wall. We encountered no complications.

When we were satisfied that appropriate samples had been taken, the incision area was compressed for five minutes and a sterile compressive dressing applied to be in place for 24 hours. The patient was advised to avoid excessive physical exercise and take non-steroidal anti-inflammatory pain tablets

Figure 1. Distribution of the patients according to different age groups.

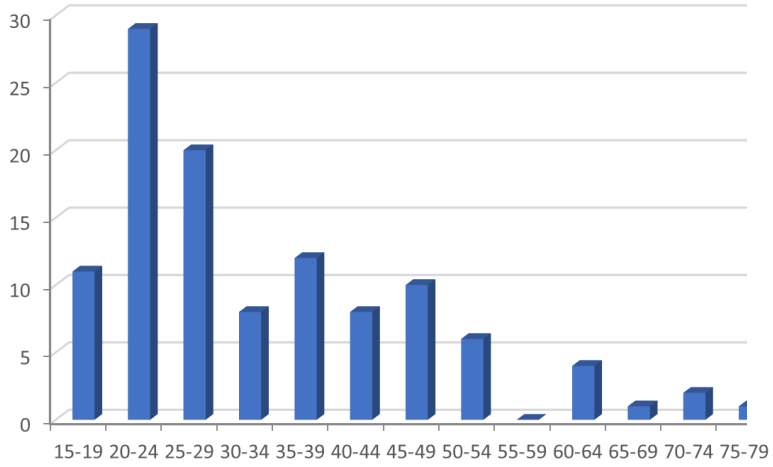


Figure 2. Proportion of malignant and benign lesions.

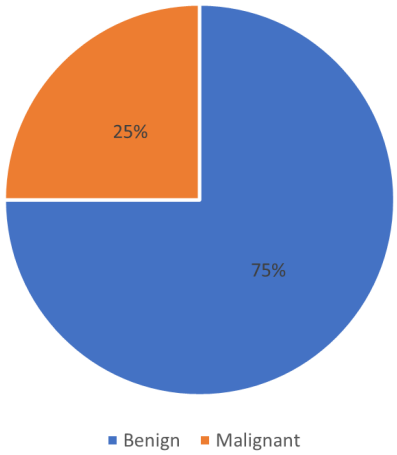
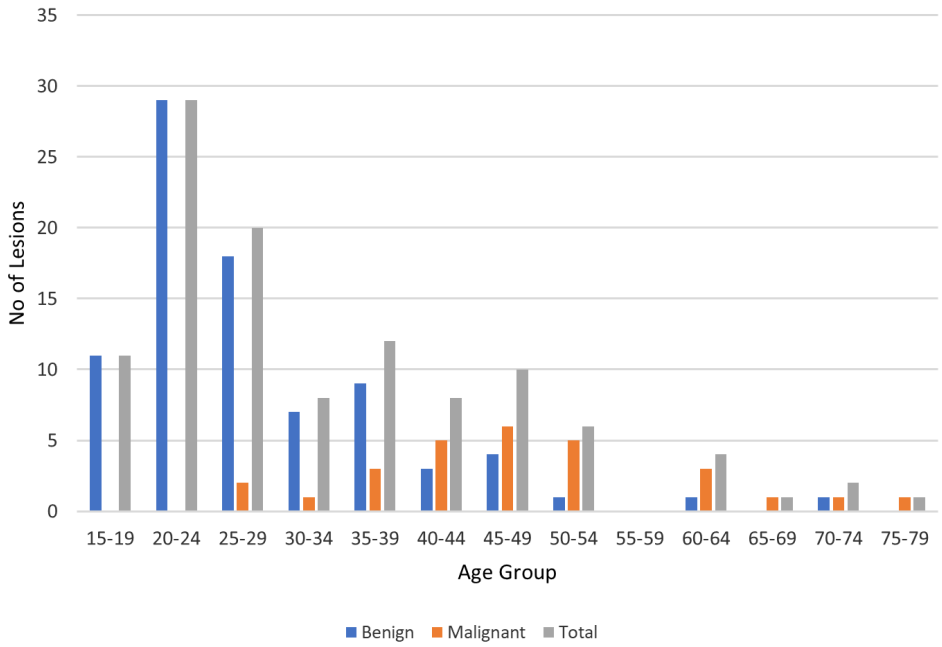


Figure 3: Frequency of benign and malignant lesions among different age groups.



 https://doi.org/10.7191/jgr.2018.1037

as necessary. The specimens were sent to the appropriate high-end laboratories in University of Nairobi histology and cytology labs for histology or cytology.

FNA was performed in 23 cases using the appropriate FNA procedure. Gauge 23 needles were used and three samples per lesion were taken and the slides placed in 95% alcohol. Histopathologic and cytology examinations were conducted by pathologists with over 15 years' experience in breast and general pathology.

Descriptive statistics, including frequencies, measures of central tendency and spread, were analyzed using MS Excel® and SPSS® software. Significance of difference among different age groups was also calculated using Fisher's exact test.

Results

Out of 115 patients who consented for the study, two patients had no mass lesion and were therefore excluded from biopsy, leaving 113 patients, median age 28 years (range: 15-79 years) (Figure 1). An extra mass was seen in three patients, leading to identification of 116 masses for biopsy/cytology. Biopsy results were lost in two cases, and two biopsy results were inconclusive, leaving a final study population of 112; 108 (96.5%) females and 4 (3.5 %) males. Of the 112 cases that were fully evaluated, 89/112 (79.5 %) underwent CNB, and 23/112 (20.5 %) underwent FNA. All four male patients had benign lesions: two were lipomas, and the other two, who had family history of breast cancer, were found to have glandular hypertrophy in the affected breast. Cancer was diagnosed histologically in 28/112 (25%) biopsy specimens, with the remaining 84/112 (75%) revealing benign histology. All the cancers in our study were invasive ductal carcinomas, which are the most common breast cancers worldwide. Of the benign lesions, there were 74/84 (88%) fibroadenomas (Figure 2). No cancers were found in the <25 years age group (Figure 3); the youngest cancer patient was 28 years old. Of the total study population, there were only 32 (28.6%) patients >40 years of age, but they accounted for 22/28 (78.6%) cancers (Table 1) ($p < 0.0001$).

Our study found that BIRADS 5 had the largest number of

Table 1. Demonstrating lesion distribution with a cutoff at 40 years of age.

	Benign	Malignant	Total
Less than 40 years	74	6	**80**
40 years and above	10	22	**32**
Total	**84**	**28**	**112**

Table 2. Proportion of malignant lesions per BI RADS category.
All BIRADS 2 and 3 were confirmed benign histologically.

BIRADS	Histology Classification		Total	% Malignant
	Malignant	Benign		
2	0	73	73	0
3	0	8	8	0
4	10	1	11	90.9
5	18	2	20	90
Total	28	84	112	25

Table 3. Comparison of ultrasound and histology.
All sonograghically benign masses were proven histologically benign.

Strain ratio	Histology Classification		Total
	Malignant	Benign	
Malignant	28	3	31
Benign	0	81	81
Total	28	84	112

 https://doi.org/10.7191/jgr.2018.1037

Figure 4a. Typical examples of malignant lesions (BI RADS 4). These lesions were found to be positive on histopathology.

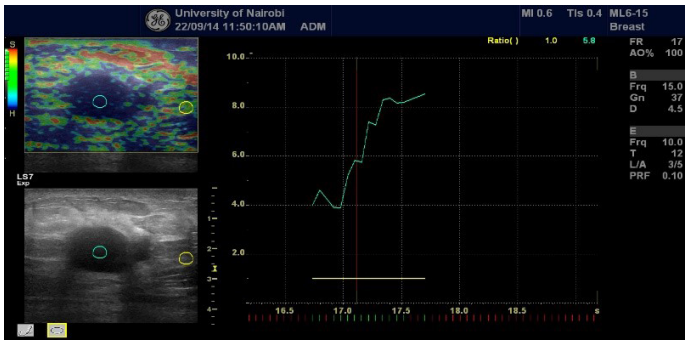
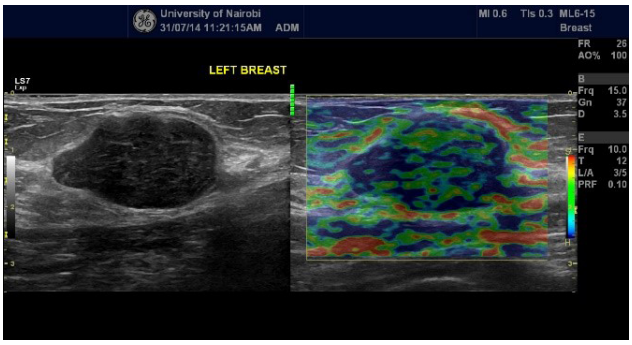


Figure 4b. Typical example of benign (BI-RADS 2) mass. All such category masses were found to be benign on histology.



cancers, while no cancer was seen in the BIRADS 2 and BIRADS 3 categories. Of the 20 BIRADS 5 masses, 18 (90%) were proven malignant. Of the 11 BIRADS 4, one was found benign and 10/11(90.9%) were proven malignant (Table 2), giving a total of 28 cancers of the 112 total cases (25%) in the study.

Regarding elastography criteria, as stated above, strain score and strain ratio cut-offs of 3 and 4.2, respectively, were used. These cut-offs were generated by receiver operating characteristics (ROC) curves in retrospect after histopathology. All 81 cases categorized as benign by BIRADS were also confirmed benign on histology (Table 3). Three lesions classified as probably malignant by elastography were found benign on histology (all had fibrotic changes due to previous infection). Ultrasound distinction between malignant and benign lesions using the BI-RADS lexicon and elastography is summarized in Figures 4a and 4b.

Discussion

Findings from this study have led to strict adherence to sonographic BIRADS standards for evaluation of all breast masses referred for ultrasound guided biopsy in our hospital.

Lesions that are benign after thorough sonographic evaluation and categorized as BIRADS 2 on imaging are not biopsied while those assessed as BIRADS 3 are recommended for follow-up in 6 months. All BIRADS 4 and 5 undergo biopsy. Lesions in BIRADS 4 and 5 that turned out histologically benign included cases with previous scar and infections that had healed and showed fibrotic changes on histopathology.

Our 25% rate of cancer amongst breast masses undergoing biopsy is in keeping with several other studies reported from other African countries in which benign masses accounted for 68-70% of the cases (16-20). One local study evaluating pattern of breast diseases in 1172 cases at the Kenyatta national hospital breast clinic found distribution of pathology at 22% malignant and 78% benign, which is close to our findings (26). Our results differ from one study from Rwanda in which the malignancy rate was 55% of all breast masses undergoing biopsy (21). Such a high prevalent rate of malignancy was attributed to previous absence of diagnostic access in the area. In terms of frequency, most cancers in our study were seen in the 40-54-year age group, with the youngest patient being 28 and the oldest 79 years old. This finding differs from studies in developed countries where breast cancer affects older populations, probably due to differences in demographic age patterns. As a developing country, Kenya has a life expectancy lower than that in the developed world. According to the Kenya demographic profile, the 2017 female life expectancy is 65.5 years. It should be noted that there were only 8 patients above 55 years old in our study, and 6 of them were diagnosed with cancer. Our study findings also correlated favorably with those in China with regards to age distribution (22).

From observations derived from our study, overenthusiastic utilization of triple test assessment protocol will lead to every palpable breast mass undergoing invasive cytology or core biopsy procedure. We believe some of these procedures can be avoided through imaging undertaken by qualified and competent radiologists. BI-RADS lexicon-based assessment has been shown to be highly predictive of the likelihood of malignant or benign results of breast masses (27-29).

Strict application of BI-RADS criteria would have avoided invasive procedures in 81 (72.3%) patients in our cohort, saving the patients from the pain, discomfort, anxiety and cost of invasive diagnostic tests.

The Kenyan breast mass work-up guidelines require highly trained and experienced radiologists and technologists, but such resources may not be widely available. In reality, in the settings of PRCs, local factors such as available equipment, personnel expertise and laboratory facilities generally determine how diagnoses in breast masses are managed. For this reason, we believe, our report does not replicate the experience of other imaging centers within the country, the region or in many PRCs. However, this issue is beyond the scope of this paper.

Various studies have demonstrated that teaching hospitals generally offer a higher quality care (23,24). One example is a study published by Shahian et al., conducted in the United States (23). In this study, teaching hospitals were associated with advanced technologies and superior clinical capabilities. The setting of our study was a teaching and referral center, where we are actively involved in training imagers in a bid to build capacity in breast imaging. A similar study in Nigeria within a similar setting also gave high diagnostic accuracy of ultrasound in women with symptomatic breast pathology (24). From Uganda, a 2010 study conducted in the largest teaching and referral hospital showed lower sensitivity and specificity than ours (25). We attribute this to the fact that the machine we used for our study was a higher-end model integrating higher frequency and elastography. We note that there are scant studies from non-teaching hospitals within our region on diagnostic accuracy of breast ultrasound. A larger study within our country and region needs to be conducted to validate our findings, since ours was only a small, prospective one.

Our study has some limitations: the total study population is small; and FNA or biopsies were carried out for all lesions, regardless of BIRADS-based US assessment, as per the local guidelines which informed the surgeons' management practice of referring all breast masses for biopsy, instead of for diagnostic evaluation only. Due to this practice, diagnostic imaging is not utilized as much as it potentially could be.

Conclusion

Most breast masses in our study cohort were benign, with only 25% histologically proven malignant. Specifically, most masses in the younger, <40 age group in this study were benign fibroadenomas. Given these results, we believe that properly used US evaluation can reduce unnecessary biopsies, especially in patients under 40 years of age. We encourage a complete diagnostic US examination for all patients referred for tissue sampling of breast masses. However, patients with high risk for breast cancer, especially strong first-degree family history, can be handled on a case-by-case basis.

Conflict of interest

The authors report no conflict of interest.

Acknowledgments

The authors sincerely acknowledge the University of Nairobi. KNH and General Electric (GE) Healthcare for availing the resources for the study. They are also grateful to the patients who consented to participate in the study.

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