Cancer Epidemiology 49 (2017) 138–143

Contents lists available at ScienceDirect

Cancer Epidemiology

The International Journal of Cancer Epidemiology, Detection, and Prevention

journal homepage: www.cancerepidemiology.net

Sequential matched analysis of racial disparities in breast cancer hospitalization outcomes among African American and White patients

Kemi Ogunsina[a], Gurudatta Naik[a,b], Neomi Vin-Raviv[c,d], Tomi F. Akinyemiju[a,b,*]

[a] Department of Epidemiology, University of Alabama at Birmingham, Birmingham AL, United States
[b] Comprehensive Cancer Center. University of Alabama at Birmingham, Birmingham AL, United States
[c] University of Northern Colorado Cancer Rehabilitation Institute, Greeley, CO, United States
[d] School of Social Work, College of Health and Human Sciences, Colorado State University, Fort Collins, CO, United States

ARTICLE INFO

Article history:
Received 20 April 2017
Received in revised form 31 May 2017
Accepted 5 June 2017
Available online 15 June 2017

Keywords:
Breast
Cancer
Hospital
Inpatient
Outcomes
Disparities
African-American
Matched
White
Age

ABSTRACT

Background: The purpose of this study is to determine if racial disparities in inpatient outcomes persist among hospitalized patients comparing African American and White breast cancer patients matched on demographics, presentation and treatment.

Methods: A total of 136,211 African American and White breast cancer patients from the Healthcare Cost and Utilization Project – Nationwide Inpatient Sample (HCUP-NIS) database, matched on demographics alone, demographics and presentation or demographics, presentation and treatment were studied. Conditional logistic regression was conducted to evaluate post-surgical complications, length of stay and in-hospital mortality outcomes. Analysis was further stratified by age (≤65 years and >65 years) to evaluate whether disparities were larger in younger or older patients. All analysis was conducted using SAS 9.3.

Results: White women had significantly shorter hospital length of stay when matched on demographics (β= −0.87, p-value = < 0.0001), demographics and presentation (β= −0.63, p-value = < 0.0001), and demographics, presentation and treatment (β= −0.51, p-value = < 0.0001) compared with African Americans. White women also had lower odds of mortality compared with African American women when matched on demographics (OR: 0.72, 95% CI: 0.65-0.79), demographics and presentation (OR: 0.77, 95% CI: 0.71-0.85), or matched on demographics, presentation and treatment (OR: 0.80, 95% CI: 0.73-0.88). The racial difference observed in length of stay and mortality was larger in the age group ≤65 years compared with >65 years

Conclusion: African American women experienced higher odds of inpatient mortality and longer length of stay compared with White women even after accounting for differences in demographics, presentation and treatment characteristics.

1. Introduction

Over the past several decades, breast cancer mortality has declined significantly nationwide [1]. This decline is attributed to improvements in early detection and more advance treatment modalities [2,3]. However, since the 1990s, disparities in survival between African American and White patients have persisted [4–6], and continues to widen across the United States (US) [7,8]. Initially, incidence of breast cancer was higher among White women in the US [7,8], but over time, this trend has converged [9]. Multiple studies have documented persistent racial disparities in breast cancer outcomes, including poorer treatment quality and higher mortality among African American women compared to White women [10–12], even among hospitalized patients who have accessed healthcare [13]. This suggests that additional research studies and intervention strategies are required to eliminate inequalities in breast cancer care and outcomes.

Several studies have identified factors such as lower socioeconomic status [14,15], an unfavorable stage or grade of disease [16], high-risk tumor biology [11], and excess co-morbidities, as factors associated with disparities in cancer care and outcomes. Other

Abbreviations: AIDS, acquired immune deficiency syndrome; HCUP, health care cost and utilization project; HIV, human immuno-deficiency virus; ICD-9 code, international statistical classification of disease; NIS, national inpatient sample; OR, odds ratio; SEER, surveillance epidemiology and end result program; US, United States.

* Corresponding author at: Department of Epidemiology, University of Alabama at Birmingham, Birmingham, AL 35294-0022, United States.
E-mail address: tomiakin@uab.edu (T.F. Akinyemiju).

http://dx.doi.org/10.1016/j.canep.2017.06.002
1877-7821/

studies have evaluated health system factors in racial differences in treatment type [17,18], timeliness of treatment or surgical delay [19–22] as potential predictors of disparities, with results racial differences in. Results from these studies suggest that African American women are less likely to receive adequate care compared to Whites [16,23], contributing to higher mortality rates observed among African Americans. However, this finding was not supported in recent studies by Silber et al., and Wang et al. [24,25]. Applying the minimum distance matching methodology [26], Silber et al. [25] utilized the Surveillance Epidemiology and End Result-Medicare linked (SEER-Medicare) database, while Wang et al. [24] utilized data from a hospital-based cohort. Both studies reported that the survival disparity between African-American breast cancer patients was primarily related to differences in tumor presentation during diagnosis, rather than treatment differences. Yet the previous study was limited to older adults (65 years and older), while racial differences in other breast cancer outcomes, especially outcomes during hospitalization such as length of stay, post treatment complications and mortality were not evaluated.

In this study, we sought to determine if racial disparities persist in hospitalization outcomes among African American and White women diagnosed with breast cancer. We conducted sequential matched analysis [25,27,28] on demographic, presentation and treatment characteristics, and conducted to evaluate the magnitude of the disparities in older compared with younger age groups we were able to evaluate, and age-stratified analysis to examine whether racial disparities are larger among patients $\leq$65 years (who are more likely to have private insurance or Medicaid) or those age 65 years and older (who are more likely to have Medicare), further controlling for the influence of differential access to care.

2. Materials and methods

Data was obtained from the Healthcare Cost and Utilization Project National Inpatient Sample (HCUP-NIS) database which consists of data on more than 39 million all-payer inpatient visits for patients hospitalized between 2007 and 2011 across 10,000 US hospitals[29]. This database includes demographic variables such as race, age, gender; clinical variables based on ICD-9 codes such as diagnosis, treatment, co-morbidities; and socioeconomic variables such as insurance status, household income range and zip code of residence. The study dataset included African American and White patients ages 40 years and above at admission, with a primary diagnosis of breast cancer (ICD-9 code = 174.0). More specific information on HCUP-NIS database is available at http://www.hcup-us.ahrq.gov/nisoverview.jsp.

This study was considered exempt by the Institutional Review Board at the University of Alabama at Birmingham, as the HCUP-NIS database is a publicly available and non-identifiable data source.

2.1. Demographic variables

African American and White breast cancer patients were matched on demographic variables including age, median household income in patient's residential area, residential region and patient's insurance status. Age was recorded in years; median household income in a residential area was categorized in quartiles as – 1) Lowest Quartile (<$25,000 per year), 2) Second Quartile (between $25,000 and $34,999), 3) Third Quartile (between $35,000 and $44,999 per year) and 4) Highest Quartile ($\geq$$45,000 per year); residential region was categorized as – 1) Large Metro (counties with population $\geq$ 1 million), 2) Small Metro (counties with population between 50,000 and 999,999), 3) Micropolitan counties and 4) Non-metropolitan and non-micropolitan counties; patients' insurance status was categorized into Medicare, Medicaid, Private, Self-payer and no insurance.

2.2. Presentation variables

African American and White breast cancer patients were additionally matched on presentation variables including comorbidities and stage. In the absence of staging information for cancer in HCUP-NIS database, we created a variable for stage using ICD-9 code for metastatic disease and non-metastatic disease (after exclusion of carcinoma in-situ). We also created a Charlson-Deyo Comorbidity Index [30] to account for influence of various comorbid conditions like Cerebrovascular disease, Congestive Heart Failure, Diabetes Mellitus, Dementia, Myocardial Infarction, Rheumatic Disease, Peptic Ulcer Disease, Liver Disease, Renal Disease and HIV/AIDS. Each comorbid condition was identified using ICD-9 codes and assigned a value of one for each condition, if present, then summed up to obtain a comorbidity score.

2.3. Treatment variables

African American and White breast cancer patients were further matched on treatment variables. Breast cancer is mainly treated by surgery, radiation therapy and/or chemotherapy/systemic therapy depending on size of tumor and spread of disease along with patient preference or overall health status [31–33]. For this study, variables on each modalities of treatment were captured using ICD-9 code for mastectomies, lumpectomies, radiation therapy and chemotherapy administration. We excluded any diagnosis of benign breast conditions like fibroadenoma, intraductal papillomas and traumatic fat necrosis and also did not differentiate between mastectomy and lumpectomy (breast conserving approach) for surgical intervention.

2.4. Outcomes for analysis

Study analysis focused on three in-patient outcomes: 1) Hospital length of stay (number of days spent in hospital, with same day discharge counted as (0); 2) Post-operative complications (using ICD-9 codes for response syndrome/septic shock, puncture wounds, disruption of operative wounds, traumatic injury during operation, infections, foreign body left inside body, non-healing wounds and other unspecified complications); and 3) In-hospital mortality defined as deaths occurring during the course of hospitalization (as recorded in HCUP-NIS database). Hospitalization, post-operative complications to procedures and in-hospital mortality are not exclusively related to breast cancer but may include other causes as well.

2.5. Statistical analyses

We conducted sequential multivariate matching to compare outcomes in African American and White breast cancer patients, similar to approaches used in recent studies [25,27,28]. We included all African American breast cancer patients who were above 40 years of age, and compared with three cohorts of White breast cancer patients matched on – 1) Demographics (age, residential income, geographic region) only, 2) Presentation (stage, comorbidity index score) in addition to Demographic variables, and 3) Treatment (surgery, radiation therapy and chemotherapy) in addition to presentation and demographic variables. To assess whether racial disparities differed by age group, we created two subsets of population – 1) $\leq$ 65 years of age and 2) >65 years of age. We conducted similar matching as reported above for outcomes in these 2 subsets. We used conditional logistic regression to compare