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EPIDEMIOLOGY

Factors contributing to delays in diagnosis of breast cancers in Ghana, West Africa

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Abstract
Background Late diagnoses and poor prognoses of breast cancer are common throughout Africa.
Methods To identify responsible factors, we utilized data from a population-based case–control study involving 1184 women with breast malignancies conducted in three hospitals in Accra and Kumasi, Ghana. Interviews focused on potential breast cancer risk factors as well as factors that might contribute to presentation delays. We calculated odds ratios (OR) and 95% confidence intervals (CI) comparing malignances with biopsy masses larger than 5 cm. (62.4% of the 1027 cases with measurable lesions) to smaller lesions.
Results In multivariate analyses, strong predictors of larger masses were limited education (OR 1.96, 95% CI 1.32–2.90 <primary vs. ≥senior secondary school), being separated/divorced or widowed (1.75, 1.18–2.60 and 2.25, 1.43–3.55, respectively, vs. currently married), delay in care seeking after onset of symptoms (2.64, 1.77–3.95 for ≥12 vs. ≤2 months), care having initially been sought from someone other than a doctor/nurse (1.86, 0.85–4.09), and frequent use of herbal medications/treatment (1.51, 0.95–2.43 for ≥3*x*/day usage vs. none). Particularly high risks associated with these factors were found among less educated women; for example, women with less than junior secondary schooling who delayed seeking care for breast symptoms for 6 months or longer were at nearly 4-times the risk of more educated women who promptly sought assistance.
Conclusions Our findings suggest that additional communication, particularly among less educated women, could promote earlier breast cancer diagnoses. Involvement of individuals other than medical practitioners, including traditional healers, may be helpful in this process.

Keywords Breast cancer · Epidemiology · Diagnosis delays · Africa

Introduction

Breast cancer is becoming an increasing public health issue in Africa, with many more diagnoses anticipated in the coming years, particularly among younger women [1]. As compared with western countries, it is much more common for tumors to be diagnosed at advanced stages [2]. To some extent this reflects the absence of screening in most African countries [3, 4], but other contributory factors are less well defined. Given the importance of early diagnosis and associated treatments to cancer prognosis, it is important to define in more detail factors that might delay disease presentation.

Studies have suggested that a variety of factors might underlie the propensity of women to delay seeking care, including being poorly educated [5, 6], specifically about the causes and treatments of breast cancer. Several studies have demonstrated that distance that women live from health care facilities may have an impact on their

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presenting for timely treatment [5, 7]. Social support factors may affect prompt medical attention for breast masses, with at least one study showing later presentation of disease among single women [8]. Fear of surgery and financial impediments to receiving care are additional barriers that affect timely treatment of breast lesions [6]. In addition, in a number of African countries, it is common for women to avail themselves of traditional treatment prior to seeking western medicine, which can result in diagnosis delays [5, 9].

A number of studies have assessed factors affecting presentation of breast cancers in Africa, but most have involved small series of patients, collection of non-structured information, and/or limited data on possible contributory factors. We therefore took advantage of data collected within the context of a large case–control study in Ghana to further address a variety of possible contributors. Analyses were facilitated by a large number of breast cancers diagnosed in two different geographic locales (Accra and Kumasi), the collection of extensive information on various factors that could contribute to presentation delays, information on when symptoms of breast cancer were first noticed in relation to medical care attention, and patterns of care seeking from both traditional practitioners as well as western medical providers. Analyses considered how these various factors contributed individually as well as after mutual adjustment of all identified predictors.

Methods

The present investigation was enabled by a multi-disciplinary population-based case–control study of breast cancer in two areas of Ghana: Accra and Kumasi, the methodology of which is described in more detail elsewhere [10]. In brief, patients for the study were recruited at the time they presented with lesions suspicious of breast cancer at three hospitals: Korle Bu Teaching Hospital in Accra and the two hospitals Komfo Anoyke Teaching Hospital and Peace and Love Hospital in Kumasi. These three hospitals are the primary hospitals providing surgical and treatment options for breast cancer in Ghana, and thus the eligible cases represent the vast majority of diagnosed cases in the country. Cases for this study comprised women aged 18–74 years who were from defined catchment areas (chosen to be within restricted travel times from the study hospitals given that the study also involved the recruitment of population controls from their homes) who were subsequently diagnosed with pathologically confirmed breast cancers.

All study subjects (including population controls enrolled in the study) were interviewed in person via a detailed questionnaire that focused on established breast cancer risk factors (demographic factors, menstrual and reproductive characteristics, family history of breast cancer, medical history, occupational history, anthropometric and physical activity variables) as well as on other factors that could result in presentation delays. This included from whom they usually sought health care, how often they visited these facilities, types of traditional medications used, travel time from their home to where they sought health care, and difficulties or hardships they faced when seeking health care. For the women recruited as possible breast cancer cases, additional questions were asked regarding when they first noticed a breast problem, the type of problems, when they first sought help, and who they first saw for help or treatment.

Interviews were conducted in-hospital by standardly trained personnel, who recorded answers to questions on detailed questionnaires. Following the interview, interviewers were requested to record the length of the interview and rate the patient's extent of cooperation (very good, good, fair, poor) as well as the overall quality of the interview (high quality, generally reliable, questionable, unsatisfactory).

Core biopsy material obtained from women prior to treatment was prepared as H&E slides to enable pathologists in Ghana to assign histopathologic diagnoses. At the time of biopsy, data were recorded by nurses and physicians on the presenting symptoms, number of lumps/masses present, and the approximate size of the lumps/masses from which biopsies were obtained. Data from medical records were also abstracted onto case abstract forms to capture information on additional clinical parameters of interest, including size of the mass at presentation, cancer stage and grade, and extent of metastases (if relevant).

Odds ratios (OR) and 95% confidence intervals (CI) were calculated for larger (>5 cm) versus smaller (≤5 cm) tumors as related to a variety of potential factors that could contribute to presentation delays. Initially, all factors were considered individually, after adjustment for study site and age (as a continuous variable). Multivariate models enabled simultaneous adjustment for factors that had shown significant associations in minimally adjusted models. In order to identify subjects at highest risks of presenting with larger tumors, risks were also calculated using a common referent, notably more highly educated women who were at lowest risk in terms of other risk predictors (e.g., those who sought prompt medical attention for breast symptoms).

Results

A majority of the 1184 patients diagnosed with malignant breast cancers were under 50 years of age, with the median age at diagnosis being 49 years (Table 1). A total of 1027

Table 1 Demographic and clinical manifestations of diagnosed malignancies, Ghana Health Breast Study

	All Sites ($N = 1184$)	%
Age at diagnosis (years)[a]		
<40	246	20.8
40–44	158	13.3
45–49	188	15.9
50–54	167	14.1
55–59	150	12.7
60–64	113	9.5
65–69	63	5.3
≥70	95	8.0
Unknown	4	0.3
Size of tumor as assessed at the time of biopsy		
≤2 cm	39	3.3
>2–5 cm	347	29.3
>5 cm	641	54.1
No palpable lump	4	0.3
Unknown	153	12.9
Symptom upon presentation[b]		
Lump or mass	1047	88.4
Pain or tenderness	131	11.1
Change in breast size	130	11.0
Skin dimpling	84	7.1
Skin ulceration or rash	70	5.9
Nipple discharge	26	2.2
Infection	20	1.7
Other symptom	6	0.5

[a] Median age was 49 years

[b] Symptoms are not mutually exclusive

of the patients (86.7%) had measurable masses at the time of their biopsies, with 157 (13.3%) showing either no palpable lump ($n = 4$) or having missing data on tumor size ($n = 153$). Of those cases with measurable tumor sizes, 39 (3.8%) had tumors ≤2 cm, 347 (33.8%) had tumors >2–5 cm, and 641 had (62.4%) tumors >5 cm in size. The presenting symptom in almost all cases was a lump or mass, although some patients also presented with pain or tenderness or change in breast size. Other symptoms (e.g., skin dimpling, skin ulcerations, or rashes) were less commonly represented.

In analyses to identify risk factors related to presentation of larger (>5 cm) compared to smaller (≤5 cm) tumors, we utilized data from completed questionnaires (obtained from 99.1% of eligible cases) and initially focused on a variety of socio-demographic factors, adjusted only for study site and age (Table 2). One of the major predictors of risk was low education, with subjects having no formal education or merely some primary school having an OR of 2.11 (95% CI 1.47–3.04) compared to those with senior secondary/vocational/university education. As compared with currently married women, elevated ORs were observed for divorced/separated or widowed women, risks that remained significant even after adjustment for education (respective ORs and 95% CI of 1.70, 1.18–2.46 and 2.14, 1.40–3.27). Single patients were not at increased risk. Although prior to adjustment for education, a number of factors were associated with significantly increased risks of presentation with larger tumors—including not owning a television, car, truck, refrigerator, or computer—most of these factors no longer remained significantly associated with risk after adjustment for education.

A variety of medical factors were also assessed in relation to tumor sizes at presentation (Table 3). After adjustment for education, significant predictors of larger tumor masses included reporting long periods of time before care was sought after the onset of breast symptoms (OR 1.81, 1.24–2.65 for 12 months or longer vs. 2 months or less) and seeking assistance from someone other than a doctor or nurse for breast symptoms (2.65, 1.31–5.40). Ever having seen a traditional healer and visiting a traditional healer more than once a year were only marginally associated with increased risk (risk increases of approximately 30%), but subjects who reported using traditional medications or treatments for 3 or more times per day were at a significantly increased risk (OR 1.67, 1.07–2.62). Whether usual care was received from a doctor or nurse versus some other provider, frequency of visits to a doctor or nurse, travel times to get to a health facility, and reported financial or other difficulties in seeking health care were not substantially related to risk, either before or after adjustment for education.

When we simultaneously adjusted for all substantial predictors of larger masses (Table 4), the factors that remained significantly associated with presentation of large masses were limited education, being divorced/separated/widowed, and having delayed seeking treatment after the onset of breast symptoms. The reporting of help for breast symptoms by someone other than a doctor or nurse and frequent use of traditional medications or treatments remained elevated, although became non-significant after adjustment for other identified risk factors.

We conducted additional multivariate analyses of predictors of large masses according to subgroups defined on the basis of study site (Accra vs. Kumasi) and age at diagnosis (<50 vs. ≥50 years). For the most part, our identified predictors of larger masses prevailed across all subgroups, including patients diagnosed in both the predominantly urban Accra and the more rural site of Kumasi, and in younger versus older subjects (Table 5).

Finally, we assessed risks of presentation with larger tumors, comparing all risks to the more highly educated

Table 2 Odds ratios for presentation with larger mass sizes by socio-demographic factors

	Mass ≤ 5 cm (N = 386)	Mass > 5 cm (N = 641)	Adjusted for study site and age		Adjusted further for education	
			OR	95% CI	OR	95% CI
Highest level of education						
Senior secondary/vocational/university	154	182	1.00	Referent		
Junior secondary school	106	142	1.32	0.93–1.87		
Primary school	41	104	2.31	1.51–3.54		
No formal education/some primary school	70	162	2.11	1.47–3.04		
Unknown	15	51	2.91	1.57–5.40		
Marital status						
Married or living with partner	228	308	1.00	Referent	1.00	Referent
Divorced or separated	62	125	1.65	1.15–2.37	1.70	1.18–2.46
Widowed	49	120	2.16	1.42–3.28	2.14	1.40–3.27
Single or never married	32	44	0.92	0.55–1.53	1.04	0.62–1.73
Unknown	15	44	2.22	1.19–4.13	Not estimable	
Religion						
Christian	334	517	1.00	Referent	1.00	Referent
Muslim/Islam	37	70	0.80	0.52–1.22	0.99	0.63–1.56
Traditionalist/no religion/unknown	15	54	1.79	0.88–3.64	2.16	0.53–8.87
Own a television						
Yes	345	519	1.00	Referent	1.00	Referent
No	26	69	1.92	1.19–3.09	1.56	0.96–2.55
Unknown	15	53	2.27	1.25–4.12	2.23	0.54–9.23
Own a car or truck						
Yes	154	200	1.00	Referent	1.00	Referent
No	217	388	1.42	1.08–1.86	1.25	0.94–1.65
Unknown	15	53	2.65	1.43–4.90	2.47	0.60–10.25
Own a refrigerator						
Yes	324	455	1.00	Referent	1.00	Referent
No	47	132	2.08	1.44–2.99	1.73	1.18–2.54
Unknown	15	54	2.45	1.35–4.44	2.82	0.67–11.91
Own a computer						
Yes	141	196	1.00	Referent	1.00	Referent
No	229	389	1.22	0.93–1.60	0.99	0.74–1.33
Unknown	16	56	2.37	1.30–4.33	1.98	0.55–7.07

patients who had lower risk profiles (e.g., currently married) (Table 6). This demonstrated exceptionally high risks for less educated women who were divorced, separated or widowed (OR 4.03, 95% CI 2.50–6.49) or single (5.98, 1.32–27.07), were taking traditional medications three or more times per day (5.35, 2.94–12.05), or who delayed seeking treatment for 6 or more months (3.80, 2.37–6.10)—risks that were much higher than women with higher levels of education with comparable risk profiles. There was less distinction according to education by whether care was initially sought for breast cancer symptoms from someone other than a doctor or nurse, with both more and less educated women at significantly high risks (respective risks of 2.92 vs. 3.75).

Discussion

In this study, we identified a number of parameters that were associated with presentation of larger breast masses. Many of the variables identified in initial analyses (e.g., absence of a computer or car) appeared to primarily be reflections of limited levels of education, which was a significant predictor in multivariate analyses. In addition to low educational levels, we also identified that not currently being married, regularly taking herbal medications, not seeking prompt attention for breast problems, and seeking medical care from someone other than a doctor or nurse were related to diagnoses of larger breast cancers.

Table 3 Odds ratios for presentation with larger mass sizes by medical factors

	Mass ≤ 5 cm (N = 386)	Mass > 5 cm (N = 641)	Adjusted for study site and age		Adjusted further for education	
			OR	95% CI	OR	95% CI
Individual from whom help is sought for illness						
Doctor/nurse in government setting	221	361	1.00	Referent	1.00	Referent
Doctor/nurse in another setting	121	162	0.80	0.60–1.08	0.85	0.63–1.15
Traditional healer	6	6	0.56	0.18–1.77	0.48	0.15–1.53
Do not seek help	8	8	0.55	0.20–1.49	0.50	0.18–1.39
Other/unknown	30	104	1.90	1.21–2.98	1.75	0.99–3.11
Frequency of doctor or nurse visits						
≤1 time a year	97	180	1.00	Referent	1.00	Referent
Twice a year	63	97	0.79	0.53–1.19	0.78	0.52–1.18
More than twice a year but less than once a month	88	106	0.61	0.42–0.90	0.59	0.40–0.86
Once a month or more	73	107	0.77	0.51–1.15	0.72	0.48–1.08
Unknown	65	151	1.09	0.73–1.63	0.85	0.54–1.32
Ever see a traditional healer						
No	282	436	1.00	Referent	1.00	Referent
Yes	93	192	1.34	0.99–1.81	1.28	0.95–1.74
Unknown	11	13	0.69	0.30–1.57	0.65	0.28–1.50
Frequency of traditional healer visits						
Never	282	436	1.00	Referent	1.00	Referent
≤1 time a year	32	51	1.09	0.68–1.75	1.17	0.73–1.89
>1 time a year	54	110	1.31	0.90–1.91	1.30	0.89–1.90
Unknown	18	44	1.46	0.82–2.61	1.05	0.56–1.96
Ever take any traditional medications or treatments						
No	113	170	1.00	Referent	1.00	Referent
Yes	245	404	1.18	0.88–1.58	1.16	0.87–1.56
Unknown	28	67	1.55	0.94–2.57	0.90	0.44–1.85
Frequency of use of traditional medications or treatments						
Never	113	167	1.00	Referent	1.00	Referent
At least one lifetime use but less than monthly	54	72	1.02	0.66–1.57	1.08	0.70–1.67
At least once a month but less than daily	28	49	1.27	0.75–2.15	1.25	0.73–2.13
Once a day	28	37	0.99	0.57–1.72	0.99	0.56–1.73
Twice a day	89	144	1.18	0.82–1.70	1.13	0.78–1.64
≥3 times a day	41	101	1.69	1.09–2.63	1.67	1.07–2.62
Unknown	33	71	1.41	0.87–2.28	0.76	0.40–1.47
Travel time from home to health care						
<30 min	123	187	1.00	Referent	1.00	Referent
30 min	104	164	1.08	0.77–1.52	1.06	0.75–1.49
31–60 min	117	201	1.19	0.86–1.64	1.15	0.83–1.60
>60 min	26	53	1.34	0.79–2.28	1.31	0.76–2.24
Unknown	16	36	1.29	0.68–2.45	1.14	0.60–2.19
Difficulties affecting access to health care[a]						
No difficulties	242	357	1.00	Referent	1.00	Referent
Cost	99	194	1.35	0.99–1.84	1.17	0.85–1.61
Distance/transportation	5	10	1.27	0.42–3.85	1.22	0.40–3.77
Time away from family/work	13	11	0.67	0.29–1.53	0.72	0.31–1.68
Other reasons[b]	8	16	1.38	0.58–3.30	1.50	0.62–3.64
Unknown	19	53	1.85	1.06–3.24	0.91	0.32–2.55

Table 3 continued

	Mass ≤ 5 cm (N = 386)	Mass > 5 cm (N = 641)	Adjusted for study site and age		Adjusted further for education	
			OR	95% CI	OR	95% CI
Time between onset of symptoms and when care sought						
2 months or less	230	383	1.00	Referent	1.00	Referent
3–5 months	62	117	1.51	1.06–2.16	1.52	1.06–2.18
6–11 months	41	120	2.36	1.59–3.52	2.21	1.48–3.31
12 months or longer	52	122	1.92	1.32–2.79	1.81	1.24–2.65
Unknown	1	0	0.00			
From whom care initially sought for breast cancer symptoms						
Doctor/nurse	376	593	1.00	Referent	1.00	Referent
Other or unknown	10	48	2.99	1.49–6.01	2.65	1.31–5.40

[a] Difficulties hierarchically classified according to order shown

[b] Includes fear of doctors/hospitals ($n = 10$), too sick to travel ($n = 9$), confidentiality concerns ($n = 2$), lack of motivation ($n = 1$), delays at the hospital ($n = 1$), and unstated reason ($n = 1$)

Similar to many other investigations [5, 6, 8, 11], we found that limited education was a major predictor of late breast cancer presentation, most likely reflecting a lack of awareness regarding signs and symptoms of cancer, as has been documented for most African countries [11, 12], including Ghana [13]. A survey from the Union for International Cancer Control (UICC) showed that approximately 25% of Africans surveyed believed that cancer had no cure, and only 36% believed cancer was a major health issue [14]. In a low-resource community in South Africa, over 80% of the women were unaware of the warning signs of breast cancer, with lack of knowledge being more common among older and rural women [15]. It is common in Africa that there are also a variety of misconceptions about the disease, with some women believing that the disease is caused by a spiritual affliction [6], and others under the impression that breast cancer is preventable by vaccination, with only limited proportions recognizing the efficacy of breast examination [16].

Thus, education is clearly an important component of breast cancer prevention, with our study, as well as others, stressing the importance of focusing on less well educated women to provide them with knowledge regarding the causes of breast cancer and the importance of timely treatment. Women should be encouraged to become familiar with their breasts and seek medical attention at the first sign or unusual symptoms. Targeted efforts among less well educated women appear especially important, as evidenced by data from a Nigerian study that found that participants with higher education were 3.6 times more likely to practice breast self-examination (BSE) than those with lower education levels [12]. Our study confirmed the importance of targeted communication efforts given that we found that poorly educated women who delayed seeking treatment were at nearly 4 times the risk of better educated women who sought timely treatment. Further, effective communication may need to account for addressing issues in easy-to-understand terms and in local dialects that are easily understood [17].

Although limited education clearly impedes women from seeking timely medical assistance for their breast problems, this was not the sole explanation for delays, as both limited education and time between problems emerging and seeking treatment remained as independent predictors of risk in our study. In many African countries, women believe that a diagnosis of breast cancer is a death sentence, mainly because their only experience with the disease is through friends and relatives who have sought medical help when it is too late for treatment to be effective [6]. Costs of care [18] or lack of awareness of health care coverage [19] can also be impediments to women seeking medical care especially since costs of a biopsy, pathology, surgery, radiotherapy, and chemotherapy often need to be covered by the patients. Finally, there are reports that women avoid medical care because of a fear of mastectomy [8, 20], especially given documented instances of husbands leaving their wives after such procedures [21].

Given some evidence that married women avoid medical care because of a fear that their husbands might leave them after a diagnosis of breast cancer, it was somewhat surprising that we found that being widowed, divorced, or separated was associated with a greater risk of late presentation as compared to being currently married. Other studies have found that single women tend to delay presentation [8], a factor in our study that only increased late presentation among poorly educated women. In aggregate,

Table 4 Multivariate adjusted odds ratios for presentation with larger mass sizes

	Mass ≤ 5 cm ($N = 386$)	Mass > 5 cm ($N = 641$)	OR[a]	95% CI
Highest level of education				
Senior secondary/vocational/university	154	182	1.00	Referent
Junior secondary	106	142	1.30	0.89–1.88
Primary school	41	104	2.20	1.39–3.47
No formal education/some primary school	70	162	1.96	1.32–2.90
Marital status				
Married or living with partner	228	308	1.00	Referent
Divorced or separated	62	125	1.75	1.18–2.60
Widowed	49	120	2.25	1.43–3.55
Single or never married	32	44	1.04	0.59–1.84
Frequency of use of traditional medications or treatments				
Never	113	167	1.00	Referent
At least one lifetime use but less than monthly	54	72	1.04	0.66–1.63
At least once a month but less than daily	28	49	1.15	0.66–2.00
Once a day	28	37	0.95	0.53–1.69
Twice a day	89	144	1.05	0.71–1.53
≥3 times a day	41	101	1.51	0.95–2.43
Time between onset of symptoms and when care sought				
2 months or less	230	282	1.00	Referent
3–5 months	62	117	1.78	1.20–2.62
6–11 months	41	120	3.38	2.24–5.11
12 months or longer	52	122	2.64	1.77–3.95
From whom care initially sought for breast cancer symptoms				
Doctor or nurse	376	593	1.00	Referent
Other or unknown	10	48	1.86	0.85–4.09

[a] Odds ratios were adjusted for all factors shown. Unknowns were included in models but risks are not shown

our findings suggest the importance of family support in contributing to a timely diagnosis of breast cancer, consistent with results from another investigation [22]. However, we could not determine which aspect of family support might be most important in the process. It is likely that married women would have daughters who might be more informed about breast cancer and that daughters might be more important in the process than husbands. Further research would be useful to determine what support systems might be most useful in promoting earlier diagnoses.

It is well documented in Africa that effective treatment can be hindered by women initially seeking care from traditional healers or alternative practitioners [5, 23–26]. Our study provided further some support for this notion by showing a non-significantly increased risk associated with women reporting use of 3 or more herbal treatments per day. Studies have documented that use of traditional healers is linked with substantial delays in patients presenting to hospitals [24, 27]. It is not unusual for women to initially seek care through a traditional healer, with care sought from hospitals only after traditional care has been unsuccessful [11]. To overcome this problem, it has been recommended that traditional healers be integrated appropriately into hospital settings to accommodate cultural preferences and beliefs [28].

Not surprisingly, we found that delaying attention for breast symptoms was independently associated with larger tumors at diagnosis. Given the attenuation in risks after adjustment for educational level, some of this association may have been due to lack of knowledge of the importance of early diagnoses. However, the fact that the association with delays persisted after adjustment for other predictors of late diagnosis suggested that other factors might have contributed, including some of the social factors previously discussed.

Dissimilar to one previous investigation [7], we did not identify that longer distances from a health facility was a significant predictor of larger breast masses. This may reflect that, for logistical reasons related to recruitment of

Table 5 Multivariate adjusted odds ratios for presentation with larger mass sizes, stratified by study site and age at diagnosis

	Study site				Age at diagnosis			
	Accra		Kumasi		<50 years		≥50 years	
	OR[a]	95% CI	OR[a]	95% CI	OR[a]	95% CI	OR[a]	95% CI
Highest level of education								
Senior secondary/vocational/university	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
Junior secondary	2.09	0.84–5.20	1.07	0.71–1.60	1.38	0.82–2.32	1.17	0.67–2.05
Primary school	3.98	1.25–12.68	1.89	1.14–3.14	1.90	1.03–3.49	2.79	1.32–5.91
No formal education/some primary school	1.69	0.72–3.97	1.87	1.20–2.91	2.58	1.39–4.77	1.59	0.94–2.69
Marital status								
Married or living with partner	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
Divorced or separated	1.66	0.66–4.15	1.74	1.12–2.69	2.62	1.37–5.02	1.43	0.85–2.41
Widowed	2.64	1.04–6.70	2.12	1.25–3.59	4.16	1.13–15.36	1.92	1.14–3.25
Single or never married	0.81	0.26–2.57	1.05	0.54–2.01	0.87	0.45–1.67	2.63	0.48–14.27
Frequency of use of traditional medication or treatment								
Never	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
At least one lifetime use but less than monthly	0.91	0.22–3.74	0.98	0.60–1.59	1.01	0.53–1.95	1.10	0.58–2.11
At least once per month but less than daily	2.53	0.47–13.63	1.03	0.56–1.87	1.13	0.52–2.46	1.14	0.51–2.54
Once a day	1.11	0.35–3.56	0.82	0.42–1.60	1.06	0.46–2.45	0.81	0.35–1.88
Twice a day	1.39	0.60–3.20	0.92	0.59–1.41	1.08	0.63–1.86	0.94	0.54–1.66
≥3 times a day	1.62	0.68–3.86	1.43	0.82–2.49	1.16	0.59–2.31	1.88	0.95–3.72
Time between onset of symptoms and when care sought								
2 months or less	1.00	Referent	1.00	Referent	1.00	Referent	1.00	Referent
3–5 months	1.60	0.71–3.62	1.88	1.21–2.93	2.13	1.19–3.81	1.53	0.90–2.63
6–11 months	3.98	1.56–10.18	3.35	2.10–5.34	3.79	2.13–6.77	3.11	1.68–5.76
12 months or longer	3.11	1.31–7.38	2.47	1.56–3.90	3.44	1.91–6.19	2.21	1.24–3.92
From whom care initially sought for breast cancer symptoms								
Doctor or nurse	1.00	referent	1.00	Referent	1.00	Referent	1.00	Referent
Other or unknown	2.32	0.25–21.31	1.96	0.85–4.56	2.05	0.70–5.96	1.58	0.47–5.33

[a] ORs were adjusted for all factors shown

Table 6 Multivariate adjusted odds ratios for presentation with larger mass sizes (>5 vs. ≤5 cm.), with risks related to a common referent of high education and low risk for additional parameters

	≥Junior secondary school		<Junior secondary school	
	OR[a]	95% CI	OR[a]	95% CI
Marital status				
Married or living with a partner	1.00	Referent	1.49	1.04–2.14
Divorced, separated, or widowed	1.56	1.06–2.28	4.03	2.50–6.49
Single or never married	0.73	0.41–1.29	5.98	1.32–27.07
Frequency of traditional medication use				
Never	1.00	Referent	1.83	1.09–3.05
Up to twice a day	1.14	0.78–1.67	1.91	1.25–2.94
≥3 times a day	1.28	0.74–2.20	5.35	2.94–12.05
Time between onset of symptoms and when care sought				
2 months or less	1.00	Referent	1.80	1.22–2.64
3–5 months	1.41	0.90–2.21	2.88	1.58–5.24
6 months or longer	1.86	1.25–2.75	3.80	2.37–6.10
From whom care initially sought for breast cancer symptoms				
Doctor or nurse	1.00	Referent	1.97	1.48–2.62
Other or unknown	2.92	1.06–8.01	3.75	1.24–11.33

[a] ORs were adjusted for study site and age

population controls in our study, we restricted the catchment area of cases to areas around the study hospitals. With restricted travel times, we did note a slightly higher risk of presentation with large tumors for subjects who needed to travel the longest distances to our study hospitals, but this association appeared to reflect an influence of limited education—with the relation disappearing after adjustment for this factor.

Given the documented rise in the number of breast cancers across Africa and the fact that treatment options are limited for late stage tumors, it is clear that further efforts must be made to stress the importance of early diagnosis. The social issues underlying educating and encouraging prompt medical attention are, however, complex, and intertwined with long-held beliefs about the origins of the disease and the most effective ways of approaching treatment [17]. Changing these beliefs will be challenging, and will involve not only the patient but her immediate family—especially given fiscal constraints involved with diagnoses and treatment. The lack of screening facilities has been viewed as a major impediment to earlier detection of breast cancers in Africa, but at least one study has concluded that dealing with the causes of delayed presentation appears more important than attempts to screen for breast cancer, since patients identified through community screening still present late [20]. Although future translational efforts will be challenging, our study has identified some of the factors that may be contributing to late presentation of disease, which may be useful in addressing impediments to early detection of diseases—which is critical to imparting effective treatments.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study does not contain any animal participants.

Informed consent Informed consent was obtained from all individual participants included in the study.

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