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Original Article

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Neoadjuvant chemotherapy in women with triple-negative breast cancer: real world results from Western Kenya

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Abstract

Background: **Triple-negative breast cancer (TNBC) is an aggressive breast cancer subtype for which neoadjuvant chemotherapy (NACT) is used for locally advanced (LA) disease. Patients with TNBC who experienced a pathologic complete response (pCR) following NACT have been found to have extended overall survival (OS) compared to patients with residual disease. Sparse data exist on the frequency and impact of pCR following NACT for TNBC in East Africa.**

Methods: **We retrospectively reviewed patients diagnosed with LA TNBC who received NACT between 2018 and 2022 at Moi Teaching and Referral Hospital in Eldoret, Kenya. After NACT, patients underwent mastectomy in which specimens were reviewed histologically as either pCR or residual disease in the breast and/or axilla. Clinical data were analyzed using descriptive statistics and Kaplan-Meier methods.**

Results: **Sixty-nine women with LA TNBC were included. Patient characteristics at diagnosis: Median age = 51 years (IQR 44-60); T4 disease = 34 (49%); and nodal involvement = 62 (91%). Forty-six patients (67%) received anthracycline/taxane-based chemotherapy with a median of 8 cycles (IQR 6-8), and 47 (68%) underwent mastectomy, with only 7% achieving pCR. Assuming all lost to follow-up died, the worst-case OS was 83% and 56% at 1 and 2 years, respectively.**

Conclusions: **In this LMIC setting, patients who presented with LA TNBC had lower pCR rates following NACT than observed in high-income countries. Our findings highlight the critical need for innovative, cost-effective programs focused on early detection of breast cancer, linkage of care, and delivery of more effective therapies to improve outcomes in the region.**

Key words: TNBC neoadjuvant pCR

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Implications for Practice

In triple-negative breast cancer (TNBC), achieving a pathologic complete response (pCR) at surgical resection following neoadjuvant chemotherapy is an important surrogate endpoint for extended overall survival. This study provides a first look at the clinicopathologic outcomes of a western Kenyan cohort of women with TNBC who received neoadjuvant chemotherapy. This cohort was characterized by locally advanced disease, low pCR rate, and low rates of surgical resection. Our findings highlight the critical need for innovative, cost-effective programs focused on early detection of breast cancer, linkage of care, and delivery of more effective therapies to improve outcomes in the region.

Introduction

Triple-negative breast cancer (TNBC) is an aggressive subtype of breast cancer (BC) that accounts for about 10%-20% of breast cancers (BC) worldwide. It is defined based on immunohistochemistry as being negative or <10% for the estrogen receptor (ER) and progesterone receptor (PR), and human epidermal growth factor receptor 2 (HER2) 2 + 0/1+ or 2 + (equivocal) with fluorescence in situ hybridization (FISH) negative.[1–3] TNBC has been found to increasingly affect premenopausal women of aged less than 50 years as well as African American women and women of West African descent.[4,5] A few studies from East Africa show that TNBC comprises about 22%-28% of women with breast cancer, which is lower than rates reported from West Africa and African American women (39%-45%) but higher than the average global reported prevalence of 10%-20%.[4–9] Importantly, locally advanced TNBC is associated with early recurrence and poor overall survival (OS), despite standard treatment, regardless of the treatment setting, when compared to other BC subtypes.[10] Additionally, survival varies based on geographic location with high-income countries (HICs) reporting a 5-year OS of over 80% while recent studies from sub-Saharan Africa report OS ranging between 30% and 50%.[11–13]

Neoadjuvant chemotherapy (NACT) before definitive surgery is routinely administered for locally advanced BC, particularly TNBC, both in SSA and around the world.[14,15] While giving chemotherapy in a neoadjuvant or adjuvant fashion has similar outcomes,[16] giving NACT offers an opportunity to downstage,[17] limit breast and axillary surgery,[15–17] improve wound closure,[15] assess treatment response,[9,14–22] and add additional adjuvant therapies that have been shown to improve outcomes in patients with residual invasive disease.[23,24] The optimal response to NACT is a pathologic complete response (pCR) in the surgical specimens and is defined by the absence of invasive cancer in the breast and axillary lymph node.[25] Patients with locally advanced TNBC who experienced a pCR following NACT had markedly improved event-free survival (EFS) and OS compared to patients with residual invasive disease in the breast or lymph nodes.[25,26] Thus, experiencing a pCR in TNBC can serve as a surrogate endpoint for survival. With conventional neoadjuvant chemotherapy, pCR rates in TNBC have ranged between 20% and 55%.[13,16,17,27,28] The addition of carboplatin to the conventional chemotherapy backbone improves pCR rates to about 55%. More recently, the KEYNOTE-522 study revealed a further improvement of pCR to 64.8% with the incorporation of pembrolizumab and is now routinely used in high-income countries (HIC).[10,29,30]

In Kenya, a lower-middle-income country (LMIC) with a population of 53 million,[10] breast cancer is the most diagnosed cancer and the third leading cause of cancer-related deaths among women.[10,31] The prevalence of TNBC in Kenya has been characterized in small studies and is similar to data from high-income countries, ranging between 15% and 44% of all breast cancers.[32–38] While there have been few descriptive studies of TNBC in the region,[14,33–38] none so far have reported on the response to treatment, including pCR. This study aims to characterize treatment outcomes of women with TNBC undergoing standard-of-care chemotherapy in western Kenya. The results of our study provide a first look at the clinical outcomes of patients with TNBC in Kenya, which can, in turn, inform future interventions to improve pCR and associated outcomes.

Methods

Study setting

This study took place at Moi Teaching and Referral Hospital (MTRH), a National Cancer Institute–Kenya-designated comprehensive cancer center located in Eldoret, Kenya, serving a catchment area of over 24 million people, with a strong breast cancer treatment program with protocols in place, international collaboration, tumor boards, and robust medical records. Currently, more than 150 patients receive cancer-directed treatment daily at MTRH, including chemotherapy, radiation, and cancer-directed surgery from ten oncology-trained providers. MTRH is a member of AMPATH, a 30-year academic global health collaboration between Moi University (MU), MTRH, and a consortium of North American Universities led by Indiana University. AMPATH is built on a tripartite mission of education, clinical care, and research to improve the health of communities in western Kenya. In 2017, the AMPATH Breast and Cervical Cancer Control Program (ABCCCP) was developed to improve access to screening and diagnostic services for breast and cervical cancer in western Kenya using a population health approach. This program has created a formalized pathway for diagnosing and treating breast cancer in western Kenya.

Study design

This is a single-center, retrospective, descriptive study of TNBC outcomes. Women, 18 years or older, enrolled in the ABCCCP program and found to have biopsy-proven, non-metastatic TNBC and treated with NACT between January 1, 2018, and December 31, 2022, were included. We did not include women

with TNBC who underwent upfront breast surgery, as our focus was on the assessment of pCR after NACT.

Study procedures

Pathologic diagnosis, staging, and breast cancer treatment were conducted as per local standards of care that are modeled after the harmonized NCCN guidelines for SSA.[39] The initial pathologic diagnosis of breast cancer was confirmed by one of two pathologists (KK, EC). Additional studies such as immunohistochemistry (IHC) were conducted to assess the ER, PR, and HER2/neu status per recent ASCO/CAP guidelines.[40,41] Based on these pathologic guidelines, TNBC was defined as ER $<1\%$, PR $<1\%$, and HER2/neu 0 or 1+. Of note, FISH testing for HER2/neu was not available at MTRH during this study period. An individual pathologist evaluated surgical specimens for residual disease using the MD Anderson RCB calculator.[42] Patients were deemed to have pCR if they had a residual cancer burden (RCB) score of 0, defined as the absence of invasive residual cancer with or without in situ disease in the MRM specimen and the regional axillary lymph nodes. Patients with RCB I, II, or III were considered to have residual disease in concordance with numerous clinical trials.

Prior to treatment with NACT, staging was conducted using computed tomographic (CT) imaging of the chest, abdomen, and pelvis on all patients. Clinical staging was determined in accordance with the 7th Edition of the American Joint Committee on Cancer (AJCC).[43]

Available therapies during the study period included NACT, modified radical mastectomy with or without axillary lymph node dissection and radiation therapy. Standard dosing of NACT was used with dose reductions based on physician discretion. Neoadjuvant chemotherapy regimens for TNBC given at MTRH included the following: 1. AC-T (67%): Doxorubicin 60 mg/m^2 plus cyclophosphamide 600 mg/m^2 every 3 weeks for 4 cycles followed by a taxane (paclitaxel 175 mg/m^2 every 3 weeks for 4 cycles or docetaxel 75 mg/m^2 every 3 weeks for 4 cycles), 2. AC (32%): Doxorubicin 60 mg/m^2 plus cyclophosphamide 600 mg/m^2 every 3 weeks for 6 cycles 3. Carbo/Gem (1%): Carboplatin AUC 5 (area under the curve) plus gemcitabine 1250 mg/m^2 every 4 weeks for 4 cycles. Dose reductions were based on provider discretion. Of note, this protocol was decided upon via international collaboration and the previously published dose-dense regimens of doxorubicin and cyclophosphamide given every 2 weeks with growth factor support and the addition of carboplatin to taxane chemotherapy are not administered at MTRH given challenges in procuring and administering growth factor support. Patients were followed either via regular clinic visits or phone.

Response prior to surgery was based on clinical examination conducted by an oncology provider and was classified into: (1) complete response: no clinically detectable breast mass or lymphadenopathy, (2) partial response: reduction in the size of the breast mass or lymphadenopathy but not meeting criteria for complete response, (3) stable: no change in the size of the breast mass or lymphadenopathy or (4) progression: increased size of the breast mass or lymphadenopathy or distant metastasis.

Definitions

Pathologic complete response (pCR) was defined as above. Relative dose intensity (RDI) is defined as the ratio of cumulative chemotherapy administered (in milligrams per m^2) per unit time (in weeks) compared to standard chemotherapy. In breast cancer, an RDI $>$ 85% predicts improved outcomes.[61] Patients located within "Uasin Gishu" county, where MTRH is located, were defined as "close" distance, whereas those traveling from outside "Uasin Gishu" county were defined as "far" distance. This ranged from some places about 50 km away within the county to as far as 300 km in a "far" county. Date of diagnosis was defined as the day when a histopathological diagnosis of breast cancer was made via a biopsy. Menopause was defined as the absence of menses for more than a year. OS was calculated from the date of diagnosis until death due to any cause or administrative censoring.

Analysis

Baseline demographic characteristics, histopathological, and treatment characteristics were summarized using descriptive statistics. Categorical data were summarized using the frequency and percentage while continuous variables were summarized using the median with interquartile ranges (IQR). Differences between groups were analyzed using Fishers exact text or Pearson chi-square test. OS as a function of the markers studied were estimated using the Kaplan-Meier method. To evaluate the potential of bias in estimating OS from LTFU, a sensitivity analysis was performed assuming: (i) all LTFU died at the time of their last known contact (worst case scenario) and (ii) all the patients survived at their last known contact (best case scenario).

Statistical analyses were performed using the RStudio (version 4.3.2). All statistical tests were two-tailed, and $P < .05$ was considered statistically significant. All the plots were constructed in RStudio (version 4.3.2).

Results

Baseline demographics and clinical characteristics

Sixty-nine women with biopsy-proven, non-metastatic TNBC who underwent NACT were included (Table 1). The median age at diagnosis was 51 years (IQR 44-60). Fifty-two patients (75%) traveled from far distances to receive their cancer care at MTRH. At the time of diagnosis, 44 patients (65%) were postmenopausal with a median parity of 5 (IQR 3-6). Most patients (96%) included in the study had active NHIF status at the time of review. Most patients had locally advanced disease at presentation with T3 and T4 comprising 46% and 49% of patients, respectively. The median Ki-67 proliferation index was high at 50% (IQR 48-70) for the cohort, with 44% of patients having grade III disease, 43% with lympho-vascular invasion, and 90% with nodal involvement. Overall, 93% had Stage 3 disease.

Table 1. Baseline clinico-demographic characteristics of women with triple-negative breast cancer diagnosed at MTRH.

Characteristic	$N = 69$[a]
Median age, years (IQR)	51 (44, 60)
County, *n* (%)	
Uasin Gishu	17 (24.6)
Other counties[b] (Average distance to MTRH = 147 km)	52 (75.4)
Median gravidity (IQR)	5.00 (3.00, 6.00)
Median parity (IQR)	5.00 (3.00, 6.00)
Menopausal status, *n* (%)	
Pre-menopausal	24 (34.7)
Postmenopausal	44 (63.7)
Not reported	1 (1.4)
NHIF status, *n* (%)	
Active	66 (95.7)
Not active	3 (4.3)
Past medical history, *n* (%)	
Hypertension	16 (23.2)
Diabetes	1 (1.5)
HIV positive, *n* (%)	
Negative	45 (65.2)
Positive	10 (14.5)
Unknown	10 (14.5)
Not reported	4 (5.8)
Histology diagnosis, *n* (%)	
Invasive ductal carcinoma (Ductal breast cancer)	69 (100)
Grade, *n* (%)	
I	3 (4.3)
II	35 (50.7)
III	30 (43.5)
Not reported	1 (1.4)
Median Ki67 (IQR), $n = 59$	50 (48, 70)
Lymphovascular invasion, *n* (%)	
No	33 (47.8)
Yes	29 (42)
Unknown	1 (1.4)
Not reported	6 (8.6)
Perineural invasion, *n* (%)	
No	44 (63.8)
Yes	7 (10.2)
Unknown	1 (1.4)
Not reported	17 (24.6)
T stage, *n* (%)	
T2	3 (4.3)
T3	32 (46.4)
T4	34 (49.3)
N stage, *n* (%)	
N0	7 (10.1)
N1	46 (66.7)
N2	13 (18.8)
N3	3 (4.3)
M stage, *n* (%)	
M0	69 (100)
Overall staging, *n* (%)	
2B	5 (7.2)
3A	28 (40.6)
3B	32 (46.4)
3C	4 (5.8)

Missing observations: Gravidity ($n = 29$), parity ($n = 29$), menopausal status ($n = 1$), HIV ($n = 4$), Grade ($n = 1$), Lymphovascular invasion and perineural invasion ($n = 1$).
[a]Median (IQR—Interquartile Range); *n* (%).
[b]Other counties: Baringo ($n = 1$), Bungoma ($n = 10$), Busia ($n = 3$), Kakamega ($n = 6$), Nandi ($n = 6$), Kisii ($n = 5$), Homa Bay ($n = 5$), Migori ($n = 4$), Vihiga ($n = 3$), Siaya ($n = 2$), West Pokot ($n = 2$), Nakuru ($n = 1$), and Narok ($n = 1$).

Treatment patterns and response

Forty-six (67%) of 69 patients received an anthracycline/taxane-based regimen with a median of 8 cycles (IQR 6-8; Table 2). Twenty-two (32%) patients received 6 cycles of anthracycline in combination with cyclophosphamide (AC). Calculated RDI for the cohort was 91.3% ($n = 62$, IQR 83.1-96). Hematological toxicities, including neutropenia and anemia, were reported rarely in 7 (10%) and 4(6%) patients, respectively. Cardiomyopathy was reported in only one patient. A modified radical mastectomy was performed in 47 patients (68%). A complete pathological report was available for 46 patients, which reported a median of 7 axillary lymph nodes removed (IQR 3-15), with most specimens having uninvolved margins ($n = 41$, 89%). The median time from diagnosis to surgery was about 8 months (IQR 3.6-39). The pCR rate in all eligible patients was only 7% (5/69) and for those who underwent surgery following NACT was 11% (5/47), respectively. Of the 5 patients who experienced pCR, 2 of them received 6 cycles of an anthracycline/cyclophosphamide and the remaining 3 received 8 cycles of a taxane-based regimen. Twenty-four patients (51%) had residual cancer in the breast and lymph nodes, while 15 (32%) had residual cancer in the breast only. There were 8 patients (17%) who had no response to NACT and 3 patients (6%) who had clinical progression documented before mastectomy.

Nineteen patients (28%) did not undergo a mastectomy. An in-depth analysis of these 19 patients shows that 85% (16/19) had documented progression (16/19, 85%), with about 75% having disease progression within the first 10 months (12/16). About 36% (7/19) of those who did not receive a mastectomy died, and an equal number of patients were LTFU (7/19, 36%). Only 4% of patients who underwent a mastectomy had disease progression in the first ten months (Figure 1). Bivariate analysis (Table 3) revealed that undergoing mastectomy (vs. not) did not correlate with proximity to MTRH, initial stage, nodal positivity, biological characteristics (grade II/III, lymphovascular or perineural invasion), HIV status, comorbidities, or type of chemotherapy used.

Overall survival

The median duration of follow-up was 19.4 months (range, 3-61 months). At the time of last censoring, 13 (18.8%) patients were dead and 15 (22%) were LTFU. For the worst-case scenario

Table 2. Treatment received among patients with triple-negative breast cancer.

First chemotherapy regimen, *n* (%)	
AC-T	46 (66.7%)
AC	22 (31.9%)
Carbo/Gem	1 (1.4%)
Median total number of neoadjuvant chemotherapy cycles (IQR)	4 (2-6)
Median Relative Dose Intensity (RDI)	91.3% (83.1%-96%)
Adverse events	
Neutropenia	7 (10.3%)
Anemia	4 (5.9%)
Febrile neutropenia	1 (1.4%)
Cardiomyopathy	1 (1.4%)
Underwent surgery as modified radical mastectomy, *n* (%)	
Yes	47 (68.1%)
No	19 (27.5%)
Not reported	3 (4.3%)
Clinical response at surgery, *n* (%)	
Stable disease	8 (11.6%)
Complete response	9 (13%)
Partial response	27 (39.1%)
Progression	3 (4.3%)
Not reported	22 (31.9%)
ALND completed, *n* (%)	
No	12 (17.4%)
Yes	46 (66.7%)
Not reported	11 (15.9%)
Number of lymph nodes removed	
Mean (SD)	7.5 (2.8)
Median [Min, Max]	6.5 [3.0, 15.0]
Median time from diagnosis to surgery (months)	
Mean (SD)	9.4 (5.3)
Median [Min, Max]	8.1 [3.6, 39.0]
Pathological complete response	
Pathologic complete response (no tumor or positive lymph nodes identified)	5 (7.2%)
Residual tumor only	15 (21.7%)
Residual tumor and lymph nodes	24 (34.8%)
Residual lymph nodes only (any number of positive lymph nodes)	3 (4.3%)
Not reported	22 (31.9%)
Margins	
Not involved	41 (59.4%)
Involved	5 (7.2%)
Not reported	23 (33.3%)
Radiation received	
No	29 (42.0%)
Yes	36 (52.2%)
Not reported	4 (5.8%)

Missing observation: radiation ($n = 4$), Margins ($n = 23$), Mastectomy procedure ($n = 3$).

(all LTFU patients died at the date of last known contact), the median OS was 38 months with 1-year and 2-year OS of 83% (95% CI, 74%-93%) and 56% (95% CI, 44%-71%), respectively. For the best-case scenario (where all LTFU are presumed alive), the median OS was not reached with the 1-year and 2-year OS of 92% (95% CI, 86%-99%) and 74% (95% CI, 62%-88%), respectively (Figure 2). Within the best-case and worst-case scenarios, presence of mastectomy was associated with a statistically significant decreased risk of death (hazard ratios for the best-case and worst-case were 0.26/$P = .016$ and 0.30/$P = .002$ respectively) and better OS (Table S1; Figure S1).

Discussion

This Western Kenyan cohort of 69 women with locally advanced, nonmetastatic, triple-negative breast cancer provides a rare evaluation of TNBC treatment in a resource-limited setting.[24,25] Our primary endpoint, pCR, occurred in only 11% (5/47) of women with TNBC at MTRH. This is similar to pCR rates reported in Southern Africa, West Africa (15% and 5% respectively)[17,18,44] and far lower than those reported from North Africa,[19,20] Latvia,[45] Colombia,[46] and community oncology within the US[47] (ranging between 28% and 46%). Additionally, elevated pCR rates in high-income countries have been shown to correlate with improved 2-year OS of >80%. This sits in stark contrast to our setting where both the pCR rate (11%) and the 2-year OS was low at 56%. It should be highlighted though, that 19 (28%) patients never underwent surgical resection of primary disease, primarily because of documented progression. This is in stark contrast to data from HICs where the vast majority of women have stable or responsive disease and subsequently undergo surgery. Thus, our pCR rate is likely lower and more accurately represented as 7% (5/69) among patients who underwent surgery.

A major contributor to poor pCR rates in our cohort is lack of population-based screening leading to locally advanced disease presentations. Common high-risk features in our population included node positivity (90%), grade III disease (44%), stage III disease (92.8%), and a high median Ki-67 (50%) at initial diagnosis. Roughly half of our cohort had either skin or chest wall involvement at presentation (T4 stage, 49%), similar to those reported from Nigeria without population-based screening.[48]

While population-based screening for breast cancer is a complex undertaking for health systems both financially and logistically, programs that target early detection of breast cancer via community engagement in resource-limited settings can lead to downstaging which could, in turn, improve breast cancer outcomes.[49–52] Numerous barriers to implementing breast cancer screening in Kenya have been identified, including lack of adequate providers, poor patient awareness of breast cancer, and a lack of appropriate follow-up channels for abnormal findings.[53] Further study is needed to understand ways to deliver screening in complex, resource-limited health systems and should address task sharing, patient and provider education, and effective linkage to care including local biopsy and result delivery which could pave the way to an efficient referral pathway.

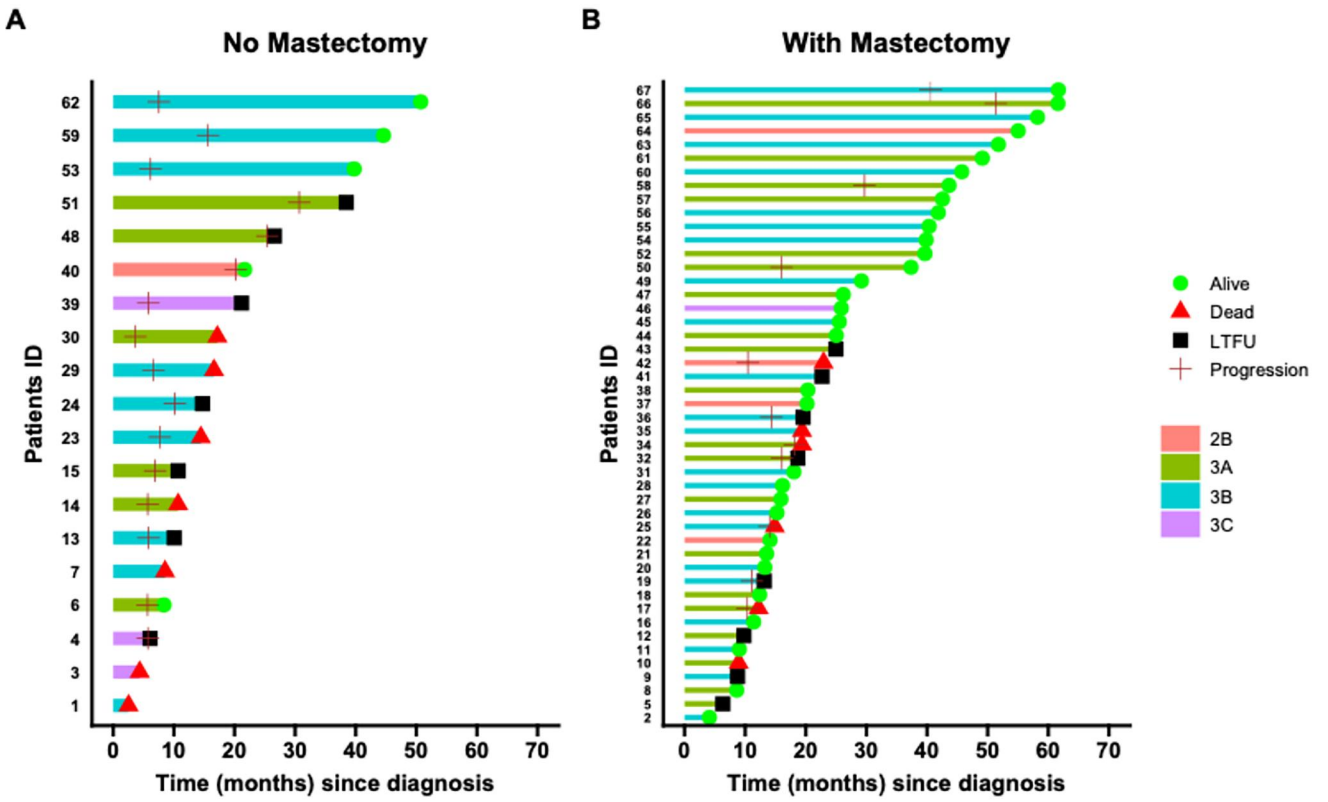


Figure 1. A swimmer plot of individual patients' profiles who did not undergo a mastectomy ($n = 19$) compared to patients who underwent a mastectomy ($n = 47$). Each bar represents events over time stratified by staging. The patients' ID has been masked with numeric representation. Three patients' surgery status were not reported.

Patients in our cohort received a median of 8 cycles of chemotherapy, which is considered an adequate number of cycles for TNBC. Relative dose intensity (RDI) can more accurately assess receipt of chemotherapy and is defined as the relation of dose and timing of actual chemotherapy to that of the standard chemotherapy regimen. An RDI of over 85% has been associated with improved outcomes in breast cancer patients.[54,55] Our study showed an RDI of 91% suggesting that patients received the chemotherapy close to its recommended dosing and timing. About a third of our patients (32%) received 6 cycles of an anthracycline/cyclophosphamide which is typically not a standard regimen but was utilized to fit within the prevailing insurance coverage and has since been stopped. This compares to a recent study in Botswana in which mean RDI was 0.8 in HIV-negative patients and even lower (0.7) in HIV-positive patients. This correlated with pCR rates of 21% and 5%, respectively.[18] A higher RDI and lower pCR in our cohort suggests that regimens that were delivered in a timely fashion were inadequate or locally advanced disease was a predominant driver. This is further supported by studies done in HICs which show that incorporating more intensive chemotherapy regimens increases pCR and OS including the addition of platinum agents (55%) and immunotherapy to dose-dense chemotherapy (64.8%).[30,44,45] Carboplatin was only used in 1.4% of our patients and no immunotherapy was available. This underscores the need to strengthen the supportive care infrastructure in western Kenya, thus enabling the health system to handle these regimens.

Broad health system strengthening is needed to facilitate the delivery of standard and additional therapies. Some examples include the establishment of a cold chain for growth factor support while receiving chemotherapy, a remote chemotherapy symptom monitoring system, and/or the establishment of a dedicated cancer clinical trials unit in the region.[56,57] This could be the nidus for investigator-initiated pragmatic clinical trials looking into the effectiveness of interventions that have been approved for TNBC such as platinum agent/immunotherapy in other well-resourced settings, low-dose immunotherapy in combination with standard chemotherapy, and other novel approaches for TNBC, including drug repurposing.[58–60]

Limitations: This is a retrospective observational study with several limitations. We included patients who received NACT, however, many patients in our setting may have gone directly to surgery and received adjuvant chemotherapy. This likely skewed our results to patients with very locally advanced disease and contributed to poor outcomes. Many in this cohort (32%) received 6 cycles of anthracycline plus cyclophosphamide which is not considered a standard chemotherapy regimen for TNBC and likely contributed to low pCR rates. With international collaboration, provider education, protocol agreement, and a change in

Table 3. Bivariate analysis for the association between mastectomy surgery and baseline characteristics.[c]

Characteristic	No mastectomy, *n* (%)	Mastectomy surgery, *n* (%)	*P*-value[a]
	N = 19	*N* = 47	
Travel distance (MTRH)[b]			.35
Close	3 (16)	14 (30)	
Far	16 (84)	33 (70)	
Node-positive disease	17 (89)	42 (89)	>.99
Overall staging			>.99
Stage 2	1 (5.3)	4 (8.5)	
Stage 3	18 (95)	43 (91)	
Perineural or lymphovascular invasion	1 (5.3)	6 (13)	.66
Grade			.33
I/II	12 (63)	23 (50)	
III	7 (37)	23 (50)	
HIV positive, *n* (%)			.67
Negative	12 (67)	32 (73)	
Positive	4 (22)	5 (11)	
Unknown	2 (11)	7 (16)	
Type of chemotherapy			.17
AC	4 (21)	17 (37)	
AC-T	14 (74)	30 (64)	
Carbo/Gem	1 (5.3)	0 (0)	
Comorbidity	4 (21)	10 (21)	>.99

[a]Fisher's exact test; Pearson's chi-squared test.
[b]Close—Uasin Gishu county; Far—All other counties.
[c]Missing—Three patients attended surgery procedure but did not get a pathology report.

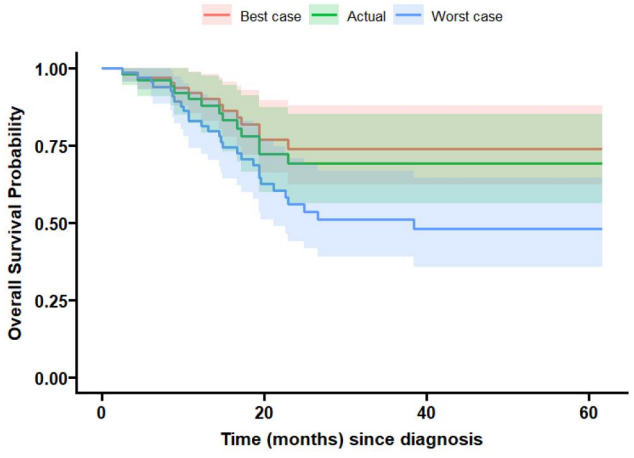


Figure 2. Kaplan-Meier plot showing overall survival (OS) of TNBC patients with loss to follow-up (LTFU) sensitivity assuming (i) all LTFU died at the time of their last known contact (worst-case scenario, *N* = 69), (ii) all the LTFU survived at their last known contact (best-case scenario, *N* = 69) and actual case, where LTFU were not included in the analysis (*N* = 54).

national insurance coverage, this regimen has since stopped being used at MTRH with the recommendation to implement standard anthracycline/taxane therapy in each patient. We also report low adverse event rates, which are likely underreported. These should be better characterized alongside a strengthened supportive care setting, especially as we attempt to add more intensive treatment to improve breast cancer outcomes.

Conclusion

Here we present a cohort of women (who received their care within ABCCCP) from western Kenya with locally advanced triple-negative breast cancer who received neoadjuvant, standard non-dose-dense chemotherapy and had a poor pCR rate of 7%. Despite receiving an adequate number of non-dose-dense chemotherapy cycles, 28% did not get to a surgical resection, highlighting inadequate treatment and advanced disease at initial presentation. These findings highlight the critical need for innovative, cost-effective programs focused on early detection of breast cancer, linkage to care, and delivery of more effective therapies to improve outcomes in the region.

Author contributions

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Supplementary material

Supplementary material is available at *The Oncologist* online.

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Conflicts of interest

H.I.R. has no conflicts of interest to declare.

Data availability

All data discussed in this original article are available in the cited literature.

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