

# Clinical and Epidemiologic Profile of Breast Cancer in Tanzania

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**Abstract.** *Purpose:* Breast cancer is a highly heterogeneous disease globally. Public health prevention measures require an understanding of the burden of breast cancer and its risk factors. The purpose of this study was to describe the clinical, pathologic, and epidemiologic characteristics of breast cancer patients in Tanzania.

*Methods:* Data was abstracted from the medical records of all breast cancer patients attending Ocean Road Cancer Institute (ORCI) over a 2-year period from July 2007 to June 2009. Tumor tissue paraffin blocks were collected for all patients with available tissues for the determination of estrogen receptor (ER) and progesterone receptor (PR). Data for all patients was analyzed descriptively and by using unconditional logistic regression, by comparing early stage (ES), defined as stages I and II and late stage (LS), defined as stages III and IV patients to obtain odds ratios (ORs), 95% confidence intervals (CIs), and *P*-values.

*Results:* Among the 488 patients, stage was determined for 356 patients, 90.7% of whom presented in LS. Of the 57 tumor tissues, 49.1% were ER-/PR-. Patients with ulceration (OR = 4.97; 95% CI = 1.07, 23.04; *p* = 0.04) and peau d'orange (OR = 6.78; 95% CI = 1.48, 31.17; *p* = 0.01) were more likely to present in LS rather than ES. Male breast cancer accounted for 2.9% of all breast cancers and inflammatory breast cancer (IBC) comprised 4.3–5.5% of cases based on registered t4d diagnosis or the criteria of IBC signs, if t4d was not reported in the medical records.

*Conclusion:* Most breast cancer patients in Tanzania are diagnosed at advanced disease stages with about half of the tumors being ER-/PR-. These data strongly support that reducing barriers to care, down-staging of disease at diagnosis, implementation of clinical guidelines for management of advanced cases, and palliative care are the four most essential factors that need to be addressed to reduce morbidity and mortality from breast cancer in Tanzania. Further research is needed to quantify the magnitude and molecular features of two relatively rare forms of breast cancer that may account for a greater proportion of the burden of breast cancer in Tanzania compared to the USA and Western Europe: male breast cancer and IBC.

**Keywords:** Breast cancer, epidemiology, Tanzania, Sub-Saharan Africa, male breast cancer, inflammatory breast cancer

**Abbreviations:** early stage (ES); late stage (LS); inflammatory breast cancer (IBC); Ocean Road Cancer Institute (ORCI); Muhimbili National Hospital (MNH); estrogen receptor (ER); progesterone receptor (PR); hematoxylin and eosin (H&E); body mass index (BMI); odds ratio (OR); 95% confidence interval (95% CI); male breast cancer (MBC)

## INTRODUCTION

Breast cancer is the most common incident cancer among women worldwide with more than 1 million new cases diagnosed every year [1]. Breast cancer varies across the world between races and regions [2,3]. In

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the U.S., African Americans have lower incidence rates but higher mortality than Whites [2], a pattern attributed to a higher aggressiveness of disease [4] and socioeconomic disparities [4,5] among African Americans. African American women also have higher incidence rate of more aggressive forms of breast cancer, such as inflammatory breast cancer (IBC) than Whites [6]. Within Africa, in spite of the low incidence of breast cancer, the mortality from this disease continues to be extremely high with survival much below that seen in other parts of the world [7], which coupled to a paucity of palliative care, renders breast cancer a large public health and humanitarian burden. African countries have few good cancer registries, which depict a diverse picture of breast cancer within the continent, with different countries having different rates of breast cancer [8]. Notably, North African countries have moderate incidence rates of breast cancer, while in the few sub-Saharan African countries where some data are available, bear low incidence and high mortality rates from breast cancer.

In the past 2 decades, little has been reported about breast cancer in Tanzania except for a few limited-scale studies. All studies agreed on the advanced disease stage of diagnosis and advanced the possibility of a possibly high rate of male breast cancer [8–12]. Studies have suggested that up to 6.5% of all breast cancer patients in Tanzania are males, which is over 10-fold higher than the proportion seen in most other parts of the world [13].

Our studies and others have shown a higher proportion of IBC patients in populations in North Africa compared to the U.S. [14–16] and distinct molecular features of the IBC cases in North Africa [17]. However, little is known about the rate or molecular features of IBC in other parts of Africa. To begin to address this paucity of information, the purpose of this study was to determine the clinical, reproductive, and epidemiologic profiles of breast cancer among women diagnosed and treated at the largest medical centers in Dar es Salam, Tanzania – Muhimbili National Hospital (MNH) and Ocean Road Cancer Institute (ORCI). The study also aimed to determine the proportion of male breast cancer and IBC cases, as well as to assess the ER/PR status of breast tumors.

## MATERIALS AND METHODS

### *Population and setting*

This retrospective study was conducted between May 2009 and April 2010. Data was abstracted from

medical records for 488 breast cancer patients attending ORCI in Dar es Salaam, Tanzania, during the 2-year period of July 2007 through June 2009. ORCI is Tanzania's first and only cancer treatment center and offers cancer screening services, radiotherapy, chemotherapy, and palliative care. In the absence of population based registries, this institution provides an initial appraisal of the cases of breast cancer diagnosed in Tanzania. It is unknown how many cases are never diagnosed. MNH is the only major hospital for surgical and histopathologic diagnosis of breast cancer in Dar es Salaam. Often, breast cancer patients are referred to MNH for surgery and then referred to ORCI for chemotherapy or radiotherapy treatment. Patients referred to ORCI bring their MNH medical record, which is filed with their ORCI medical file. Thus, both ORCI and MNH medical files are available for data abstraction for most patients visiting both centers. The following data was abstracted from medical records: demographic (age, sex, region of residence, body mass index), reproductive (number of children, marital status, menopausal status), clinical (family history of breast cancer, duration of symptoms, laterality, recurrence, stage at presentation, mass, ulceration, pain, nipple retraction, erythema, edema, peau d'orange), diagnostic (pathologic method of diagnosis), surgical (type of surgery), and treatment variables (type of chemotherapy).

Tumor containing paraffin blocks were collected for all patients ( $n = 57$ ) with available tissues from the pathology department of MNH. The study was approved by the University of Michigan Institutional Review Board and the Ocean Road Cancer Institute in Tanzania and the data were stripped of all personal identifiers, per the approved procedures.

### *Laboratory methods*

Paraffin-embedded tumor tissues were obtained from the pathology department at MNH and cut into 4  $\mu$  slides. Four to five slides were cut from each paraffin block and one slide from each set was stained with haematoxylin and eosin (H&E). Two slides from each set were analyzed for ER/PR status.

Paraffin-embedded samples were cut to 4  $\mu$  thick and placed on positively charged slides. Slides were immunostained using the Dako Cytomation En Vision System (Dako, Carpinteria, CA). After deparaffinization, sections were rehydrated and endogenous peroxidase was blocked with 1% H<sub>2</sub>O<sub>2</sub> in methanol. After pressure induced epitope retrieval (Biocare Medical Decloaking Chamber, Concord CA; citrate buffer, pH

6.0), sections were incubated with anti-ER antibody (clone 1D5, dilution 1:100; Dako) or anti-PR antibody (clone 636, dilution 1:200; Dako) at room temperature. The reaction was visualized using the EnVision kit and 3, 3'-diaminobenzidine as chromogen, followed by light counterstaining with haematoxylin. Positive and negative controls were used in each staining run. Negative controls consisted of eliminating primary antibody and positive controls were known ER/PR positive human tumors. In a blinded fashion, the samples were read and scored by light microscopy. Each slide was scored visually and independently by two pathologists blinded to all clinicopathologic data. The intensity of staining was recorded using the Allred score (AS), a method that is semi-quantitative for the proportion of positive cells (scored on a 0 to 5 scale) and staining intensity (scored on a 0 to 3 scale), with a maximum score of 8 (AS > 2 was considered positive).

#### Data management

All pertinent information abstracted from medical records was entered into a database tailored to this project. As there was no stage information routinely collected, TNM data was used to estimate an AJCC stage [18]. For those without staging information, the AJCC stage was used to estimate the stage. For those with staging information, we compared the stage reported in the medical record with the AJCC stage that was estimated and the highest stage was used in the analysis. Menopausal status was missing for 285 (58.4%) cases. For those without data, age was used as a proxy to determine menopausal status. Those who were aged 50 years or older at time of diagnosis were included in the post-menopausal category.

#### Data analysis

All statistical analysis was conducted using SAS 9.2 (SAS, Cary, NC). Frequencies were run on variables related to demographics, clinical-pathological features, and treatment to determine their distribution overall and among early stage (ES) (Stage 1 and 2) compared to late stage (LS) (Stage 3 and 4) breast cancer cases. For 29 cases, it was determined that they were either in stage 3 or 4 but it was not possible to determine their specific stage. Thus, we included these cases wherever applicable in our analysis in the correct grouping. The differences in distribution of variables between ES and LS were examined using Mantel-Haenszel chi-square tests and Fisher's exact tests to obtain *p*-values for the

test of no-association. We also tried to identify IBC cases using TNM criteria where IBC cases are coded as T4d [18] and using the criteria we reported before [16]. The criteria include using signs of IBC – erythema, edema and peau d'orange for identification of IBC cases that are not reported in the medical records as such. Logistic regression was used to create a descending model with LS and ES presentation as outcomes. As predictors in the model we chose age and only the variables that were statistically significant in the bivariate analysis. By eliminating variables that did not affect variable estimates by more than 10% we created the most parsimonious descending model. We have reported the adjusted odds ratio (OR), 95% confidence interval (95% CI), and *p*-values that were obtained.

## RESULTS

A total of 488 breast cancer cases were identified over a period of two years from 2007–2009 with a mean age of 43.4 ( $\pm$  13.3) years (Table 1). Among the 356 cases for whom we could determine stage, 33 (9.3%) were in ES with a mean age of 45.3 ( $\pm$  13.3 years) while 323 (90.7%) were in LS with a mean age of 49.8 ( $\pm$  13.0 years). All male cases of breast cancer (2.9%) presented in LS and majority of female cases in ES were pre-menopausal (66.7%) ( $p$  = 0.046) (Table 1). Grade information was available for only 10% of the cases and ranged between grades 2–3. Type information was available on the majority of cases (350 cases) and the encountered types were: ductal (85.5%), medullary (5.1%), lobular (2.3%), mucinous (2.3%), and other types in (2.3%).

Table 2 illustrates the clinical, pathologic and clinical characteristics of patients. The mean duration of symptoms was 17.18 ( $\pm$  24.58) months. Patients in ES were more likely to have masses less than 5 cms ( $p$  < 0.001) and had a lower chance of having ulceration ( $p$  = 0.002), pain ( $p$  = 0.027), or nipple retraction ( $p$  = 0.005). Patients in ES also had a lower chance of having erythema ( $p$  = 0.025) or peau d'orange ( $p$  < 0.001) (Table 2).

Estrogen receptor (ER) and progesterone receptor (PR) information was available for only 57 patients all of whom were in the LS category (Table 3). About half the patients (49.1%) had ER-/PR- breast cancer followed by ER+/PR+ breast cancer (40.4%). Treatment characteristics were more likely to be similar between the two groups except for tamoxifen which was more commonly administered to women in ES ( $p$  = 0.003)

Table 1  
Demographic and reproductive characteristics of breast cancer in Tanzania, 2007–2009

Variables by level	Total distribution (Total <i>N</i> = 488)		Stage 1 & 2 (Total <i>N</i> = 33, 9.27%)		Stage 3 & 4 (Total <i>N</i> = 323, 90.73%)		Early vs. late stage <i>P</i> -value
	No.	%	No.	%	No.	%	
	Age at Diagnosis <sup>(474,33,315)</sup>						
Mean ± SD	49.39 ± 13.30	–	45.27±13.87	–	49.81±12.99	–	0.059 <sup>a</sup>
Range	19–100	–	24–80	–	28–100	–	
Sex <sup>(488,33,323)</sup>							
Female	474	97.13	33	100	312	96.59	0.609 <sup>b</sup>
Male	14	2.87	0	0	11	3.41	
Menopausal Status <sup>(462,33,306)</sup>							
Pre-menopausal	233	50.43	22	66.67	148	48.37	0.046 <sup>c</sup>
Post-menopausal	229	49.57	11	33.33	158	51.63	
Number of Children <sup>(387,26,271)</sup>							
Mean ± SD	4.12 ± 2.67	–	4.65 ± 3.59	–	3.99 ± 2.52	–	0.216 <sup>a</sup>
Range	0–16	–	0–15	–	0–16	–	
Marital Status <sup>(340,22,241)</sup>							
Married	221	65	15	68.18	152	63.07	0.119 <sup>c</sup>
Single	27	7.94	4	18.18	19	7.88	
Divorced/Widowed /Separated	92	27.06	3	13.64	70	29.05	
[3pt] Region <sup>(256,14,174)</sup>							
Dar es Salaam	58	22.66	3	21.43	43	24.71	0.251 <sup>c</sup>
Other	198	77.34	11	78.57	131	75.29	
Body Mass Index <sup>(235,20,163)</sup>							
Underweight	16	6.81	0	0	11	6.75	0.579 <sup>c</sup>
Normal Weight	95	40.43	9	45	70	42.95	
Overweight	62	26.38	7	35	43	26.38	
Obese	62	26.38	4	20	39	23.93	
Family History of Breast Cancer <sup>(201,9,155)</sup>							
No	184	91.54	9	100	140	90.32	0.056 <sup>c</sup>
Yes	17	8.46	0	0	15	9.68	

*a* = Student's *t*-test; *b* = Fisher's exact test; *c* = Chi-square test.

(Table 3). We also compared ES and LS cases using an unconditional logistic model (Table 4). The results depicted that patients with ulceration (OR = 4.97; 95% CI = 1.07, 23.04; *p* = 0.04) and peau d'orange (OR = 6.78; 95% CI = 1.48, 31.17; *p* = 0.01) were more likely to present in LS rather than ES.

Table 5 shows the analysis for determining the IBC in our study population. Cases reported as t4d were 4 cases (0.82%) of all female breast cancers. Most-likely IBC were 16 cases (3.28) and possible IBC (7 cases) represented 1.43% of cases. The total of the 3 groups (t4d, most-likely, and possible IBC) were 27 cases (5.53%). However, when cases with duration of illness of 18 or more months were eliminated from the IBC grouping, the number was 21 cases that were 4.3% of all female breast cancers. Most-likely IBC had all three signs of IBC – erythema, edema and peau d'orange – and possible IBC cases had only peau d'orange or at least 2 of the 3 signs of the most-likely IBC.

## DISCUSSION

This study illustrated interesting observations about breast cancer in Tanzania. First, the vast majority of cases (90.73%) are diagnosed as advanced stage 3 and 4 cases. Second, LS cases had a higher likelihood of having masses greater than 5 cms, ulceration, pain, nipple retraction, erythema or peau d'orange. Third, almost half the cases presented with ER-/PR- tumors. Fourth, we observed that approximately 3% of breast cancer cases were male and all male breast cancer (MBC) cases were in LS. Fifth, IBC in this study ranged between 4–5% of all breast cancers.

The findings of our study clearly indicate that the picture of breast cancer is grim in Tanzania with the majority of patients presenting with advanced stage of disease. This is consistent with findings from a previous study from Tanzania [19] which found no cases in stage 1 and most cases in stage 3 or 4. We also had

Table 2  
Clinical characteristics of breast cancer in Tanzania, 2007–2009

Variables by level	Total distribution (Total <i>N</i> = 488)		Stage 1 & 2 (Total <i>N</i> = 33, 9.27%)		Stage 3 & 4 (Total <i>N</i> = 323, 90.73%)		Early vs. late stage <i>P</i> -value
	No.	%	No.	%	No.	%	
Duration of Symptoms in Months <sup>(397,26,272)</sup>							
Mean ± SD	17.18 ± 24.58	–	20.77 ± 32.05	–	16.85 ± 22.74	–	0.420 <sup>a</sup>
Range	0–168	–	0.5–132	–	0–168	–	
Laterality <sup>(485,33,323)</sup>							
Right	233	48.04	16	48.48	146	45.20	0.224 <sup>b</sup>
Left	222	45.77	17	51.51	150	46.44	
Bilateral	30	6.19	0	0	27	8.36	
Recurrence <sup>(485,33,323)</sup>							
No	423	87.22	29	87.87	288	89.16	0.771 <sup>c</sup>
Yes	62	12.78	4	12.12	35	10.84	
Stage <sup>(327)</sup>							
I	3	0.92	–	–	–	–	–
II	30	9.17	–	–	–	–	
III	105	32.11	–	–	–	–	
IV	189	57.80	–	–	–	–	
Mass <sup>(458,31,308)</sup>							
No	27	5.90	4	12.9	17	5.52	0.113 <sup>c</sup>
Yes	431	94.10	27	87.1	291	94.48	
Mass Size <sup>(223,20,163)</sup>							
< 5 cm	69	30.94	14	70	39	23.93	< 0.001 <sup>b</sup>
≥ 5 cm	154	69.06	6	30	124	76.07	
Ulcer <sup>(440,31,300)</sup>							
No	303	68.86	28	90.32	191	63.67	0.002 <sup>c</sup>
Yes	137	31.14	3	9.68	109	36.33	
Pain <sup>(443,31,303)</sup>							
No	245	55.31	22	70.97	152	50.17	0.027 <sup>b</sup>
Yes	198	44.70	9	29.03	151	49.84	
Nipple Retraction <sup>(439,31,300)</sup>							
No	336	76.54	29	93.55	212	70.67	0.005 <sup>c</sup>
Yes	103	23.46	2	6.45	88	29.33	
Erythema <sup>(439,31,300)</sup>							
No	370	84.28	30	96.77	242	80.67	0.025 <sup>c</sup>
Yes	69	15.72	1	3.23	58	19.33	
Edema <sup>(440,31,301)</sup>							
No	349	79.32	27	87.1	228	75.75	0.185 <sup>c</sup>
Yes	91	20.68	4	12.9	73	24.25	
Peau d'Orange <sup>(439,31,300)</sup>							
No	310	70.62	29	93.55	187	62.33	< 0.001 <sup>c</sup>
Yes	129	29.38	2	6.45	113	37.67	

*a* = Student's *t*-test; *b* = Chi-square test; *c* = Fisher's exact test.

only 3 cases in stage 1 with more than 90% of cases in stage 3 or 4. Large proportions of patients presenting at LS were reported in other Sub-Saharan countries such as Senegal (60%) [20], Cameroon [21], and Nigeria (58.3%) [22]. Still a proportion of 90% of late stage breast cancers is much higher than most of the countries in this region and its imperative to highlight the

reasons for this. Within Tanzania, OCRI, located in the city of Dar es Salaam, is the only specialized treatment center for cancer and as such most of its patients come from different parts of the country after travelling long distances. Thus, there are numerous patient-mediated barriers to seek care. Research in adjoining countries has revealed including distance to the facili-

Table 3  
Pathologic and treatment characteristics of breast cancer in Tanzania, 2007–2009

Variables by level	Total distribution (Total <i>N</i> = 488)		Stage 1 & 2 (Total <i>N</i> = 33, 9.27%)		Stage 3 & 4 (Total <i>N</i> = 323, 90.73%)		Early vs. late stage <i>P</i> -value
	No.	%	No.	%	No.	%	
ER/PR Status <sup>(65,0,61)</sup>							
ER-/PR-	31	47.69	–	–	29	47.54	–
ER+/PR+	28	43.08	–	–	28	45.9	
ER-/PR+	1	1.54	–	–	0	0	
ER+/PR-	5	7.69	–	–	4	6.56	
Pathologic Diagnostic Type <sup>(459,32,308)</sup>							
Cyto Only	122	26.58	8	25	84	27.27	0.959 <sup>b</sup>
Histo Only	178	38.78	13	40.63	110	35.71	
Both	139	30.28	10	31.25	103	33.44	
Neither	20	4.36	1	3.13	11	3.57	
Treatment <sup>(488,33,327)</sup>							
Chemo Only	75	15.37	1	3.03	62	19.20	0.090 <sup>b</sup>
Radiotherapy Only	3	0.61	0	0	2	0.62	
Surgery Only	38	7.79	4	12.12	19	5.88	
Chemo & Radiotherapy	19	3.89	0	0	15	4.64	
Chemo & Surgery	243	49.80	23	69.69	154	47.68	
Radiotherapy & Surgery	12	2.46	1	3.03	9	2.79	
Chemo, Surgery, & Radiotherapy	70	14.34	4	12.12	50	15.48	
None Recorded	28	5.74	0	0	12	3.72	
Chemotherapy <sup>(454,30,311)</sup>							
Neoadjuvant	116	25.55	3	10	88	28.3	0.130 <sup>b</sup>
Adjuvant	267	58.81	24	80	174	55.95	
Sandwich	15	3.30	1	3.33	12	3.86	
Type Unknown	9	1.98	0	0	7	2.25	
Tamoxifen <sup>(324,25,226)</sup>							
No	118	36.42	2	8	82	36.28	0.003 <sup>c</sup>
Yes	206	63.58	23	92	144	63.72	

*a* = Student's *t*-test; *b* = Chi-square test; *c* = Fisher's exact test.

ty, inability to pay for medical care, and beliefs, fears, cultural factors and ignorance [21]. Similar barriers to care have also been noted in other studies such as in Nigeria [23], which discovered lack of education, long distance, delay in referrals from peripheral areas, non-acceptance of hospital treatment and preference for traditional treatment as reasons for high number of breast cancer cases presenting in late stage.

Breast cancer patients presenting in LS of disease have more advanced symptoms including tumor mass, pain, ulceration, erythema and peau d'orange. As such, our finding that cases in LS were more likely to have all of the above symptoms was quite expected. It is important to note here that LS breast cancer is more difficult and costly to treat and also results in significantly more morbidity in terms of life lost through disability [24]. This also raises the issue of a probable high presence of neglected cases of breast cancer that go undetected and do not make it to Dar es Salaam. There are probably

numerous cases in LS who die with advanced disease in remote regions of Tanzania. In Dar es Salaam, breast cancer corresponds to 12.7% of all cancers which is much less than 46.9% for cervical cancer [25]. However the proportion of breast cancer cases might be much higher if all the cases are detected.

In addition to presenting at an advanced stage of disease, we also found a majority of cases to be ER-/PR- which is consistent with previous reports from Tanzania [26]. This is also a finding which has been commonly observed in other developing countries in Africa, such as Nigeria, where more than 70% of breast cancer cases were negative for ER or PR [22,27]. In Kenya, 66% of breast tumors were found to be ER-/PR- [28]. This has also been observed in other developing country populations, mostly in rural areas, such as India [29]. It is clearly known that ER-/PR- breast tumors are more aggressive [30] and the higher proportion of these tumors may partially explain the more

Table 4

Multiple regression model\* assessing the factors that determine late stage (Stage III and IV) at presentation of breast cancer cases diagnosed in Tanzania, 2007–2009

Variables by level	OR	95% CI	P-value
Age <sup>#</sup>			
0–48.5	1.00	–	–
> 48.5	1.93	0.29, 12.83	0.497
Menopausal Status			
Pre-menopausal	1.00	–	–
Post-menopausal	1.39	0.21, 9.19	0.733
Duration of symptoms			
0–9 months	1.00	–	–
> 9 months	0.95	0.62, 1.45	0.82
Pain			
No	1.00	–	–
Yes	2.05	0.77, 5.43	0.15
Ulcer			
No	1.00	–	–
Yes	4.97	1.07, 23.04	0.04
Nipple retraction			
No	1.00	–	–
Yes	2.99	0.64, 14	0.163
Edema			
No	1.00	–	–
Yes	0.80	0.23, 2.72	0.719
Peau d'Orange			
No	1.00	–	–
Yes	6.78	1.48, 31.17	0.014

\*Unconditional logistic regression comparing 179 late-stage and 21 early-stage cases.

<sup>#</sup>Median age has been used to create the two age-categories.

advanced disease seen among Tanzanian women given the fact that the duration of symptoms does not differ significantly between the patients in ES and LS. The high proportion of more aggressive ER-/PR- breast tumor subtypes in Tanzanian women might also be related to the same factors which are responsible for aggressive breast cancer seen among African-American women [31]. However, in our study ER/PR status was available for a small subset of patients, therefore it was difficult to determine the overall proportion of ER-/PR-breast cancer for the patients presenting in late stage.

In our study, we captured some cases of MBC that made up 2.87% of all cases. This is much lower than that observed in an earlier study from Tanzania that found the proportion of MBC cases to be 6.5% using data spanning 13 years [13]. A higher proportion for MBC of 7–14% has been observed in Sub-Saharan countries [32]. Studies from Nigeria depict a proportion of MBC ranging from 3.7% [33] to 8.9% [34] as compared to the US, where the proportion of male

breast cancer is 1.12% [35]. Another disconcerting fact was that all the cases of male breast cancer in our study presented in LS, which was an observation similar to studies from Nigeria [33,34]. It is quite possible that development of breast cancer in males is matter of stigma in these countries and the most probable reason for delayed seeking of care. Additionally, we might have detected a greater number of MBC cases if we had a bigger dataset spanning a larger number of years.

We also tried to determine the number of IBC cases among our study population using two separate criteria – one using AJCC staging criteria [18] and the other using the presence of the three clinical signs of IBC, namely erythema, edema and peau d'orange [16]. Very little is known about IBC in Sub-Saharan Africa. Our studies and other studies mainly from Tunisia [14, 15], have depicted a higher proportion of IBC in North Africa compared to the U.S. [14]. Further studies are required to better define IBC in Sub-Saharan Africa with possible investigation into the association of infections with breast cancer incidence.

This study had a number of strengths. This was one of the few studies from Tanzania recording the epidemiology of breast cancer in recent times from the two biggest centers of cancer treatment in the country. We managed to obtain records of a fairly large sample of cases spanning two years which was highly representative of breast cancer cases in Tanzania. However our analysis was limited by missing data for a number of variables. Also, we would have preferred to obtain more information regarding the individual risk factors of breast cancer from Tanzania but hospital records do not routinely have such data. We also had limited number of patients for whom biopsies were done and tissues were available. This curbed our analysis related to ER/PR.

Overall this study draws attention to the situation of women with breast cancer in Tanzania who mostly present in LS. ER determination is also absent in Tanzania which has been defined as a “basic level resource” in The Breast Health Global Initiative (BHGI) [36]. Improvement and expansion of cancer care facilities, increasing awareness of women regarding breast cancer, improving palliative care, and increased research related to reducing barriers to care and down-staging of disease are the most essential factors that need to be addressed to reduce morbidity and mortality from breast cancer in Tanzania. Further research on the magnitude and risk factors for male breast cancer and IBC in this population is warranted.

Table 5  
Distribution of probable inflammatory breast cancer (IBC) cases by criteria and duration of symptoms in Tanzania, 2007–2009

Criteria	Duration (in months)				Total N (%) <sup>c</sup>
	6 or less	More than 6 and less than 12	More than 12 and less than 18	18 or more	
T4d	2	1	0	1	4 (0.82)
Most likely IBC <sup>a</sup>	6	7	0	2	16 (3.28) <sup>d</sup>
Possible IBC <sup>b</sup>	2	0	0	3	7 (1.43) <sup>e</sup>
Total N (%) <sup>c</sup>	10 (2.05)	8 (1.64)	0	6 (1.23)	27 (5.53) <sup>f</sup>

a: Classified based on the presence of all the three signs of IBC – erythema, edema and peau d'orange.

b: Classified based on the presence of only peau d'orange or at least 2 of the three signs of IBC.

c: % of all cases in the study.

d: 1 case had missing information for duration.

e: 2 cases had missing information for duration.

f: Total of 3 cases had missing information for duration.

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