10-2015

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HEALTH EDUCATION RESEARCH Vol.30 no.5 2015
Pages 786–796
Advance Access published 3 September 2015

Impact of an educational intervention on breast cancer knowledge in western Kenya

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Received on December 4, 2014; accepted on August 6, 2015

Abstract

Our objective was to assess the effectiveness of educational sessions that accompanied breast cancer screening events in three communities in western Kenya between October and November 2013. Five hundred and thirty-two women were recruited to complete a test of breast cancer-relevant knowledge and randomly allocated to 'pre-test' or 'post-test' groups that immediately preceded or followed participation in the educational sessions. The education was organized as a presentation by health professionals and focused mainly on causes of breast cancer, early and late cancer presentation signs, high-risk groups, screening methods to find early-stage breast cancer, self-breast exam procedures and treatment options for this disease. Participants were invited to ask questions and practice finding nodules in silicone breast models. The median age was 35 years (interquartile range: 28–45), and 86% had not undergone breast cancer screening previously. Many individual items in our test of knowledge showed statistically significant shifts to better-informed responses. When all items in the assessment questionnaire were scored as a 'test', on average there was a 2.80 point (95% CI: 2.38, 3.22) significant improvement in knowledge about breast cancer after the educational session. Our study provides evidence for the effectiveness of an educational strategy carefully tailored for women in these communities in Kenya.

Introduction

Globally, the incidence of breast cancer continues to increase with high mortality rates reported among women diagnosed with this form of cancer [1, 2]. While previously the burden of breast cancers has been predominantly reported in developed countries, low- and middle-income (LMIC) developing countries are now experiencing an increase in breast cancer cases [1, 2]. In 2008, breast cancer accounted for 23% (1.38 million) of the total new cancer cases and 14% (458 400) of the total cancer deaths globally. About half of the breast cancer cases and 60% of the associated deaths occurred in developing countries [1, 2].

Early detection and treatment of breast cancer has been widely advocated as a strategy to mitigate breast cancer-related morbidity and mortality rates in developing countries [1–4]. Unfortunately, most patients in developing countries present to care with advanced-stage breast cancer [5, 6]. Late presentation in these settings has been mainly associated with lower education levels and low-income status [6]. In addition, low-level knowledge of early signs and symptoms of breast cancer continues to pose a challenge on efforts to promote timely uptake of breast cancer screening and treatment [7, 8].

doi:10.1093/her/cyv043

This unfortunate situation is compounded by inadequate health system infrastructure (personnel, equipment and referral systems) that is needed to provide a full array of breast cancer prevention and treatment services [4].

Despite these many challenges, community breast cancer awareness through education and screening approaches continues to be seen as critical to advancing detection and care[2, 3]. Unfortunately, there are very few studies in sub-Saharan Africa that have assessed the impact of breast cancer awareness intervention programs. The only study we found was conducted in Ghana and reported an increase in breast cancer knowledge and screening uptake following a breast cancer awareness program [7]. The majority of studies have been conducted in developed countries [9]. This state of the research literature has limited our knowledge about effective community-based approaches to promote breast cancer awareness in sub-Saharan Africa. Further studies that describe effective interventions and how to improve educational strategies to enhance early detection of breast cancer in this region are warranted.

Kenya is one of the LMIC countries in need of such studies. In Kenya, the incidence of breast cancer is 34 per 100 000 women higher than the incidence in the East Africa region of 19 per 100 000 women [2, 10]. Late presentation of breast cancer remains high with at least 90% of cases presenting with Stage 3 or 4 disease at Moi Teaching and Referral Hospital (MTRH), one of the largest referral hospitals in Kenya (Eldoret Cancer Registry). To date, there are no studies conducted in Kenya to assess the impact of a community or special target population awareness program on the knowledge about breast cancer. We therefore designed a community breast cancer education program and assessed the impact of the program on the knowledge of breast cancer among women in three sites in western Kenya who had volunteered for clinical breast screening exams at special events.

Method

Study sites

Based in Western Kenya, the Academic Model for Providing Access to Healthcare (AMPATH) is a collaboration among Moi University School of Medicine (MUSoM), MTRH and a consortium of North American Universities led by Indiana University [11]. At first focused on delivering HIV care, over the past several years, AMPATH has broadened its services to include primary health care and chronic disease management, including prevention and treatment services for cancer. Within AMPATH, the AMPATH-Oncology Institute (AOI) was initiated to organize and offer care to cancer patients, as access to treatment options were otherwise limited [12]. The 'Walther project', in which the current study was nested, was initiated in 2011 under the auspices of AOI with a grant from the Walther Cancer Foundation of Indianapolis, Indiana. The Walther project has focused primarily on cancer prevention activities through provision of free annual breast screening services to selected communities in western Kenya.

Study design

The current report focuses on breast cancer education services that were designed to accompany clinician breast examination screening and includes data from a before-and-after assessment of educational effectiveness. The study was conducted between October and November 2013 during community breast screening events in Turbo, Mosoriot and Kapsokwony. We targeted community women (18 years and older) who attended the breast cancer screening events in the respective sites. Ethical approval for the study was obtained from the Moi University Institutional Research and Ethics Committee (IREC) as well as the Indiana University Institutional Review Board (IRB). A written consent was sought from all participants prior to their enrolment into the study.

Sampling

We sought to enroll a total sample of 550 women attendees to achieve a power of 90% to detect a difference of 5% in rates of correct responses to the various items in a questionnaire-based test of knowledge [13]. Of this projected recruitment sample, equal numbers of women were randomly assigned to the pre- and post-test groups.

Educational session

The 'blueprint' for the content of the teaching session was based on previous survey findings assessing women's knowledge and domains of ignorance about breast cancer in the same community [14] using the Breast Cancer Awareness Module (BCAM) [15]. The teaching script focused mainly on causes of breast cancer, early and late signs, high-risk groups, screening for breast cancer, self-breast exam procedures and treatment options (Supplementary Appendix S1). A single teaching session took an average of 30 minutes and was conducted in either of the two preferred languages; Swahili or English. In each teaching session, participants were given an opportunity to try to find the small breast masses present in a silicone breast cancer examination training model, so they would understand what the clinicians were trying to find in clinical exams. In each community, we used different teaching instructors with expertise in breast cancer. In Kaspokwony, we had a physician, nurse, and behavioral scientist conduct the educational sessions. In Turbo, a physician and a nurse facilitated the educational sessions while in Mosoriot a nurse taught alone. At the end of each session participants were given the opportunity to ask questions. Supplementary Appendix S2 includes some of the commonly asked questions.

Study instrument

To assess the impact of the teaching session, we used a structured questionnaire (Supplementary Appendix S3) adapted from the BCAM. The validity and reliability of the BCAM in this population was assessed in a previous study. Study findings were used to improve the face validity and understandability of items for this Kenyan population [16]. For this study the questionnaire included questions on: 1. socio-demographic characteristics; 2. knowledge of early or late signs of breast cancer and women who are at greatest risk; 3. true or false questions about breast cancer cure, cause, gender relative risk, and screening. Finally, the questionnaire asked whether a participant had been previously trained to do breast self-examination or had undergone [14] previous screening.

To assess general improvement in participant knowledge after the educational session responses to the questionnaire item variables were scored and compared. Scoring was done as Early = 0, Late = 1, Don't know = 0 for the following variables: A large lump in the breast, A wound in the breast that would not heal, Pain in the breast, A bloody discharge from the breast, A lump in the armpit (questionnaire items 5–8 and 10). The treatment was different for "A small painless lump in the breast" (item 9) that was scored as follows: Early = 1, Late = 0, Don't know = 0. The item concerning which women are most likely to get breast cancer (item 11) was scored as: 30 year old = 0, 50 year old = 0, 70 year old = 1, Don't know = 0. The scoring system for the following items–Breast cancer can be cured if found early (item 12), major cause of breast cancer is family inheritance (item 14), breastfeeding lowers the risk of breast cancer (item 17) and the best time to check for breast cancer is after the menstrual period (item 20)—was True = 1, False = 0, Don't know = 0. Finally, the scoring system was True = 0, False = 1, Don't know = 0 for the following variables: Men and women are equally affected by breast cancer (item 13), major cause of breast cancer is witchcraft (item 15), major cause of breast cancer is eating wrong foods (item 16), breast cancer can be cured by herbs (item 18 and surgery spreads breast cancer and makes it worse (item 19). The highest possible total score of correct responses for items #5–20 was 16 points.

Study procedure

Community mobilization for these special screening events was done through public announcements on local radio stations in Kapsokwony, Turbo and

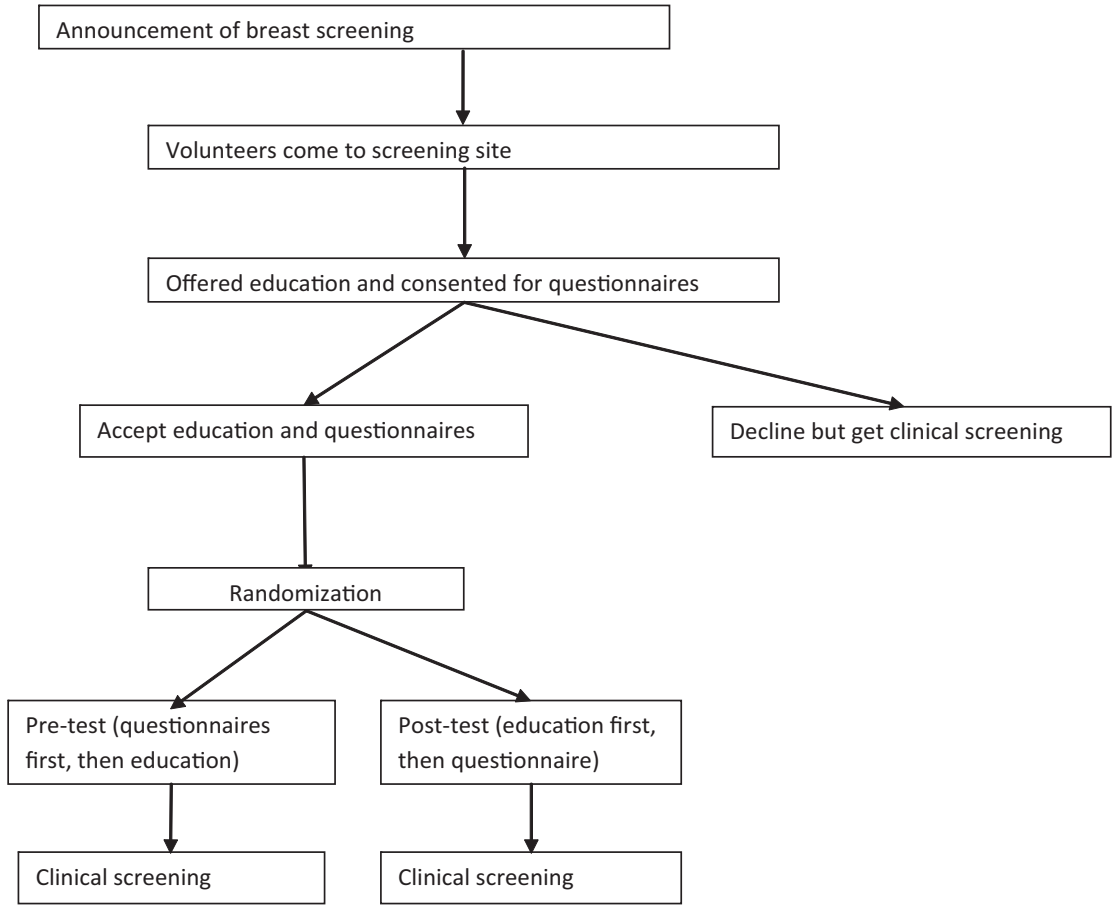

Fig. 1. Study procedure.

Mosoriot. Screening events were held at the local health centers. Women attendees who volunteered for the clinical breast exams were randomly assigned to complete the test of knowledge as members of a pre- or post-test group. The survey was administered to the "pre-test" group prior to the teaching session and clinical breast exam, while the "post-test" group completed the survey after the teaching session and before the clinical breast exam. All these activities were carried out on the same day. Fig. 1 shows the study procedures.

Data analysis

Statistical analyses were performed using STATA Version 12 special edition (http://www.stata.com/). Categorical variables were summarized using item response frequencies. Continuous variables that assumed the Gaussian distribution were described as a mean with the corresponding standard deviation (SD) while those that were skewed were summarized as median with the corresponding interquartile range (IQR). Normality assumptions for the continuous variables were assessed using empirical Shapiro-Wilk test and graphical approaches. The test for association between the continuous outcome variables and categorical (binary) explanatory variables was done using Wilcoxon two-sample test, while the test for association between categorical variables was done using Pearson's Chi Square test. We reported the Fisher's exact *P* whenever

the expected cell count was <5 in at least one of the cells.

To assess the impact of the educational session on particular points of knowledge, comparisons of the distribution of pre- and post-test responses to individual questions items were completed and are presented in Tables II and III. The scores for each item response were summed to develop a summary score for each participant. Summary scores for pre- and post-test groups were compared, using the two-sample *t*-test.

Results

A total of 532 women participated in the study, with 269 women in the pre-test versus 263 in the post-test group. The median age was 35 (IQR: 28–45) years. There were no statistically significant differences between the pre- and post-test groups in terms of age, marital status, educational level and having previously undergone screening. The majority of participants were married (76%) and had received at least a primary level of education (95%). Similarly, a most (86%) of them had not previously undergone screening for breast cancer. On the other hand, compared to the pre-test group, a larger percent of the post-test group reported having been previously "trained" to check their breasts for lumps (20% versus 43%, $P = 0.001$) (Table I). This was a surprising difference to find since the women had been randomized to pre- and post-test groups, and all questionnaires were completed before they experienced clinical breast examination screening. We speculate that some women in the post-test group, when responding to this question, were considering the educational experience to which they had just been exposed–including practice with the silicone models–as 'training,' rather than to any other specific training in breast self-exam on another occasion.

As shown in Table II, the one item that directly assessed knowledge of an early-stage manifestation of breast cancer was the item that asked participants about a small painless lump. The remaining four items were designed to detect misunderstandings about early- versus late-stage breast cancer. Generally, a higher proportion of women in the post-test group had correct knowledge about the early and late signs of breast cancer. On the other hand, more than a quarter of the women in both groups believed that having a pain in the breast and a lump in the armpit were signs of early-stage breast cancer.

There were significant differences between the pre- and the post-test assessments. Across all communities, the responses to all items changed after exposure to teaching, except for the item "Breast cancer can be cured if found at an early stage", which was subject to a "ceiling effect" that obscured any possible change. The total mean knowledge score was 8.47 (SD: 2.82). The pre-test group average knowledge score was 7.09 (SD: 2.52), while the average knowledge score for the post-test group was 9.89 (SD: 2.38). There was a statistically significant difference in the average knowledge scores +2.80 (95% CI: 2.38–3.22).

Only in Kapsokwony was there a consistency in terms of a higher proportion of the post-test group obtaining correct responses across all the early and late warning signs items (Table II). In Turbo, there were no significant differences between the groups on two items assessing knowledge of advanced breast cancer signs; a bloody discharge from the breast and a lump in the armpit. In general, a higher proportion of women in this site believed that a bloody discharge from the breast (56.3%) and a lump in the armpit were signs of late-stage breast cancer (38.8%). In Mosoriot, there was no significant difference between the pre- and post-test groups in the item assessing knowledge of early warning signs of breast cancer, with the majority (69.4%) in both pre- and post-test groups reporting that a small painless lump in the breast is a sign of early-stage breast cancer.

In each of these communities, nearly all women knew that breast cancer could be cured if found at an early stage. There was a significantly higher proportion of women in the post-test group compared to the pre-test group who reported correct responses in items assessing knowledge of risk, causes and treatment for breast cancer ($P < 0.001$) (Table III).

Table I. *Characteristics of women enrolled in the study*

Characteristic	Pre ($n = 269$,51%)	Post ($n = 263$,49%)	*P*-value
Age	35(28–45)	34(28–44)	0.940
Marital status			0.946
Married	205(76%)	200(76%)	
Single	41(15%)	41(16%)	
Separated	8(3%)	6(2%)	
Divorced	1(0.4%)	0	
Widowed	14(5%)	16(6%)	
Education level ($n = 532$)			0.506
None	16(6%)	13(5%)	
Primary	132(49%)	130(50%)	
Secondary	81(30%)	89(34%)	
College or above	40(15%)	29(11%)	
Location			
Kapsokwony	91(49%)	93(51%)	
Turbo	119(52%)	108(48%)	
Mosoriot	59(49%)	62(51%)	
Trained to perform a self-breast exam			<0.001
	No 214(80%)	151(57%)	
	Yes 55(20%)	112(43%)	
Previously undergone breast cancer screening			0.324
	No 236(88%)	223(85%)	
	Yes 33(12%)	40(15%)	
How often should a woman check for a breast lump			0.113
At least once in < 1 year	50(19%)	40(15%)	
Once in 2 or 3 years	184(68%)	202(77%)	
Other	6(2%)	3(1%)	
Don't know	29(11%)	17(6%)	

Interestingly, a higher proportion of women in both the pre- (46%) and post- (55%) test groups believed that men and women are equally affected with breast cancer. When stratified by community, in Kapsokwony there was no pre-post group difference on responses about whether breast cancer could be cured if found early and if herbs could cure breast cancer. The majority of women in this site believed that breast cancer could be cured early (94.6%) and that herbs could not cure it (66.3%).

In Turbo, significantly higher proportions of the participants in the post-test arm compared to the pre-test arm reported correct responses on the following items: the major cause of breast cancer is family inheritance, major cause of breast cancer is eating wrong foods, breast feeding lowers the risk of breast cancer, breast cancer cannot be cured by herbs and that surgery did not spread breast cancer and did not make it worse. Almost one-half (49.7%) of women across the two groups in this site were of the opinion that breast cancer affected both men and women equally, and only 5.7% believed that witchcraft was the major cause of breast cancer. In addition, only 35% of women in both groups combined agreed that the best time to check for a lump is after the menstrual period.

In Mosoriot, there were no statistically significant pre-post differences on most of the items. There was a significant shift to correct responses, however, in the post-test group of women who submitted more correct responses to items on major cause of breast cancer is family inheritance, breast cancer can't be cured by herbs and that the best time to check for lump is after menstrual period. As was the case in

Table II. *Knowledge of early and late signs of breast cancer*

Sign	Total $n = 532$ Pre, n (%)	Post, n (%)	P-value	Kapsokwony, $n = 184$ Pre, n (%)	Post, n (%)	P-value	Turbo, $n = 227$ Pre, n (%)	Post, n (%)	P-value	Mosoriot, $n = 121$ Pre, n (%)	Post, n (%)	P-value
	Early sign of breast Cancer											
A small painless lump in the breast												
Early stage	167(62)	215(82)	<0.001	56(62)	82(88)	<0.001	73(61)	87(81)	0.001	38(64)	46(74)	0.302
Late stage	33(12)	30(11)		8(9)	8(9)		18(15)	14(13)		7(12)	8(13)	
Don't know	69(26)	18(7)		27(30)	3(3)		28(24)	7(6)		14(24)	8(13	
	Late signs of breast cancer											
A large lump in the breast												
Early stage	93(35)	82(31)	<0.001	3842	24(26)	<0.001	36(30)	31(29)	0.097	19(32)	27(44)	0.059
Late stage	92(34)	151(57)		1719	63(68)		53(45)	61(56)		22(37)	27(4)	
Don't know	84(31)	30(11)		3640	6(6)		30(25)	16(15)		18(31)	8(13)	
A wound in the breast that will not heal												0.040
Early stage	60(22)	35(13)	<0.001	30(33)	15(16)	<0.001	25(21)	10(9)	0.006	5(8)	10(16)	
Late stage	150(56)	207(79)		38(42)	74(80)		72(61)	86(80)		40(68)	47(76)	
Don't know	59(22)	21(8)		23(25)	4(4)		22(18)	12(11)		14(24)	5(8)	
Pain in the breast												
Early stage	151(56)	131(50)	<0.001	55(61)	53(57)	<0.001	64(54)	43(40)	0.006	32(54)	35(56)	0.009
Late stage	56(21)	112(43)		10(11)	36(39)		35(29)	54(50)		11(19)	22(35)	
Don't know	61(23)	20(8)		25(28)	4(4)		20(17)	11(10)		16(27)	5(8)	
A blood discharge from the breast												
Early stage	60(22)	57(22)	<0.001	32(36)	23(25)	<0.001	20(17)	21(19)	0.535	8(14)	13(21)	0.020
Late stage	114(43)	161(61)		22(24)	60(65)		65(55)	63(58)		27(46)	38(61)	
Don't know	94(35)	45(17)		36(40)	10(11)		34(29)	24(22)		24(41)	11(18)	
A lump in the armpit												
Early stage	108(40)	123(47)	<0.006	38(42)	51(55)	0.001	53(45)	7(6)	0.433	17(29)	25(40)	0.016
Late stage	67(25)	81(31)		13(14)	28(30)		41(34)	47(44)		13(22)	22(35)	
Don't know	94(35)	59(22)		40(44)	14(15)		25(21)	31(29)		29(49)	15(24)	

Table III. *Knowledge of risk, causes and treatment for breast cancer*

Knowledge statement	Pre, *n* (%)	Post, *n* (%)	*P*-value	Kapsokwony, *n* = 184 Pre, *n* (%)	Kapsokwony, *n* = 184 Post, *n* (%)	*P*-value	Turbo, *n* = 227 Pre, *n* (%)	Turbo, *n* = 227 Post, *n* (%)	*P*-value	Mosoriot, *n* = 121 Pre, *n* (%)	Mosoriot, *n* = 121 Post, *n* (%)	*P*-value
Breast cancer can be cured if found early *n* = 532.												
True	255(95)	256(98)	0.253	84(92)	90(98)	0.091	113(95)	106(98)	0.450	58(98)	60(97)	1.000
False	3(1)	1(0.4)		1(1)	1(1)		2(2)	0		—	—	
Don't know	11(4)	5(2)		6(7)	1(1)		4(3)	2(2)		1(2)	2(3)	
Men and women are equally affected with breast cancer ***n* = 532**												
True	123(46)	144(55)	<0.001	37(41)	55(56)	0.001	57(48)	56(52)	0.175	29(49)	33(53)	0.734
False	99(37)	102(39)		30(33)	32(34)		45(38)	45(42)		24(41)	25(40)	
Don't know	47(11)	17(6)		24(26)	6(6)		17(14)	7(6)		6(10)	4(6)	
Major cause of breast cancer is family inheritance *n* = 530												
True	117(43)	235(89)	<0.001	40(44)	89(96)	<0.001	56(47)	99(92)	<0.001	21(36)	47(76)	<0.001
False	109(41)	20(8)		35(38)	3(3)		44(37)	6(6)		30(51)	11(18)	
Don't know	43(16)	8(3)		16(18)	1(1)		19(16)	3(3)		8(14)	4(6)	
Major cause of breast cancer is witchcraft *n* = 530												
True	15(6)	9(3)	<0.001	5(5)	4(4)	0.005	9(8)	4(4)	0.071	1(2)	1(2)	0.805
False	232(87)	249(95)		77(84)	88(96)		99(84)	101(94)		56(95)	60(97)	
Don't know	21(8)	4(2)		9(10)	0		10(8)	3(3)		2(3)	1(25)	
Major cause of breast cancer is eating wrong foods *n* = 531												
True	122(46)	125(48)	<0.001	34(38)	52(56)	0.001	61(51)	49(45)	0.012	27(46)	24(39)	0.581
False	87(32)	112(43)		32(36)	35(38)		32(27)	47(44)	0.012	23(39)	30(48)	
Don't know	59(22)	26(10)		24(27)	6(6)		26(22)	12(11)	0.012	9(15)	8(13)	
Breast feeding lowers the risk of breast cancer *n* = 532												
True	129(48)	197(75)	<0.001	35(38)	81(87)	<0.001	64(54)	84(78)	<0.001	30(51)	32(52)	0.621
False	83(31)	51(17)		29(32)	7(8)		34(29)	20(19)		20(34)	24(39)	
Don't know	57(21)	15(6)		27(30)	5(5)		21(18)	4(4)		9(15)	6(10)	
Breast cancer can be cured by herbs *n* = 532												
True	89(33)	48(18)	<0.001	13(14)	16(17)	0.092	54(45)	17(16)	<0.001	22(37)	15(24)	0.013
False	123(46)	194(74)		56(62)	66(71)		41(34)	85(79)		26(44)	43(69)	
Don't know	57(21)	21(8)		22(24)	11(12)		24(20)	6(6)		11(19)	4(6)	
Surgery spreads breast cancer and makes it worse *n* = 532												
True	129(48)	83(32)	<0.001	33(37)	26(28)	0.002	67(56)	33(31)	<0.001	29(49)	24(39)	0.378
False	100(37)	151(57)		41(46)	63(68)		36(30)	56(52)		23(39)	32(52)	
Don't know	39(15)	29(11)		16(18)	4(4)		16(13)	19(18)		7(12)	6(10)	
The best time to check for a lump is after menstrual period *n* = 530												
True	100(37)	150(57)	<0.001	32(36)	60(65)	<0.001	42(35)	49(45)	<0.254	26(44)	41(66)	0.050
False	68(25)	51(19)		19(21)	18(20)		34(29)	24(22)		15(25)	9(15)	
Don't know	100(37)	60(23)		39(43)	14(15)		43(36)	34(31)		18(31)	12(19)	
Refused				—	—		0	1(1)		—	—	

the other communities, the majority (>97%) of the women in both pre- and post-test groups agreed that breast cancer could be cured if found early. Similarly, a small proportion (2%) of women in this site believed that breast cancer is caused by witchcraft. At least one-half (51%) knew that breast feeding lowers the risk of getting breast cancer, and 45% believed that breast cancer surgery would spread the cancer and make it worse.

Discussion

Our findings show a significant improvement in the level of breast cancer knowledge following educational session held with community women during special breast cancer screening events in western Kenya. We believe that this impact was influenced by the teaching approach used, one in which participants were actively engaged in small groups. Short lecture sessions were facilitated by well-trained health professionals who utilized tailored content developed from a previous breast cancer knowledge assessment in the same population. In addition, providing participant opportunities for engaging in breast exam demonstrations using silicone breast models as well as preserving significant time for a question and answer session all may have been vital to address myths and clarify content.

Our findings may reveal that it is critical to carefully design breast cancer awareness programs that are situated in the socio-cultural environment of the targeted population. In this regard, it resonates with other research that suggests tailored content enhances the information relevance and promotes breast cancer screening [17, 18]. We believe that breast cancer programs in Kenya could utilize our findings to promote the level of breast cancer awareness across its communities. This educational approach may have significant implications for the uptake of breast cancer screening and treatment programs in a wider region.

Despite the positive impact observed from our educational sessions, we note that some items failed to show a positive impact or any significant group differences. Specifically, the item that assessed knowledge of gender as a risk factor showed a negative change in direction, with a higher number of those in the post-test group believing that breast cancer affected men and women equally. One interpretation of this finding may be that the respondents were reporting their belief that men and women who have developed breast cancer are equally affected by the disease, rather than responding to the question we intended to pose to them about the relative risk among men and women of getting the disease in the first place. Further cognitive interviewing to improve the clarity of the instrument itself is needed to better understand these findings. In the meantime, breast cancer awareness programs need to underscore the fact that women are disproportionately at a higher risk of breast cancer compared to men. This is critical in the efforts to promote early detection of breast cancer among the higher-risk gender group, especially in such a resource-scarce environment where the capacity to provide regular breast cancer screening may be limited. Items that did not show any significant group differences emerged when we stratified our findings by location of events. Our educational sessions had the least impact on women from the Mosoriot community where only one health care professional was present. On the other hand, the greatest positive impact was observed in the site (Kapsokwony) that had a more comprehensive team including a physician, nurse and behavioral scientist. Ensuring that broad and inclusive team of trained health care professionals facilitates breast cancer awareness sessions may be fundamental to addressing knowledge gaps from both a clinical and socio-behavioral perspective.

It is noteworthy that more than a quarter of women in both groups mistakenly believed that having a pain in the breast and a lump in the armpit were early signs of breast cancer. Even though the educational sessions had a positive impact on responses to these items, even after exposure to education something more than a trivial proportion of women still associated onset of breast cancer with pain and abnormal changes in their breasts, generally symptoms and signs of late-stage breast cancer. These findings support previous

evidence that women in Kenya generally seek treatment at advanced stage breast cancer [10, 19]. Unfortunately, late presentation to care has important implications on the effectiveness of breast cancer treatment. It was therefore not surprising that the majority of the women in the pre-test group believed that breast cancer surgery results promote cancer metastasis. On the other hand, it was encouraging to note that the majority of community women coming to screening did not associate breast cancer with witchcraft. Continuous and effective breast cancer awareness programs that fully engage targeted communities should be fostered to demystify myths and promote correct breast cancer knowledge.

From our study, it was evident that the majority of women had not previously undergone breast cancer screening, highlighting the need for decentralized screening programs that reach a wider population of women in Kenya. Integration of breast cancer screening into routine primary care may go a long way in promoting screening uptake. This could be coupled with training on self-breast exam as a measure to enhance breast health self-awareness as well as screening for early detection and treatment of breast cancer. Even though controversies over the value of breast self-examination persist, we believe that in a community challenged with low awareness level, inadequate programs and an impoverished health infrastructure, a combination of self- and annual-clinical breast exams may be the best option for our environment in western Kenya. It has been shown that educational interventions and utilization of strategies such as breast self-examination and clinical breast examination are more likely to promote higher mammography screening [20–22], essentially the only screening modality that has been thought to reduce mortality from breast cancer. We eagerly await the availability of mammography for the women of Western Kenya.

As the Ministry of Health in Kenya gradually invests in breast cancer screening and treatment programs, annual mammography may become increasingly available to women across communities in Kenya. Strategies to raise community consciousness about breast cancer may utilize our study findings to develop tailored awareness programs for this region. In addition, health care professionals at the community level will require extensive training to provide breast cancer screening services. They will also need skills on effective community awareness approaches to accurately communicate breast cancer messages. Our study presents an educational approach that has demonstrated a positive impact on breast cancer knowledge and could be adopted to enhance the skills of these health care professionals. Finally, efforts to make breast cancer treatment accessible and affordable remain critical to ensure that women who screen positive for breast abnormalities receive timely treatment and care.

Our study has a number of strengths. This is the first study in Kenya that assesses the impact of an education tool on breast cancer knowledge. It provides a snapshot of specific knowledge gaps and approaches to enhancing breast cancer awareness. Our study is not without limitations. The educational sessions targeted community women who presented themselves for breast cancer screening. We believe that this group of women may be significantly different from those who did not attend the screening events, and hence our findings may not be representative of community women in this region. Our test of knowledge questionnaire needs further cognitive interviewing to test understandability of the instrument before it is ready for general use and re-use in our populations to be certain that the two items that may have been misunderstood are revised to assure clarity.

In conclusion, our study provides evidence of effective educational strategies that were carefully tailored for communities in Kenya. Incorporating approaches that fully engage these women was critical to the success of our educational session. Our findings provide important insight on breast cancer knowledge gaps across different sites, some of which still persisted even after our awareness efforts. Breast cancer programs in Kenya could utilize our findings to promote the level of breast cancer awareness and promote timely breast cancer screening and treatment uptake.

Acknowledgements

The authors acknowledge the Walther Cancer Foundation and the AMPATH-Oncology Institute (AOI) for their support of this study as well as cancer research in Kenya.

Funding

This work was supported by the Walther Cancer Foundation of Indianapolis, Indiana, USA.

Conflict of interest statement

None declared.

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