

Breast Cancer Knowledge, Beliefs, and Screening Practices among Women Seeking Care at District Hospitals in Dar es Salaam, Tanzania

Emma Perry Morse¹, Bertha Maegga², Gertrud Joseph³ and Susan Miesfeldt⁴

¹Pathfinder International, Watertown, MA, USA. ²Tanzania Public Health Association, Dar es Salaam, Tanzania. ³Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania. ⁴Medical Oncology, Maine Medical Center Cancer Institute, Scarborough, ME, USA.

ABSTRACT

BACKGROUND: Limited disease awareness among women may impact breast cancer stage-at-diagnosis in Tanzania, reducing survival. This study assessed breast cancer knowledge, screening practices, and educational preferences among outpatients at Tanzanian government-supported hospitals.

METHODS: A convenience sample of women was surveyed regarding (1) knowledge/beliefs of breast cancer etiology, risk factors, symptoms, treatment, (2) early detection knowledge/practice, and (3) educational preferences.

RESULTS: Among 225 respondents, 98.2% knew of breast cancer; 22.2% knew someone affected by breast cancer. On average, 30% of risk factors and 51% of symptoms were identified. Most accepted one or more breast cancer myths. Among 126 aware of breast self-exam, 40% did not practice it; only 0.9% underwent regular clinical breast examinations despite 68% being aware of the procedure. Among treatments, 87% recognized surgery, 70% radiation, and fewer systemic therapy. Preferred educational sources were group sessions, television/radio, and meetings with breast cancer survivors.

CONCLUSIONS: This work reveals incomplete breast cancer awareness among Tanzanian women and promises to inform development of user-focused educational resources.

KEYWORDS: breast cancer, awareness, urban, Tanzania, low income

CITATION: Morse et al. Breast Cancer Knowledge, Beliefs, and Screening Practices among Women Seeking Care at District Hospitals in Dar es Salaam, Tanzania. *Breast Cancer: Basic and Clinical Research* 2014;8:73–79 doi: 10.4137/BCBCR.S13745.

RECEIVED: November 27, 2013. **RESUBMITTED:** January 13, 2014. **ACCEPTED FOR PUBLICATION:** January 13, 2014.

ACADEMIC EDITOR: Goberdhan P. Dimri, Editor in Chief

TYPE: Original Research

FUNDING: This project was supported by a Fulbright Program grant sponsored by the Bureau of Educational and Cultural Affairs of the United States Department of State and administered by the Institute of International Education. EPM was the recipient of a Fulbright Research Fellowship while based in Dar es Salaam during the conduct of this study. The authors disclose no other funding sources.

COMPETING INTERESTS: Authors disclose no potential conflicts of interest.

COPYRIGHT: © the authors, publisher and licensee Libertas Academica Limited. This is an open-access article distributed under the terms of the Creative Commons CC-BY-NC 3.0 License.

CORRESPONDENCE: emorse@pathfinder.org

Background

Breast cancer is the most common cancer and a principal cause of cancer death among women globally.^{1,2} Once considered a disease of high-income countries, about 50% of breast cancer cases and 58% of breast cancer deaths occur in developing nations.² The five-year survival rate among women with newly diagnosed breast cancer in the United States has reached 89%.³ In contrast, breast cancer cure rates in low-income countries are estimated to be below 40%.⁴ Many advances in breast cancer control in high-income countries like the United States are attributed to attention to disease risk factors and symptoms, advances in early detection, and accessible and effective multimodality treatment.¹

The majority of breast cancer-affected women from low-income countries like Tanzania present with advanced-stage disease, resulting in limited therapeutic options and persistently high mortality rates.⁵ Delays in breast cancer diagnosis and treatment in developing nations are attributed to patient, healthcare provider, and system-mediated barriers to early detection and care.⁶

In high-income countries with existing public health and health systems infrastructure, evidence-based guidelines for population-based breast cancer screening and early detection have been defined, developed, and implemented. These guidelines, principally focused on mammography, are commensurate with high living standards, and access to quality



screening, diagnostic, and treatment services. In contrast, population-based breast cancer screening is a complex undertaking in under-resourced countries with limited public health infrastructure and fragmented health systems. Recognizing these limitations in existing resources, the Breast Health Global Initiative outlined international evidence-based breast health guidelines for low- and middle-income countries, grouping early detection, diagnosis, treatment, and care resource allocation into four tiers based on the country's existing services.

Among resources dedicated to breast cancer early detection, the first tier ("basic level") of this four-tier algorithm included "development of culturally sensitive, linguistically appropriate local educational programs for target populations to teach the value of early detection, breast cancer risk factors, and breast health awareness (education and self-examination)."⁷ This basic system of early detection, designed for the most resource-limited nations, is focused on attention to early signs and symptoms of the disease, clinical breast examination (CBE), and timely referral for diagnosis and treatment.

Little is known about general breast cancer awareness, prevention, and early detection practices among women from low-resource countries, including Tanzania. This baseline knowledge is essential to the development of culturally and linguistically appropriate educational programs that promote understanding of and attention to evidence-based, lifestyle-directed breast cancer prevention interventions, breast health awareness, and early detection and treatment.

The aim of this study was to assess breast cancer knowledge, beliefs, and practices among low-income Tanzanian women related to: (i) disease-associated risk factors, (ii) causes (including myths and folklore), (iii) early detection, (iv) treatment, and (v) existing and preferred sources of information. The ultimate goal of the work was to inform development of effective breast cancer educational resources for Tanzanian women aimed at removing barriers to evidence-based prevention and early detection interventions.

Materials and Methods

Ethical research clearance was secured from the appropriate authorities before initiation of this study. For approval at each of the three study hospitals, chief medical officers at the corresponding district municipal offices were provided with a copy of the survey instrument as well as the detailed research proposal. Letters of approval obtained from the chief medical officers were submitted to directors of research at each study hospital for site approval.

Study design. A structured verbal survey was completed by Tanzanian women presenting to one of three district hospitals for outpatient medical care.

Setting. This study was conducted in the outpatient reproductive and child health (RCH) clinics of three government-subsidized district hospitals in Dar es Salaam: Mwananyamala Hospital (Kinondoni district), Temeke Hospital (Temeke district), and Amana Hospital (Ilala district). The three hospitals

provide primary care services. Dar es Salaam is the largest city in Tanzania with a population of 3.2 million. Based on data from the Tanzanian national census, the populations of Kinondoni, Temeke, and Ilala districts are 1,083,913, 768,451, and 634,924, respectively.⁸

Participants. Participants included a convenience sample of 225 adult women, presenting for outpatient care at one of three study RCH clinics between May and July 2012. The study cohort of adult women seeking outpatient care was selected as the target population for development of breast cancer-related educational resources. The sample size was determined by the study design, a review of existing literature, and the number of potentially eligible participants attending RCH clinics.

Procedures. Potential participants were met in the waiting areas of the three RCH clinics by one of two bilingual Tanzanian research assistants. Interviews were administered at different times on different days at each study site. Research assistants briefly explained the background of the study and the types of questions to be asked during the interview. All women who agreed to participate in the study completed a written informed consent document in Kiswahili, the national language of Tanzania. Research assistants read and reviewed the informed consent document for women with limited literacy. Potential participants were informed that their involvement in the study would not impact their medical care. They were advised that they could elect to not respond to all survey items.

Surveys were completed verbally and in person. Recruitment concluded when the target cohort of 75 women was reached at each of the three hospitals for a total sample size of 225 women. There were no monetary incentives for participating in the study.

Survey instrument. The survey instrument used was adapted from an existing instrument employed in a study of breast cancer awareness conducted in Benin City, Nigeria.⁹ It was reformatted for ease of data collection; ie, several of the questions were converted to table format. A bilingual research assistant translated the adapted survey into Kiswahili. The survey was back-translated into English by another research assistant to confirm the accuracy of the translation.

The survey instrument included 23 items and was designed to take approximately 20 minutes to complete, allowing for data collection while the women waited to be seen by clinic staff. Most items required yes/no/don't know responses; multiple-choice responses were required for the sociodemographic and preferred educational resource items.

The first section of the instrument recorded respondents' sociodemographic characteristics including age, income, education level, marital status, and profession. The second section gauged respondents' (i) general health beliefs, including perceptions of the etiology of illness and bad health, and (ii) attitudes and beliefs regarding the seriousness of and personal risk for breast cancer. The third section assessed respondents'



(i) knowledge of breast cancer-associated risk factors, and knowledge and practices regarding breast cancer screening [breast self-exam (BSE) and clinical breast exam (CBE)], (ii) perceptions of breast cancer causes based on common myths and folklore, (iii) knowledge of symptoms, and (iv) awareness of treatment options. The fourth section solicited knowledge of existing sources of breast cancer information, as well as preferences regarding the type and format of educational resources or programs.

Data collection. Two trained Tanzanian research assistants collected participant data on a paper copy of the survey instrument. All surveys were coded and did not contain participant identifying information. Coded surveys were collected, and the results were entered into a secure electronic database for subsequent analysis.

Analysis. Data presented summarize responses to questions related to participants' (i) overall awareness of breast cancer, including perception of the seriousness of the disease, (ii) perception of personal risk of breast cancer, (iii) knowledge and beliefs of breast cancer risk factors and causes, (iv) knowledge and practice regarding breast cancer screening and early detection, (v) awareness of symptoms, (vi) knowledge of breast cancer treatments, (vii) existing sources of breast cancer information, and (viii) preferred educational resources.

Results

Study participants. A total of 225 women participated in the study (75 from each study site). The sociodemographic characteristics of participants are summarized in Table 1. Respondents were 18–55 years of age with 56.9% at or below 30 years. A total of 15 (6.7%) reported no education or had not completed primary school, 102 (45.3%) had completed primary school only (equivalent of an elementary school education in the United States), 73 (32.4%) had started but not completed secondary school (equivalent of a high school education in the United States), 7 (3.1%) had completed secondary school, and 15 (6.7%) reported having attended a university. More than two-thirds (68.9%) of respondents were married. Most (71.1%) were either unemployed (26.2%) or held a low wage job (44.9%): vendors (41.8%) and farmers (3.1%). Six respondents (2.7%) were medical professionals: three nurses, two social workers, and one physician. The average monthly household income of respondents was 205,400 Tanzanian shillings (TSh) (equivalent of US \$130 per month), which is below the mean Dar es Salaam household income of 216,630 TSh.¹⁰

Overall awareness of breast cancer and perception of personal risk. Regarding breast cancer awareness, most respondents (98.2%) had heard about breast cancer. Fifty participants (22.2%) knew someone with a history of breast cancer.

A total of 120 respondents (53.3%) knew that breast cancer could spread to other parts of the body, and 89 women (39.5%) reported that breast cancer was contagious. A majority

Table 1. Sociodemographic characteristics of participants (n = 225).

	n (%)
Age (years)	
Under 21	13 (5.8)
21–30	115 (51.1)
31–50	92 (40.9)
51 and over	5 (2.2)
Occupation	
Business (vendor)	94 (41.8)
Unemployed	59 (26.2)
Student	20 (8.9)
Tailor	11 (4.9)
Teacher	9 (4.0)
Farmer	7 (3.1)
Medical professional*	6 (2.7)
Self-employed	6 (2.7)
Other	13 (5.8)
Marital status	
Married	155 (68.9)
Single	65 (28.9)
Divorced/widowed	5 (2.2)
Education level	
None	7 (3.1)
Religious school	1 (0.4)
Some primary	8 (3.6)
Completed primary	102 (45.3)
Trade/vocational	12 (5.3)
Some secondary	73 (32.4)
Completed secondary	7 (3.1)
University	15 (6.7)
Number of children	
None	55 (24.4)
One	60 (26.7)
2–4	101 (44.9)
5 or more	9 (4.0)
Estimated monthly household income in TSh**	
0–49,000	7 (3.1)
50–149,000	55 (24.4)
150,000–299,000	81 (36.0)
300,000–499,000	54 (24.0)
500,000 and above	12 (5.3)
Don't know/no response	16 (7.1)

Notes: *includes nurse(3), social worker(2), doctor(1) **At study, 1580 Tanzanian shillings = 1 US dollar. Mean = 205,400 TSh (Mean household income Dar es Salaam according to 2007 HBS report = 216,630 TSh <http://nbs.go.tz/tnada/index.php/catalog/2>).

of women (n = 173; 76.9%) did not believe that breast cancer was stigmatized in their community.

Women were asked to compare the seriousness of breast cancer to other diseases (ie, HIV, TB, malaria). A total of 94



(41.8%) respondents indicated that breast cancer was more serious than other diseases, 47 (20.9%) equally serious compared with other diseases, 46 (20.4%) less serious than other diseases, 3 (1.3%) not serious at all, and 34 (15.1%) did not know or noted that its seriousness depended on the specific disease with which it was being compared. One participant did not respond to this question.

When respondents were asked if they believed that they were at risk of getting breast cancer, 101 (44.9%) selected “Don’t Know,” 69 (30.7%) selected “No,” 53 (23.6%) selected “Yes,” and one did not respond. Among the 53 women who stated that they were at risk, 24.5% believed they were at high risk, 50.9% claimed to have a medium risk, 13.2% reported that they were at low risk, and 11.3% did not specify their level of risk. The most common reason for perceived high risk was the belief that all women were susceptible to the disease (68.9%).

Knowledge and beliefs of breast cancer risk factors and causes. Respondents were asked to identify established

Table 2. Knowledge and beliefs of breast cancer risk factors and causes (n = 225).

KNOWLEDGE OF BREAST CANCER RISK FACTORS	YES n (%)	NO n (%)	DON'T KNOW/ NO RESPONSE n (%)
Alcohol	119 (52.9)	47 (20.9)	59 (26.2)
Women who do not breast feed	107 (47.6)	67 (29.8)	51 (22.7)
Diet	83 (36.9)	84 (37.3)	58 (25.8)
Increasing age	59 (26.2)	126 (56.0)	40 (17.8)
Positive family history	37 (16.4)	138 (61.33)	50 (22.2)
Obesity	32 (14.2)	144 (64.0)	49 (21.8)
Early menstrual flow/late menopause	16 (7.1)	134 (59.6)	75 (33.3)
BELIEFS REGARDING CAUSES OF BREAST CANCER	YES n (%)	NO n (%)	DON'T KNOW/ NO RESPONSE n (%)
Putting money under brassiere	185 (82.2)	16 (7.1)	24 (10.7)
Will of God	158 (70.2)	44 (19.6)	23 (10.2)
Attack from the enemy	75 (33.3)	109 (48.4)	41 (18.2)
Scratching the breast	60 (26.7)	112 (49.8)	53 (23.6)
When a child bites a mother during breast feeding	52 (23.1)	140 (62.2)	33 (14.7)
Guinea worm infection	45 (20.0)	103 (45.8)	77 (34.2)
Wearing brassiere always	41 (18.2)	138 (61.3)	46 (20.4)
Breast feeding for a long time	23 (10.2)	166 (73.8)	36 (16.0)
Prolonged fondling of a breast by a man	14 (6.2)	169 (75.1)	42 (18.7)
Large breasts	13 (5.8)	187 (83.1)	25 (11.1)
Small breasts	6 (2.7)	190 (84.4)	29 (12.9)

risk factors for breast cancer. Table 2 shows that more than half of the women (52.9%) identified alcohol as a risk factor for breast cancer, followed by not breastfeeding (47.6%), and diet (36.9%). Only 16.4% of respondents identified a positive family history as a risk factor for breast cancer. On average, participants correctly identified only 30% of risk factors listed.

Table 2 summarizes respondents’ beliefs regarding causes of breast cancer based on common myths and folklore. Among the most common beliefs, 82.2% accepted that putting money under one’s brassiere causes breast cancer, 70.2% believed that breast cancer is the will of God, 33.3% noted that breast cancer resulted from an enemy attack, and 26.7% believed that the act of scratching one’s breast can cause cancer.

Knowledge and practice relative to breast cancer screening and early detection. Table 3 summarizes respondents’ knowledge and practices relative to breast cancer screening and early detection interventions. A total of 99 (44%) reported never hearing of BSE. Among the 126 who had heard of it, 25.4% practiced it regularly, 34.1% practiced it occasionally, and 40.5% never practiced it; 40.8% of respondents accurately described how to do BSE. Women who were aware of BSE were also asked what factors would encourage and discourage them from doing this exam. Encouraging factors cited were knowledge of the procedure (87.7%), an available instruction sheet (56.9%), and the opportunity to attend an awareness program (39.0%). Common responses for procedure deterrents were lack of knowledge about the procedure (46.2%), forgetfulness (30.0%), and feeling overworked/too busy (30%). A total of 19 (8.4%) stated that nothing would prevent them from doing BSE.

Respondents’ knowledge and receipt of CBE were assessed. Thirty-two percent of respondents were not aware of CBE; 60.4% had heard of it but had not received a CBE, 6.2% had received at least one CBE, and two women reported having an annual CBE.

Table 3. Knowledge and practice of early detection strategies for breast cancer (n = 225).

	n	%
Breast Self-Exam (BSE)		
Never heard of it	99	44.0
Heard of it but do not practice it	51	22.7
Heard of it and practice it occasionally	43	19.1
Heard of it and practice it monthly	32	14.2
Don't know	0	0.0
Clinical Breast Exam (CBE)		
Never heard of it	72	32.0
Heard of it but never had an exam	136	60.4
Heard of it and had at least one exam	14	6.2
Heard of it and go for yearly exams	2	0.9
Don't know	1	0.4



Awareness of breast cancer symptoms. Respondents' awareness of breast cancer-associated symptoms varied. On average, women correctly identified 51% of symptoms listed. Most respondents (70.2%) correctly identified a painless breast lump as an early symptom of breast cancer. Breast sores (68.9%), skin changes (64.4%), and swelling (52.0%) were also identified. Fewer identified crusting of the nipple (51.6%), breast redness that does not go away (48.9%), an inverted nipple (43.6%), one breast becoming larger than the other (35.1%), and breast dimpling (41.8%).

Knowledge of breast cancer treatments. Women were asked a series of questions to assess their knowledge and beliefs regarding breast cancer treatments. When asked if traditional healers can cure breast cancer, 88.4% responded "No." Most respondents (n = 213; 94.7%) agreed that breast cancer is treatable in a hospital. Among allopathic treatment options offered: 87.1% (n = 196) noted that surgery was a common treatment for breast cancer, followed by radiation by 70.2% (n = 158), oral medicines by 44.4% (n = 100), and chemotherapy by 28.4% (n = 64).

Education intervention feedback. When asked about existing sources of information contributing to their knowledge of breast cancer, 113 (50.2%) selected television as their main source of information, 82 (36.4%) selected the radio, 20 (8.9%) selected other people, 55 (24.4%) selected the general media (unspecified source), and 16 (7.1%) selected hospitals. Very few selected posters/brochures (n = 2; 0.9%), schools (n = 2; 0.9%), or newspapers/magazines (n = 4; 1.8%) as educational sources. Most participants (n = 219; 97.3%) responded that it was important for their community to have access to a breast cancer educational program or resource.

Summarized in Table 4, the most favored future sources of educational materials (selected as very good or good) included forming groups for health education (218; 96.8%), television or radio programs (220; 97.7%), and breast cancer survivors teaching other women about the disease (212; 94.2%).

Discussion

Sub-Saharan African countries, including Tanzania, face substantial threats from diseases once thought to be rare in low-income nations. Cases of breast cancer are expected to increase in Tanzania as communicable diseases (such as HIV, malaria, and tuberculosis) are better controlled. Furthermore, as certain breast cancer-associated lifestyle behaviors, such as poor diet and lack of exercise, are affected by national development efforts, breast cancer incidence is predicted to increase.^{1,11} Because cancer treatment is generally more costly than the expense for care of most communicable diseases, this demographic transition is likely to strain Tanzania's meager national health care budget.¹²

Efforts aimed at breast cancer prevention and early detection are essential to limiting the burden of breast cancer in Tanzania. The Breast Health Global Initiative cited culturally and linguistically sensitive public education as the first

Table 4. Preferred methods of breast cancer education (n = 225).

PREFERRED METHODS OF EDUCATION	1 - VERY GOOD	2 - GOOD	3 - NEUTRAL	4 - BAD	NO RESPONSE	MEAN SCORE
Gather people together for health education	99	119	3	0	4	1.57
Television and radio programs	81	139	1	0	4	1.64
Breast cancer survivors teach about breast cancer	62	150	5	2	6	1.76
Educational book or brochure	52	164	4	1	4	1.79
Illustrations or plays	48	167	5	1	4	1.81
Teach people songs about breast cancer	42	165	9	3	6	1.88
Video or film	41	168	8	3	5	1.88
Information on computer	3	158	56	4	4	2.28
Community healers teach about breast cancer	5	32	175	7	6	2.84



and most basic step in implementing a breast health program. Prerequisite to the development of culturally appropriate educational resources is broad understanding of (i) the target populations' baseline knowledge, attitudes, beliefs, and practices related to breast cancer prevention and screening, (ii) potential barriers to risk reduction and early detection, and (iii) preferences regarding types and sources of educational resources.

This work examined general breast cancer awareness as well as potential patient-mediated barriers to breast cancer prevention, diagnosis, and care among 225 urban Tanzanian women representing the target population for future public breast cancer education programs and resources. We show that survey participants had (i) incomplete knowledge of breast cancer risk factors and early detection methods, and (ii) current beliefs in common myths and folklore regarding the causes of breast cancer. Few respondents had regular CBEs, and many demonstrated incomplete knowledge of breast cancer symptoms. Furthermore, they reported incomplete awareness of available allopathic breast cancer treatments, particularly systemic therapies, including chemotherapy and oral medications (ie, hormonal therapy).

There has been limited study of breast cancer awareness in sub-Saharan Africa. A survey of employed civil servants from Benin City, Nigeria examined general awareness of breast cancer risk factors and symptoms. This earlier work revealed greater knowledge of breast cancer risk factors in comparison to the data presented here. Specifically, among the Nigerian women surveyed, 37.5, 14.3, 39.2% correctly identified family history, obesity, and age, respectively, as breast cancer-associated risk factors. In comparison, among the Tanzanian women surveyed, only 16.4, 14.2, 26.2%, respectively, acknowledged these risk factors in our survey. Although greater awareness of breast cancer risk factors may reflect the higher education level among participants of the Nigerian study (92% reported a secondary or tertiary education), it may also reflect other sociodemographic factors, or national or regional differences in the availability of educational resources.

There are very limited data regarding breast cancer awareness in Tanzania. However, a 2002 study examined cervical cancer awareness among Tanzanian women. Similar to breast cancer stage-at-diagnosis data in Tanzania, this work showed that more than 90% of the patients studied had late-stage disease at the time of diagnosis. Like the data presented here, overall knowledge of cervical cancer was low, and the majority of women were not aware of the importance of cervical cancer screening. The authors linked late-stage disease presentation to respondents' incomplete knowledge of symptoms, and lack of access to screening and early detection interventions. This pattern is consistent with barriers to adequate breast cancer control in Tanzania.¹³

To our knowledge, there are no previous reports of Tanzanian women's preferences for breast cancer educational

resources. Among participants of the work presented here, most preferred face-to-face group educational sessions. Other preferred sources of information were television and radio programs, as well as breast cancer survivors serving as educators. Each of these sources of educational materials and programs could be developed through existing community, clinic, or hospital-based venues within Dar es Salaam.

Limitations

Although this study provides valuable insight into Tanzanian women's awareness of breast cancer and preferences for educational resources, there are several important limitations of the results presented.

First, this study included only women from urban Tanzania. Findings cannot be generalized to women from less populated areas, particularly rurally remote regions of the country.

Second, although trained, bilingual research assistants collected survey responses from participants verbally and in person, and strict translation measures were followed in developing the survey instrument, we recognize that literacy and language barriers may have influenced the validity of the data collected.

Third, because this study included women presenting for care at government-funded, hospital-based outpatient clinics, the results presented may not reflect (i) the knowledge, beliefs, and screening practices of women who do not have access to medical care, (ii) those who receive care at private hospitals or clinics, or (iii) those who seek treatment from traditional healers.

Fourth, although this work reflected a broad sociodemographic population relative to age, education level, and income, the small study population limited the broad generalizability of this work for Tanzania and other African nations. Furthermore, because this work involved women presenting to RCH clinics for care, it did not reflect the knowledge, attitudes, and beliefs of women older than 55 years, which is an important demographic limitation relative to breast cancer risk. However, breast cancer prevention and awareness resources should be focused on women in early adulthood because of the long latency period of this disease.

Fifth, we were unable to broadly assess availability of local and regional screening and treatment services at a health system level, and recognize that differences in awareness and access to these services may have impacted survey responses.

Conclusions

This study shows that urban Tanzanian women have incomplete knowledge of breast cancer risk factors, symptoms, and treatment. Beliefs in common myths and folklore relative to causes of breast cancer persist among the women surveyed. This work provides valuable insight into preferred sources/methods of education, and promotes development of effective educational resources aimed at reducing patient-mediated



barriers to breast cancer prevention, early detection, and care in Tanzania. Importantly, efforts aimed at removing barriers to breast health promotion and early detection must be combined with investment in public health infrastructure and service delivery at the provider and facility level to improve prompt access to effective breast cancer diagnostic and treatment services.

Acknowledgments

We are grateful to the women who participated in this study, as well as the administrative and clinical staff who facilitated data collection at the three study sites. We also thank Dr. Sarah Maongezi for her professional support throughout the study period, Richard Skolnik for his guidance in study design, Norma Albrecht for her technical help, and Goodluck Mwashilindi for his assistance in data collection.

Author Contributions

Conceived and designed the experiments: EPM, BM, GJ, SM. Analyzed the data: EPM, SM. Wrote the first draft of the manuscript: EPM, SM. Contributed to the writing of the manuscript: EPM, SM. Agree with manuscript results and conclusions: EPM, BM, GJ, SM. Jointly developed the structure and arguments for the paper: EPM, SM. Made critical revisions and approved final version: EPM, BM, GJ, SM. All authors reviewed and approved of the final manuscript.

DISCLOSURES AND ETHICS

As a requirement of publication the authors have provided signed confirmation of their compliance with ethical and legal obligations including but not limited to compliance

with ICMJE authorship and competing interests guidelines, that the article is neither under consideration for publication nor published elsewhere, of their compliance with legal and ethical guidelines concerning human and animal research participants (if applicable), and that permission has been obtained for reproduction of any copyrighted material. This article was subject to blind, independent, expert peer review. The reviewers reported no competing interests.

REFERENCES

1. Bray F, McCarron P, Parkin DM. The changing global patterns of female breast cancer incidence and mortality. *Breast Cancer Res.* 2004;6(6):229–39.
2. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int J Cancer.* 2010;127(12):2893–917.
3. National Cancer Institute. *Surveillance Epidemiology and End Results.* 2012. U.S. Department of health & Human Services. Bethesda, MD, USA.
4. Coleman MP, Quaresma M, Berrino F, et al. Cancer survival in five continents: a worldwide population-based study (CONCORD). *Lancet Oncol.* 2008;9(8):730–56.
5. Burson AM, Soliman AS, Ngoma TA, et al. Clinical and epidemiologic profile of breast cancer in Tanzania. *Breast Dis.* 2010;31(1):33–41.
6. Macleod U, Mitchell ED, Burgess C, Macdonald S, Ramirez AJ. Risk factors for delayed presentation and referral of symptomatic cancer: evidence for common cancers. *Br J Cancer.* 2009;101(suppl 2):S92–101.
7. Yip CH, Smith RA, Anderson BO, et al. Guideline implementation for breast healthcare in low- and middle-income countries: early detection resource allocation. *Cancer.* 2008;113(8 suppl):2244–56.
8. The United Republic of Tanzania. NBoS, Ministry of Planning, Economy and Empowerment. Tanzania Census 2002, Analytic Report. 2006.
9. Osime OC, Okojie O, Aigbekaen ET, Aigbekaen IJ. Knowledge attitude and practice about breast cancer among civil servants in Benin City, Nigeria. *Ann Afr Med.* 2008;7(4):192–7.
10. National Bureau of Statistics. Tanzania – National Household Budget Survey 2007. Vol 2013. 2007.
11. Jemal A, Bray F, Forman D, et al. Cancer burden in Africa and opportunities for prevention. *Cancer.* 2012;118(18):4372–84.
12. Lingwood RJ, Boyle P, Milburn A, et al. The challenge of cancer control in Africa. *Nat Rev.* 2008;8(5):398–403.
13. Kidanto HL, Kilewo CD, Moshiro C. Cancer of the cervix: knowledge and attitudes of female patients admitted at Muhimbili National Hospital, Dar es Salaam. *East Afr Med J.* 2002;79(9):467–75.