

Health Disparity or Bad Biology? An Analysis of Triple Negative Breast Cancer Patients in an Urban Academic Hospital

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Abstract

Background: 10-25% of patients diagnosed with breast cancer have triple negative breast cancer (TNBC). TNBC is more aggressive than receptor-positive breast cancer.

Objective: The objective of this study is to examine the demographics of this patient population.

Methods: The Commission on Cancer tumor registry was queried for breast cancers from 2006 to 2013. The tumors were divided into groups according to receptor status. Patient demographics were then analyzed along with TNM staging defined by the American Joint Committee on Cancer.

Results: Breast cancer tumors were identified (n=3267) and complete receptor data was available for 1238 tumors. Of these, 83% (1028/1238) of tumors were non-TNBC, while 17% (210/1238) were TNBC. Patients with TNBC were more likely to be <40 years of age (p=0.018) and African American (p<0.001). No significant difference was found comparing insurance type, median household income, or duration from diagnosis to definitive treatment between the TNBC and non-TNBC groups.

Conclusion: TNBC is more common among African-American and younger women, but not more common among uninsured patients or those below the poverty level. This suggests an actual difference in tumor biology and not simply a health disparity.

Keywords: Triple negative breast cancer; Health disparity; Tumor biology

Introduction

Breast cancer is a disease with several different molecular subtypes, with each subtype carrying its own prognosis and treatment modality. Ten to twenty-five percent of patients diagnosed with breast cancer have triple negative breast cancer (TNBC), which is defined as tumors negative for estrogen, progesterone, and Her2-neu receptors. TNBC is more aggressive than receptor positive cancer, with lower likelihood of relapse-free survival and overall survival [1]. TNBC also has limited options for medical management, as it lacks a known target for hormonal or immunotherapy.

Reviews suggest TNBC may represent a higher proportion of tumors in African American patients and it presents at a later stage [2,3]. An analysis of the Surveillance, Epidemiology, and End Results (SEER) California Cancer Registry showed that African American women are more likely than white women to be diagnosed with TNBC by an odds ratio of 1:4 [4]. A comparison of TNBC and all other subtypes of breast cancer showed that TNBC presents at a more advanced disease state [4]. In the same study, the authors demonstrate that compared to women living in areas of high socioeconomic status, women living in areas of lower socioeconomic status are more likely to be diagnosed with TNBC [4].

The objective of this study is to examine the demographics of a population of patients with TNBC. Factors such as race, age, socioeconomic status, and insurance coverage are compared to distinguished features that are more prevalent among patients with TNBC. By further investigating the demographics of this population, we are better able to clarify whether health disparities truly play a role in patients with TNBC.

Materials and Methods

The Commission on Cancer registry tumor database was queried for breast cancers from 2006 to 2013. The tumors were divided into groups according to receptor status. Patient demographics were then analyzed along with TNM staging defined by the American Joint Committee on Cancer. Analyses using the Chi-Square test were conducted in R 3.3.2. Data is presented as both ratios and percentages of the final cohort for which complete data was obtained. This study was approved by and performed in accordance with the guidelines and policies of our Institutional Review Board.

Results

Initially, all breast cancer tumors were identified in the database (n=3267). Complete receptor data was available for 1238 tumors. Eighty-three percent (1028/1238) of breast tumors were non-TNBC, while 17% (210/1238) were TNBC. Statistically, there were more patients under age

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40 (p=0.018), patients were more likely to be of African American race, and tumors were more likely to be classified as grade III (p<0.0001) in the TNBC group (p<0.0001). There were more patients presenting with American Joint Commission on Cancer (AJCC) stage I disease in the hormone-receptor positive group (non-TNBC) (p<0.0001) while there more women presenting with AJCC stage III cancer in the TNBC group (p<0.0001). There was no significant difference in the proportion of women that were uninsured or who were on Medicaid (Tables 1 and 2), or in the duration from time of diagnosis to the first contact at the treating institution (Table 3). Statistical analysis did not show any difference in the proportion of patients that were residents of Illinois counties with a median household income less than \$25,000 between non-TNBC and TNBC patients (Table 4).

Discussion

TNBC is more common among African-American and younger women, but TNBC is not more common among patients below the poverty level or without insurance. African-American women and women less than 40 years of age are more likely to have TNBC compared to other subtypes of breast cancer. Furthermore, patients diagnosed with TNBC are more likely to present with stage III cancer, while patients with non-TNBC are more likely to present with stage

I. However, when comparing rates of patients without insurance and patients with Medicaid, no significant differences were found between the two groups (non-TNBC and TNBC). Furthermore, no significant difference was found in patients with and without TNBC when comparing the proportion of patients below the poverty level. Although African-Americans represent a higher proportion of TNBC patients and are more likely to have a delay in time to treatment, there were no significant differences in non-TNBC and TNBC patients when comparing time of cancer diagnosis to contact at the treating institution [5].

The majority of the data and results from this study support the existing literature. TNBC has been shown by multiple other studies to be much more common in African American women than any other ethnicity [1,3,6]. The reasons behind this are likely multifactorial and are thought to be largely in fact due to tumor genomics causing more aggressive tumor carcinogenesis from ancestral migratory patterns as recently highlighted by Newman and Kaljee [7]. We demonstrated that the tumors in patients with TNBC were more likely to be grade III, as does the current literature on TNBC's stage of presentation [4]. Later stage of presentation could also be attributed to the fact that African-American and Hispanic females are more likely to get mammography screening performed at mammography institutions with less favorable

Demographics and TNM Staging	Non-triple negative tumors (n=1028)	Triple negative tumors (n=210)	p value
Age <40 years old	63 (6.1%)	23 (11%)	0.018
White	757 (73.6%)	113 (53.8%)	<0.0001
Black	256 (24.9%)	92 (43.8%)	<0.0001
Hispanic	88 (8.5%)	17 (8.1%)	0.920
Medicaid	98 (9.5%)	22 (10.5%)	0.764
Uninsured	8 (0.8%)	0 (0%)	NA
Grade III	303 (29.5%)	170 (81%)	<0.0001
T1	658 (64%)	107 (51%)	0.0005
T2	195 (19%)	62 (30%)	0.0008
T3	40 (3.9%)	10 (4.8%)	0.699
T4	49 (4.8%)	16 (7.6%)	0.129
N0	853 (83%)	161 (76.7%)	0.039
N1	132 (12.8%)	36 (17.1%)	0.121
N2	18 (1.8%)	9 (4.3%)	NA
M0	957 (93.1%)	197 (93.8%)	0.823
M1	58 (5.6%)	10 (4.8%)	0.729

Table 1: Comparison of patient demographics and stage between triple negative tumors and non-triple negative tumors.

AJCC stage	No- triple negative tumors (n=1028)	Triple negative tumors (n=210)	p value
0	37/1028 (4%)	9/210 (4%)	0.78
I	547/1028 (53%)	69/210 (33%)	<0.0001
II	282/1028 (27%)	93/210 (44%)	<0.0001
III	107/1028 (10%)	26/210 (12%)	0.47
IV	51/1028 (5%)	11/210 (5%)	1
Unknown	4/1028 (0.4%)	2/210 (1%)	N/A

Table 2: Comparison of American Joint Committee on cancer stage between non-triple negative and triple-negative breast cancer patients.

Time from diagnosis to first contact at treating institution (days)	Non-triple negative tumors (n=1028)	Triple negative tumors (n=210)	p value
0	402/1025 (39%)	85/210 (40%)	0.79
1-21	242/1025 (23%)	47/210 (22%)	0.76
22- 42	177/1025 (17%)	31/210 (15%)	0.43
43-84	131/1025 (13%)	26/210 (12%)	1
> 85	72/1025 (7%)	21/210 (10%)	0.18

Table 3: Comparison of time from diagnosis to first contact at treating institution between triple negative tumors and non-triple negative tumors.

Residents of Illinois Counties Annual Median Household Income	Non-triple negative tumors (n=1028)	Triple negative tumors (n=210)	p-value
<\$25,000	15/954 (2%)	6/196 (3%)	0.15
>\$25,000	939/954 (98%)	190/196 (97%)	0.15

Table 4: Comparison of non-triple negative tumor patients and triple negative tumor patients in Illinois (IL) counties with median household income of <\$25,000 and >\$25,000.

diagnostic capabilities compared to Caucasian females [8].

Data from the California Cancer Registry demonstrates that regardless of race or ethnicity, women living in areas of lower economic status are more likely to be diagnosed with TNBC than any other type of breast cancer compared to women living in higher socioeconomic areas [4]. Our results from the SEER database were not consistent with this conclusion, as the data did not show that patients below the poverty line were more likely to be diagnosed with TNBC. This is likely due to fact that this finding was based off of a comparison of the highest quintile of socioeconomic status and the lowest. Instead, our study analyzed the proportion of patients below the poverty level compared to patients living above the poverty level.

The data was collected from a database with no subjective variables analyzed, making it a heterogeneous and a reliable representation of the local population seeking care or referred to our institution. Although the data did not show that TNBC was more common among patients without insurance, this could be due to the fact that only 8 patients in the non-TNBC group were uninsured, and zero patients in the TNBC group were uninsured. It is possible that with a larger patient population, there would be enough power to analyze the data for a difference. However, this is unlikely to have influenced our results, as the number of uninsured patients with TNBC was n=0, while the non-TNBC group was higher with n=8.

The overarching implications of our data suggest that further research needs to be done on the actual tumor biology and identifying a molecular target for drug therapy versus focusing on socioeconomic influences on TNBC. Furthermore, since TNBC presents at a later stage than non-TNBC, better methods of screening that lead to earlier diagnosis should be studied, identified, and implemented. For future steps, factors such as parity and length of breastfeeding could also be studied, as some studies have shown an association between these two variables and patients with TNBC [6].

Conclusion

We found that there is no statistical difference among patients with TNBC that are below the poverty level or without insurance compared

to those above the poverty line or insured patients. However, our data did demonstrate that TNBC is more common among African-American women and women of younger ages. This suggests an actual difference in tumor biology with TNBC patients, and not simply a health disparity.

Conflict of Interest

The authors have no disclosures. There was no financial or material support. This study was approved by and performed in accordance with the guidelines and policies of the Rush University Medical Center Institutional Review Board. There was no ethical consent or standards of animal care that were applicable to this study.

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