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Factors Influencing Advanced Stage Presentation among Women with Breast Cancer Attending at Muhimbili National Hospital: A Cross-Sectional Study

Joseph A. Loth[1], Larry O. Akoko[1], Athuman Mbalamula[2], Ally H. Mwanga[1]

[1]*Department of Surgery, College of Medicine, Muhimbili University of Health and Allied Science, Dar es Salaam, Tanzania*
[2]*Department of Surgery, Muhimbili National Hospital, Dar es Salaam, Tanzania*

***Corresponding author:** Joseph A. Loth, Email: josephloth70@gmail.com

Abstract

Background: Breast cancer is the second most common malignancy affecting women in Tanzania, with most patients presenting at an advanced stage. Delayed presentation is thought to be a key contributor, influenced by various socio-demographic and healthcare access factors. However, tumour biology may also play a role.

Objective: This study aimed to determine the proportion of women presenting late with breast cancer, identify factors associated with delayed presentation, and assess the relationship between delay and advanced-stage diagnosis.

Methods: We conducted a cross-sectional study involving 127 women with histologically confirmed breast cancer at Muhimbili National Hospital between January and December 2022. Data were collected through structured interviews and medical records to assess sociodemographic, clinical, and pathological variables. Delayed presentation was defined as seeking care more than three months after symptom onset. The study had approximately 75.8% power to detect the association between delayed presentation and late-stage breast cancer diagnosis. Bivariate and multivariate logistic regression analyses were performed to identify factors associated with delayed presentation (defined as presenting more than three months after symptom onset). Associations between delay, tumour characteristics, and stage at diagnosis were also assessed.

Results: Of the 127 patients, 57.5% presented with delayed care. Factors significantly associated with delay in bivariate analysis included age ≥50 years (p=0.021), unemployment (p=0.046), lack of formal education (p=0.009), absence of health insurance (p=0.042), rural residence (p=0.015), reliance on motorized transport (p=0.021), and not performing breast self-examinations (p<0.001). In multivariate analysis, only not practicing breast self-examination remained a significant independent predictor (OR=4.3, 95% CI: 1.6–11.2, p=0.003). Delayed presentation was significantly associated with advanced-stage disease (p=0.005). However, approximately one-third of timely presenters still had advanced disease, suggesting that aggressive tumour biology—particularly Luminal B subtype—also plays a role.

Conclusion: Delayed presentation is common among women with breast cancer at MNH and is significantly associated with advanced-stage diagnosis. However, biological tumour aggressiveness also contributes to disease progression, underscoring the need for improved diagnostic workup and tailored treatment pathways.

Keywords: *Breast cancer, Delayed presentation, Diagnostic delay, Stage at diagnosis, Tanzania, Tumour biology, Luminal B subtype.*

Introduction

Breast cancer is the most frequently diagnosed cancer among women globally, accounting for over 2.3 million new cases and 685,000 deaths in 2020, according to the World Health Organization (WHO) (1). Despite advances in early detection and treatment, the burden remains disproportionately high in low- and middle-income countries (LMICs), where late-stage presentation is more common and survival rates are markedly lower (2). Early detection is critical, as it significantly improves prognosis and reduces mortality; however, many women, especially in resource-limited settings, do not present for care until the disease is advanced (3).

In sub-Saharan Africa (SSA), breast cancer incidence is increasing, yet survival outcomes lag due to systemic delays in diagnosis and treatment. Studies show that over 60% of women in SSA present with stage III or IV disease (4,5). In Tanzania, breast cancer is the second most common cancer among women, with rising incidence rates reported at major referral centers (6,7). Factors contributing to diagnostic delay include limited awareness, cultural beliefs, financial barriers, long travel distances, and inadequate healthcare infrastructure (8). Understanding and addressing these delays is essential to improving early detection and treatment outcomes.

This study aimed to determine the proportion of women with breast cancer who present late, identify socio-demographic and clinical factors associated with delayed care, and examine the relationship between diagnostic delay and stage at diagnosis at MNH. By understanding the interplay between presentation delay and tumour biology, the findings will inform targeted interventions to promote earlier diagnosis, improve referral systems, and support evidence-based policies for cancer control in Tanzania and other similar resource-constrained settings.

Methodology

Study design and setting

A quantitative cross-sectional study was conducted among women diagnosed with breast cancer (BC) who were receiving care at the Surgical Department of Muhimbili National Hospital (MNH) between May 2022 and April 2023. MNH is the largest and oldest tertiary hospital in Tanzania, located in Dar es Salaam, and serves as both the national referral hospital and a teaching facility affiliated with the Muhimbili University of Health and Allied Sciences. As a public institution directly linked to one of the few cancer centres in the country, MNH receives referrals from both public and private healthcare facilities, making it a representative center for breast cancer cases in Tanzania. The hospital provides comprehensive services for cancer diagnosis, staging, surgery, and chemotherapy, while patients requiring radiotherapy are referred to the Ocean Road Cancer Institute (ORCI) or one of the two private cancer treatment centres in Dar es Salaam.

Study population and power

The study involved consecutive female patients aged 18 years or older with histologically confirmed breast cancer who provided written informed consent to participate. A post-hoc power analysis based on the observed data

(127 patients) showed that the study had approximately 75.8% power to detect the association between delayed presentation and late-stage breast cancer diagnosis, with an observed effect size (Cohen's *w*) of 0.236, at a two-tailed alpha level of 0.05.

Study variables

The primary outcome variable was the clinical stage of breast cancer at the time of presentation to MNH. Stages I and II were classified as early-stage disease, while stages III and IV were considered advanced-stage disease.

Predictor variables included the time interval between the initial detection of symptoms and the patient's arrival at Muhimbili National Hospital (MNH) for treatment. A presentation within three months of symptom onset was categorized as *non-delayed*, while arrival after more than three months was classified as *delayed presentation*. Patients presenting with late-stage disease were also asked an open-ended question to explore their reasons for delay, enabling the capture of a wide range of potential contributing factors. Additional predictor variables encompassed sociodemographic and contextual characteristics: *age* (in years, calculated from date of birth) with patients grouped as young (<50 years) and elderly (50 years and above), *marital status* (married or unmarried), and *occupational status* (formally employed, defined as salaried, or informally employed, defined as non-salaried). *Family support* was assessed based on the patient's perception and categorized as either good or poor, and *insurance coverage* for treatment was recorded as present or absent. Geographic and accessibility variables included *place of residence* (urban or rural) and *distance to any health facility*, inferred from the reported means of reaching the facility and categorized as either walkable or requiring motorized transport. Patients were also asked whether they practiced *breast self-examination (BSE)*, with responses categorized as practicing or not practicing. The study also collected information on tumour characteristics, including *molecular subtypes* and *WHO histopathological classifications* to further describe the clinical profile of the patients.

Participants' identification and data collection

Patients with breast cancer were recruited at admission when a high suspicion index of a breast cancer diagnosis was made. Consenting for potential inclusion into the study was done, and sociodemographic characteristics were collected directly from the patient via interview and from the case notes. Once histology results were out, at about two weeks from the initial hospital consultation, a final decision to include all patients with a histologically confirmed BC diagnosis was made, and both WHO histopathological diagnosis and subtype were recorded. This information was entered into a study-specific predefined questionnaire administered by (DL).

Ethical considerations

Ethical approval to carry out this study was obtained from the Institutional Review Board of Muhimbili University of Health and Allied Sciences (MUHAS), and permission to enrol patients was obtained from the MNH teaching and consultancy bureau. Individual patients provided informed consent to participate. At the

end of data collection, de-identification was done by removing patients' hospital registration numbers before entering them into the data analysis software for analysis for confidentiality. The study was conducted as per the Declaration of Helsinki on studies involving human subjects.

Results

Table 1 presents the bivariate associations between sociodemographic characteristics and delayed diagnosis among 127 women with breast cancer at Muhimbili National Hospital, where 57.5% of patients experienced a delay in presenting for treatment. The delay was significantly more common among women aged 50 years and older compared to those under 50 years (69.1% vs. 48.6%; p=0.021). Similarly, the delay was more frequent among unemployed than employed women (62.2% vs. 41.4%; p=0.046), and among those with no formal education compared to those with any formal education (87.5% vs. 53.2%; p=0.009). Lack of health insurance was associated with delay (64.2% vs. 45.7%; p=0.042), as was residing in rural areas (67.1% vs. 45.6%; p=0.015). Women who relied on motorized transport to reach health facilities experienced more delays than those living within walking distance (71.1% vs. 50.0%; p=0.021). Notably, the absence of breast self-examination (BSE) was strongly associated with delay: 67.0% of women who did not practice BSE experienced delays compared to only 26.7% among those who did (p<0.001). In contrast, marital status (p=0.51) and perceived family support (p=0.767) showed no statistically significant association with delay.

Table 1: Showing association between socio-demographic characteristics and time to presenting for treatment among women with a breast cancer diagnosis at Muhimbili National Hospital, N=127

Factor and Variable	Frequency (%)			p-value
	Total	Not Delayed	Delayed	
Age Category (N=127)				0.021
< 50 years	72 (56.7)	37 (51.4)	35 (48.6)	
≥ 50 years	55 (43.3)	17 (30.9)	38 (69.1)	
Marital status				0.51
Single	64 (49.6)	29 (45.3)	35 (54.7)	
Married	63 (50.4)	25 (39.7)	38 (60.3)	
Occupation status				0.046
Employed	29 (77.2)	17 (58.6)	12 (41.4)	
Unemployed	98 (22.8)	37 (37.8)	61 (62.2)	
Education status				0.009
Formal	16 (12.6)	52 (46.8)	59 (53.2)	
No Formal	111 (87.4)	2 (12.5)	14 (87.5)	
Family Support status				0.767
Good	8 (6.3)	51 (42.9)	68 (57.1)	
Poor	119 (93.7)	3 (37.5)	5 (62.5)	
Insurance status				0.042
Insured	81 (63.8)	25 (54.3)	21 (45.7)	

Not Insured	46 (36.2)	29 (35.8)	52 (64.2)	
Distance to health facility				0.021
Walking	45 (35.4)	41 (50.0)	41 (50.0)	
Transport	82 (64.6)	13 (28.9)	32 (71.1)	
Permanent residence				0.015
Urban	57 (44.9)	31 (54.4)	26 (45.6)	
Rural	70 (55.1)	23 (32.9)	47 (67.1)	
Practice BSE				<0.001
Practice	30 (23.6)	22 (73.3)	8 (26.7)	
Do not practice	97 (76.4)	32 (33.0)	65 (67.0)	
Total		**54 (42.5)**	**73 (57.5)**	

A multivariable logistic regression analysis was conducted using stepwise selection of variables that demonstrated statistical significance in the univariate analysis (Table 1) in order to adjust for potential confounding factors associated with delayed presentation (Table 2). All included variables were associated with higher odds of delayed presentation, with odds ratios of at least 1.5, indicating a 50% or greater increase in odds compared to their respective reference groups. The highest odds were observed among patients who did not practice breast self-examination (BSE) and those with no formal education, with odds ratios of 4.3 in both cases. However, only the lack of BSE practice remained statistically significant in the adjusted model (aOR 4.3; 95% CI 1.6–11.2; p=0.003) the remaining factors did not show a statistically significant association with delay.

Table 2: Bivariate logistic regression of factors influencing delayed presenting to the facility for care among women with BC at MNH

Factor	Variable	OR (95% CI)	P-value
Age	< 50	1	
	≥ 50	1.7 (0.7–3.9)	.227
Employment status	Employed	1	.397
	Not employed	1.6 (0.5–4.7)	
Insurance status	Insured	1	
	Not insured	1.8 (0.7–4.7)	.200
Distance to facility	Walking to facility	1	.425
	Motorised means	1.5 (0.6–4.0)	
Residence location	Urban	1	.331
	Rural	1.5 (0.6 – 3.6)	
Breast Self-examination	Practice	1	.003
	Do not practice	4.3 (1.6–11.2)	
Education Level	Formal education	1	.090
	No formal education	4.3 (0.8–22.7)	

In Fig. 1, we present the reported reasons for the observed delay in presenting to MNH for treatment. A larger proportion of patients gave no reason for their delay. Three reasons stood out as important among these patients, with the majority reporting financial obstacles (35.4%) as the main reason. The other two were seeking alternative care from local herbs and the fear of cancer therapies in 15% and 7.1%, respectively.

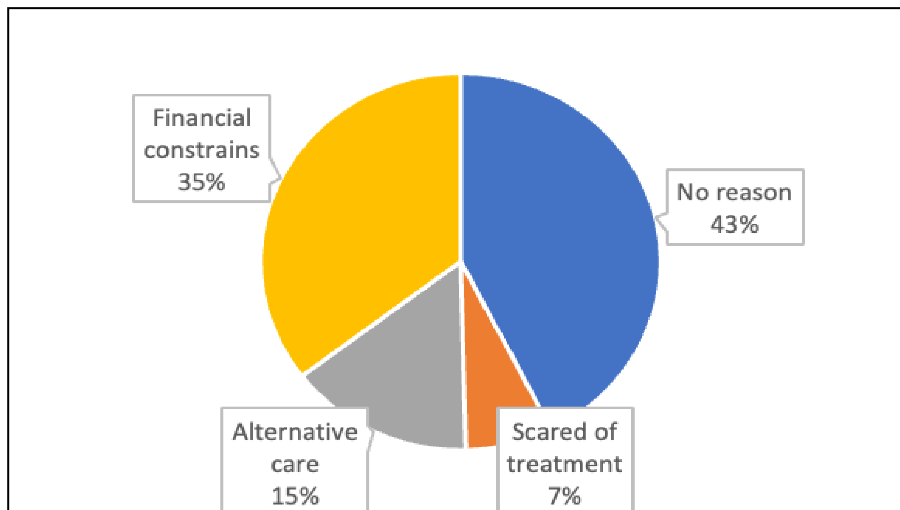

Figure 1. Pie chart showing reasons for late presentation among 127 women with breast cancer at MNH, 2022

Figure 2 illustrates the clinical stage at presentation among the 127 women diagnosed with BC at MNH. The majority presented with advanced-stage disease, with Stage IV accounting for 52% and Stage III for 20% of cases. Notably, no patients in this cohort were diagnosed at Stage I.

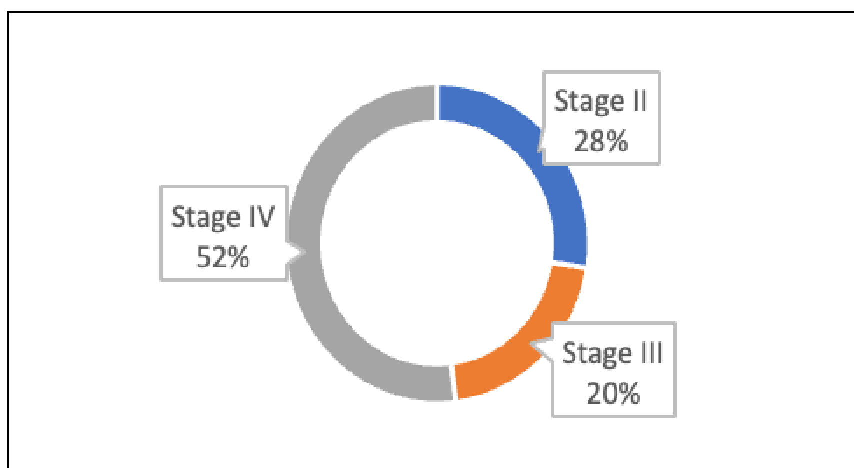

Figure 2. Doughnut showing clinical stage at diagnosis of 127 patients treated for breast cancer who attended Muhimbili National Hospital in 2022

In Table 3, we summarize the tumour molecular subtypes, histological classification, time to presentation as delayed or not delayed, and age category in relation to the clinical stage at diagnosis among 127 patients. Molecular subtype, histological classification, and delay in presentation were all significantly associated with the stage at diagnosis (p-values: 0.013, 0.026, and 0.005, respectively). Patients with the Luminal B subtype were

much more likely to present with advanced disease, comprising 24.7% of advanced cases but only 3.6% of early cases. Conversely, other molecular subtypes made up 96.4% of early cases but only 75.3% of advanced cases, suggesting a strong association between the Luminal B subtype and advanced-stage disease. Similarly, invasive ductal carcinoma was the predominant histological type (92.1%) overall and was more common among those with advanced-stage disease (95.7%) than early-stage disease (82.9%), whereas other histology was relatively more frequent in early cases (17.1% vs. 4.3%). Delay in presentation was also strongly associated with stage: 65.2% of those with advanced disease had delayed presentation compared to only 37.1% in the early group. In contrast, the age category (<50 vs. ≥50 years) showed no significant association with disease stage (p = 1.0), as the distribution was nearly identical between early and advanced presentations.

Table 3: Distribution of clinical variables and their relationship to Stage at presentation among women with breast cancer at MNH, n=127

Factors and variables	Frequency (%)			p-value
	Total	Early	Advanced	
Molecular subtype (n=117)				0.013
Luminal B	23 (19.7)	1 (3.6)	22 (24.7)	
Others*	94 (80.3)	27 (96.4)	67 (75.3)	
Histological classification				0.026
Others**	10 (7.9)	6 (17.1)	4 (4.3)	
Invasive ductal Carcinoma	117 (92.1)	29 (82.9)	88 (95.7)	
Delayed in presentation				0.005
Not delayed	54 (42.5)	22 (62.9)	32 (34.8)	
Delayed	73 (57.5)	13 (37.1)	60 (65.2)	
Age category (years)				1
< 50	72 (56.7)	20 (57.1)	52 (56.5)	
≥ 50	55 (43.3)	15 (42.9)	40 (43.5)	
Total		**35 (27.6)**	**92 (72.4)**	

*Key: *malignant phyllodes'/sarcoma/Paget's disease; **Luminal A, Triple negative and Her2-Ric*

Discussion

This study examined the association between delayed presentation and stage at diagnosis among women with breast cancer receiving care at a national referral hospital in Tanzania. More than half of the participants (57.5%) reported delays in seeking medical attention, and a substantial majority (73.2%) were

diagnosed at an advanced stage (stage III or IV). A statistically significant association was observed between delayed presentation and late-stage diagnosis, aligning with patterns observed in other low- and middle-income countries (LMICs) where structural barriers to timely cancer care persist. Likewise, these findings are consistent with previous studies from different regions of Tanzania. Gnanamuttupulle et al. (9) documented a predominance of late-stage disease and triple-negative breast cancer in Northern Tanzania, while Rambau et al. (10) reported a similar trend in Northwestern Tanzania. These regional data confirm a persistent burden of delayed detection and poor outcomes.

The high proportion of late-stage presentation observed in this study aligns with those across sub-Saharan Africa (SSA). Actually, there is a possibility of under staging in the SSA context since staging investigations are limited to basic imaging (ultrasound and chest X-ray), reflecting systemic gaps in diagnostic infrastructure. In Nigeria, for instance, over 70% of women presented at stages III or IV and attributed the late stage to patients' delays and systemic health barriers (11). Similarly, Clegg-Lamptey et al. (12) in Ghana attributed 60–70% of late-stage presentations to cultural beliefs, economic hardship, and limited awareness. Getachew et al. (13) also reported delay among patients with BC in Ethiopia. These findings contrast sharply with high-income countries (HICs) such as the US and UK, where early-stage diagnoses are more common due to structured screening programs and accessible healthcare systems (14, 15). This picture explains the high mortality rate observed among BC patients in SSA, which has the highest rates globally, probably attributable to reflecting weak health infrastructure and late presentation (16, 17). These disparities highlight the urgent need for early detection and system improvements in Tanzania and similar settings.

While delayed presentation was a significant independent predictor of advanced-stage breast cancer, it did not account for all cases. About one-third of patients who sought care early were still diagnosed at advanced stages, suggesting that aggressive tumour biology may also drive rapid progression—an observation consistent with prior literature (18). Conversely, early-stage diagnoses occurred in one-third of patients despite delayed presentation, potentially due to less aggressive subtypes or individual tumour variations. Invasive ductal carcinoma (IDC), the most common histology in this cohort and globally (18), was generally associated with advanced disease. Luminal B subtype, known for its aggressive nature and higher risk of bone metastases (19), was more frequently linked to advanced stages in this study. However, limitations in staging—due to reliance on chest X-ray and abdominal ultrasound rather than PET or bone scans—may have led to misclassification, especially among Stage III patients.

Social determinants such as informal employment, lack of insurance, and low level of education were significantly associated with delayed presentation. These findings are supported by prior studies in Uganda and Ghana, which identified financial barriers, limited education, and familial stigma as major obstacles to timely diagnosis (20, 21). In In

Tanzania, over 80% of the population resides in rural areas with poor access to specialized care. High out-of-pocket costs for diagnostics contribute to catastrophic health expenditures (22), discouraging early engagement with healthcare services. Family-related barriers, including stigma and lack of emotional support, have similarly been documented in Kenya and Nigeria (23, 24). Nyamhanga et al. in Tanzania (25) identified poor health literacy, cultural beliefs, and health system inefficiencies as major contributors to diagnostic delays among midlife women in Tanzania. A systematic review by Akuoko et al. (26) in Ghana highlighted fear, spiritual beliefs, and lack of symptom recognition as key determinants of late presentation. In the absence of mammography infrastructure, especially in rural Tanzania, low-cost strategies like clinical breast examinations and community health education through primary care providers represent feasible alternatives (27–29). These findings suggest a need for integrated interventions addressing health system and socioeconomic determinants of delay.

Breast cancer tends to affect younger women in Africa, as can be seen in our current study, where the majority were under 50 years old. Regions, especially SSA countries, need to understand the epidemiological distribution of BC in their local context to implement the WHO-recommended biannual mammographic screening for women at average risk of BC between 50 and 69 years in high-income settings (30). On the other hand, WHO recommends health promotion and early detection strategies, timely diagnosis, and comprehensive breast cancer management (31). Since many low-resource settings have a mixed population based on income divide, both approaches should be used to ensure all clusters of women within a country are reached by what is appropriate for their circumstances.

These findings suggest a need for integrated interventions addressing health system and socioeconomic determinants of delay. Public awareness campaigns via local media and integration of early detection messages into primary care platforms can address knowledge gaps. Financial protection schemes such as community health funds or national insurance could mitigate out-of-pocket costs. Decentralizing cancer diagnostic and referral services is crucial for improving accessibility. In the current model, patients often must travel to tertiary facilities for biopsy and histology services due to a lack of a coordinated specimen transport system, further exacerbating delays.

The study’s strength lies in its use of primary patient-level data integrating clinical and sociodemographic factors, hence offering a comprehensive analysis of delay predictors, which was important in addressing late-stage presentation. However, the cross-sectional design limits causal inference by introducing recall bias affecting symptom onset accuracy. Furthermore, generalization was affected by being a single centre and failure to document the geographical distribution of the patients. Nonetheless, this study provides valuable insight for guiding national and regional cancer control strategies in addressing delays and promoting early diagnosis to improve breast cancer outcomes in Tanzania.

Conclusion

Delayed presentation and late-stage diagnosis remain major challenges in breast cancer care in Tanzania. Lack of breast self-examination stood out as the main predictor of delayed presentation, while the role of socioeconomic and educational factors could not be ruled out entirely. These findings urgently call for targeted interventions addressing patient, community, and system-level barriers to healthcare access. Enhancing public awareness, expanding financial coverage, decentralizing services, and improving referral pathways are critical to improving early detection and survival outcomes.

Abbreviations

BC	Breast Cancer
BSE	Breast Self-Examination
HICs	High-Income Countries
IDC	Invasive Ductal Carcinoma
LMICs	Low-and-Middle-Income Countries
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
ORCI	Ocean Road Cancer Institute
PET	Positron Emission Tomography
SSA	Sub-Saharan Africa
WHO	World Health Organization

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Competing interests

Al the authors have no conflicts of interest to declare.

Authors' contributions

LOA and DL contributed to the conception and design of the study, acquired, analysed and interpreted the data, and drafted and critically revised the manuscript. NEK contributed to the design of the study, data interpretation and critically revised the manuscript. All authors read and approved the final manuscript.

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