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Racial Differences in Adjuvant Systemic Therapy for Early Breast Cancer among Medicaid Beneficiaries

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Abstract

Black breast cancer patients have shorter survival compared to whites. Lack of optimal treatment may be a potential explanation for this difference. Although racial disparities in surgical and radiation therapy have been studied extensively, there is little information on racial disparities in use of adjuvant systemic therapy. Medicaid enrolled patients provide an opportunity to examine racial disparity in breast cancer treatment by minimizing the roles of access to health care and socioeconomic status. This study, therefore, compared breast cancer treatment, particularly adjuvant systemic therapy and survival in black and white women enrolled in Medicaid. Linked New Jersey Cancer Registry and Medicaid Research files provided diagnostic, prognostic, and treatment information on 237 black and 485 white women aged 20–64 years diagnosed with early stage breast cancer between January 1997 and December 2001. Racial differences in treatment and survival were examined using logistic regression and Cox proportional hazards models respectively. There were no differences in surgical, radiation, or adjuvant systemic treatment between blacks and whites. Breast cancer specific mortality (Hazard ratio (HR) = 1.37; 95% confidence interval (CI) = 0.94–1.98) and all-cause mortality (HR = 1.43; 95% CI = 1.08–1.89) were higher among blacks than whites. In this study of Medicaid-enrolled women with similar socioeconomic status and health care access, blacks and whites received similar breast cancer treatment. In spite of this, blacks had higher mortality than whites. Our findings suggest that factors other than treatment differences may contribute to the racial disparity in mortality.

Keywords

breast cancer; cancer treatment; health care disparities; vulnerable populations

INTRODUCTION

Significant racial/ethnic differences exist in breast cancer incidence and mortality in the United States. Black women have lower incidence of breast cancer, yet sustain higher mortality than their white counterparts. Lack of optimal therapy is a potential explanation for the higher breast cancer mortality among blacks. Racial disparities in surgical and hormonal therapies have been reported by several investigators, with blacks less likely to receive these treatments (1–13). However, there is little information on racial differences in the receipt of adjuvant chemotherapy because obtaining this information requires resource intensive medical record reviews from doctors' offices (14,15). Furthermore, the persistence of racial disparity in the treatment of breast cancer in settings where both races are covered by same medical insurance is not well understood.

Linked cancer registry-Medicaid data provides a unique opportunity to study racial disparities in the receipt of standard treatment for early breast cancer by minimizing racial differences in access to care. Cancer registry provides access to accurate data on surgical and radiation therapy and the Medicaid file captures adjuvant systemic treatment information. We, therefore, linked the New Jersey Cancer Registry file with the New Jersey Medicaid file to examine racial differences in treatment for early breast cancer and survival among Medicaid beneficiaries.

METHODS

Data Sources

A retrospective cohort study was conducted using data from the New Jersey Cancer Registry (NJSCR) linked with the New Jersey Medicaid Research file. The NJSCR database provided information on socio-demographic variables (age, race, marital status), on tumor characteristics (histologic type, grade or differentiation, and cancer stage), on cancer treatment (mastectomy or BCS, radiation therapy, adjuvant hormonal therapy, and adjuvant chemotherapy), and on patients' vital status (alive or dead). If the patient had died, the date of death and the cause of death were also available. The accuracy of tumor registry data has been examined by comparing it with data collected from patients' treating physicians and hospitals for a breast cancer quality improvement project (16). While the tumor registries and the quality improvement project had similar information on tumor stage and surgery type, receipt of radiation and adjuvant systemic treatment were less accurate from tumor registries (16).

Doctors' office visit data from the New Jersey Medicaid research file was used to supplement information on adjuvant systemic treatment obtained from the cancer registry data. New Jersey Medicaid is a health care program for the poor and is financed with state and federal dollars. The State of New Jersey Medicaid Management Information System (NJMMIS) is a comprehensive database that encompasses all medical encounter claims submitted by providers for the care of Medicaid enrollees (17,18). Under a cooperative agreement between the federal government and states, the NJMMIS and many other states submit Medicaid data to the Centers for Medicare and Medicaid Services (CMS). CMS checks the quality and completeness of data received from each state and converted the State Medicaid data to State Medicaid Research Files (SMRF) for the years prior to 1999 or the Medicaid Analytic Extract (MAX) files for the year 1999 and thereafter.

The SMRF/MAX has four separate files: (a) the personal summary file, (b) the inpatient file, (c) the other therapy file, and (d) the drug file. Table 1 provides available information in each of these files. Each file contains a unique identifier for each Medicaid enrollee. This unique patient identifier was used to merge these four data files.

The Medicaid drug file has been validated against primary source data (e.g. medical and pharmacy records) and the agreement was found to be high (19–21). Furthermore, the use of Medicaid data to identify drug utilization is believed to be more comprehensive than either patient recall or physician's prescribing records. The likelihood of having gaps in breast cancer treatment claims due to changes in eligibility is low as a result of the "Breast and Cervical Cancer Prevention and Treatment Act of 2000" enacted by New Jersey under which medical assistance is provided through Medicaid for women diagnosed with breast cancer in the national screening program for low-income women (22).

Study Participants

Participants in this study were women 20–64 years of age who were diagnosed with early-stage breast cancer (SEER Summary Stage "localized" and "regional spread to lymph nodes") between January 1997 and December 2001. This corresponds to the American Joint Commission on Cancer (AJCC) stages I, IIA, IIB, or IIIA (23). We excluded women who were neither white nor black, who were diagnosed with other cancers, and whose breast cancer was not the primary cancer.

Women who met the above criteria were identified from the New Jersey Cancer Registry and linked with the New Jersey Medicaid File for the same years using probabilistic record linkage methodology. To accomplish the record linkage duplicate records were first deleted. The linkage was then conducted in three phases. In the first phase, records that matched exactly on all linkage variables (social security number, date of birth, gender, race, and zip code of residence) were included as "exact matches" in the linked database. The second and third phases of the linkage algorithm identified records that linked on some but not all the linkage variables. These records were evaluated manually to determine whether they matched in both databases. The final linked database included 722 women with early stage breast cancer (485 white and 237 black).

Definition of Standard Treatment

Receipt of standard treatment for early breast cancer was defined on the basis of the National Institutes of Health consensus report (24). A woman diagnosed with early stage breast cancer was considered as having received standard treatment if she (a) was treated surgically either with breast conserving surgery (BCS) followed by radiation therapy or by total mastectomy. Breast conserving surgery was defined as excision of primary tumor and adjacent breast tissue. The procedure is also referred to as lumpectomy, segmental mastectomy, or partial mastectomy; (b) received hormonal treatment regardless of involvement of axillary lymph nodes for estrogen receptor (ER) and/or progesterone receptor (PR) positive tumors; (c) received polychemotherapy for ER and PR negative tumors (both node-negative and node-positive); (d) received hormonal treatment plus polychemotherapy for ER and/or PR positive tumors (both node-negative and node-positive). For instance, a woman who was diagnosed with a receptor positive tumor was considered to have received standard treatment if she underwent either mastectomy or BCS followed by radiation therapy and also received adjuvant hormonal therapy alone or in combination with chemotherapy. On the other hand, a woman who was diagnosed with a receptor negative tumor was considered to have received standard treatment if she underwent either mastectomy or BCS followed by radiation therapy and also received adjuvant chemotherapy.

Standard polychemotherapy regimens include a combination of doxorubicin, cyclophosphamide and 5-fluorouracil or epirubicin, cyclophosphamide, and 5-fluorouracil. Hormonal therapy includes any of the following most commonly prescribed drugs; tamoxifen or raloxifene, anastrozole or letrozole, and goserelin or leuprolide. These drugs

are listed in the Medicaid data either as National Drug Codes (NDC) or as Healthcare Common Procedure Coding Systems (HCPCS) J-codes. The Food and Drug Administration requires that drug manufacturers identify and report all drug products using a unique, three-segment number, called the National Drug Code (NDC), which is a universal product identifier for human drugs (25). The HCPCS is a standardized coding system developed by the Centers for Medicare and Medicaid Services to identify medical services and procedures furnished by physicians and other health care professionals (26). We used the Lexicon database (27) to identify all possible NDC and HCPCS J-codes for adjuvant hormonal therapy and adjuvant chemotherapy. This database includes several relational databases of drug names, drug product information, disease names and coding systems (NDC, HCPCS, and others) (27). Drugs can be identified from this database using the drug name, brand description, or active ingredients. Each drug name is associated with a unique drug identifier, which was used to identify the relevant codes. We then, linked the codes identified from Lexicon to NDC and J-codes available in the drug file of the Medicaid database. This enabled us to identify all adjuvant hormonal and chemotherapy treatments from the Medicaid files.

Confounding Variables

The decision to prescribe adjuvant systemic therapy depends on several prognostic variables. In addition to stage of cancer at diagnosis, these include tumor histology, grade (well differentiated, moderately differentiated, poorly differentiated, or anaplastic), and receptor status (positive or negative). The above clinical information was obtained from the cancer registry files and was used to adjust for the effect of these prognostic indicators on the receipt of standard treatment. The presence of comorbid conditions may also influence a physician's decision in prescribing adjuvant systemic therapy for breast cancer. Comorbid conditions were identified from the Medicaid inpatient and other therapy files using ICD-9 codes. Comorbidity was classified by computing the Charlson's comorbidity index (28); which is a weighted measure of the number and severity of comorbid conditions. This index was originally developed in a cohort of breast cancer patients to assess the effect of comorbidity on breast cancer mortality. Since then, it has been applied widely to several clinical scenarios in medical research. This study was approved by the Institutional Review Boards of the University of Medicine and Dentistry of New Jersey and the New Jersey Department of Health and Senior Services.

Statistical Analysis

We first compared the distribution of demographic variables (age at diagnosis, marital status) and tumor characteristics (histology, grade, ER, and PR status) between whites and blacks. Receipt of standard breast cancer treatment was the dependent variable and race (black versus white) was the main independent variable. The receipt of standard breast cancer treatment was compared between black and white women using logistic regression models after adjusting for the confounding effects of age, marital status, presence of comorbid conditions, tumor stage, histology, and grade.

We also compared differences between blacks and whites in surgery (BCS or mastectomy versus no surgery) and the type of surgery performed (BCS versus mastectomy). For those with BCS, we examined whether RT was delivered or not. Similarly, for ER and/or PR positive patients, we compared the receipt of hormonal therapy versus no therapy. In this group, we also compared the receipt of hormonal therapy alone versus hormonal therapy plus chemotherapy. For ER and PR negative patients, we compared the receipt of chemotherapy versus no treatment. Multivariate logistic regression models accounting for demographic and clinical confounding variables were constructed for all the above comparisons.

Survival analysis using the Kaplan–Meier method was performed to evaluate if racial/ethnic differences existed in the rates of breast cancer specific and overall survival. Survival times were computed as the difference between date of diagnosis and date of death for decedents or the date of last follow-up for survivors. We constructed Cox proportional hazards models to compare breast cancer specific and overall survival between blacks and whites after accounting for important confounders. Hazard ratios and their 95% confidence intervals were estimated using these models. Analyses were performed with the use of sas software, version 9.1 (SAS Institute Inc., Cary, NC).

RESULTS

Table 2 provides the distribution of patient and tumor characteristics between blacks and whites. Blacks were more likely than whites to have characteristics that indicated a poor prognosis. Blacks were younger, never married (single), and were diagnosed more frequently with tumors that had spread to lymph nodes, were receptor negative, and were poorly differentiated or anaplastic.

Overall, only about 60% of patients received the standard initial treatment for their cancers. The vast majority of patients (97%) underwent either BCS or mastectomy. However, only about half of those who underwent BCS received radiation therapy. 59% ($n = 193$) of women with receptor positive tumors received adjuvant hormonal therapy whereas 70% ($n = 101$) of women with receptor negative tumors received adjuvant chemotherapy.

The proportion of black and white patients who received standard initial treatment for early breast cancer is shown in Table 3. There were no differences in the proportion of black and white women receiving surgical treatment (BCS or mastectomy), radiation after BCS, or adjuvant therapy (hormonal and/or polychemotherapy). Results from logistic regression analyses showed no racial/ethnic differences in receipt of standard initial treatment after adjusting for age, marital status, comorbidity, tumor stage, grade, and histology (see Table 4).

A total of 226 deaths occurred in this study population. Of these, 138 women (61%) died as a result of their breast cancer. Cox proportional hazards models showed that breast cancer specific mortality [Hazard ratio (HR) = 1.37; 95% confidence interval (CI) 0.94–1.98] as well as all-cause mortality (HR = 1.43; 95% CI 1.08–1.89) respectively were 37% and 43% higher among blacks than whites. Figures 1 and 2 show the adjusted survival curves for breast cancer specific and overall survival, respectively.

DISCUSSION

This study examined racial differences in adjuvant hormonal and chemotherapy. Relatively little population-based information is available on racial differences in adjuvant hormonal and chemotherapy because adjuvant therapy is mostly given in outpatient settings and obtaining this information is resource intensive and difficult. Linking the NJSCR file with the Medicaid file allowed us to obtain information on outpatient hormonal and chemotherapy utilization information thus adding to the scant literature on racial differences in adjuvant therapy.

In this population of Medicaid-enrolled patients with breast cancer, we found that only 60% of the women received the standard initial treatment for their breast cancer. This reflects the socioeconomic marginalization of this population. In spite of the overall low rate of receipt of standard treatment, we did not find any differences in its use between blacks and whites. Several studies have shown disparities in breast cancer treatment between blacks and whites (1–4,7,8,10–13) However, these disparities are significantly reduced or eliminated when

socioeconomic status and health insurance are taken into account (1,6,29,30). By studying Medicaid beneficiaries, we were able to minimize the effect of socioeconomic status and access to care on receipt of standard treatment and survival. This is because Medicaid beneficiaries are relatively homogeneous with respect to socioeconomic status as most enrollees have incomes below the federal poverty line. Medicaid enrollees are also likely to have similar access to care as they can avail of inpatient and outpatient services through their enrollment in Medicaid. Our results indicate that women with similar medical insurance are likely to be treated equally for their breast cancer. Equal treatment among the races, however, did not translate to equal survival benefits. We found that blacks as compared to whites were 37% more likely to die of breast cancer and 43% more likely to die of all-causes. This suggests that the increased risk of death among blacks may be a result of being diagnosed with more aggressive tumors.

In conclusion, there were no differences in surgical and adjuvant systemic therapy (radiation, hormonal and chemotherapy) utilization between black and white women with early breast cancer who were insured with Medicaid. However, in spite of similar treatment, blacks have higher breast cancer and all-cause mortality than whites. Our findings suggest that factors other than treatment differences contribute to the racial disparity in mortality.

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*Hazard ratio is for blacks as compared to whites

Figure 1.
Breast-cancer specific survival by race, adjusted for age, marital status, stage, histologic type, comorbidity, and receipt of standard treatment for breast cancer.

*Hazard ratio is for blacks as compared to whites

Figure 2.
Overall survival by race, adjusted for age, marital status, and comorbidity.

Table 1

Description of Data Available from the New Jersey State Medicaid files

Filename (description)	Variables extracted
Personal summary file (patient-level)	Date of birth
	Date of death
	Gender
	Race/ethnicity
	County code
	Zip code
	Social security number
Inpatient file (claims-level)	Date of admission
	Primary and secondary diagnoses codes
	Procedure dates
	Procedure codes
Drug file (claims-level)	Type of drug
	Number of days supplied
	Date of prescription
	Date filled
	Quantity of drug
Other therapy file (claims-level)	National Drug Code (NDC) number
	Date of service
	Type of service
	Primary and secondary diagnoses codes
	Procedure code
Outpatient and emergency services	Drug codes for injections

Table 2

Descriptive Characteristics of the Study Population

Characteristics	White (n = 485)	Black (n = 237)
Patient characteristics		
Age in years, n (%)		
<40	85 (17.5)	52 (21.9)
40–44	84 (17.3)	40 (16.9)
45–49	79 (16.3)	30 (12.7)
50–54	84 (17.3)	33 (13.9)
55–59	70 (14.4)	36 (15.2)
60–64	83 (17.1)	46 (19.4)
Marital status, n (%)		
Single	133 (27.4)	111 (46.8)
Married	173 (35.7)	39 (16.5)
Widowed/separated/divorced	158 (32.6)	73 (30.8)
Unknown	21 (4.3)	14 (5.9)
Charlson's comorbidity index, n (%)		
0	329 (67.8)	152 (64.1)
1–2	114 (23.5)	59 (24.9)
3 or greater	42 (8.7)	26 (11.0)
Tumor characteristics		
SEER summary stage, n (%)		
Localized	275 (56.7)	126 (53.2)
Regional spread to lymph nodes alone	210 (43.3)	111 (46.8)
Receptor status, n (%)		
ER* or PR** positive	247 (51.6)	98 (42.2)
ER and PR negative	81 (16.9)	63 (27.2)
ER and PR not done	32 (6.7)	14 (6.0)
ER and PR unknown	119 (24.8)	57 (24.6)
Tumor grade, n (%)		
Well differentiated	45 (9.3)	16 (6.8)
Moderately differentiated	146 (30.1)	61 (25.7)
Poorly differentiated/anaplastic	211 (43.5)	132 (55.7)
Unknown/unstaged	83 (17.1)	28 (11.8)
Tumor histology, n (%)		
Infiltrating ductal	391 (80.6)	196 (82.7)
Other	94 (19.4)	41 (17.3)

* ER, estrogen receptor;

** PR, progesterone receptor.

Table 3

Standard Initial Treatment for Early Breast Cancer by Race/Ethnicity, 1997–2001

	Whites	Blacks
Treatment received, <i>n</i> (%)	<i>n</i> = 328	<i>n</i> = 161
Standard breast cancer treatment *	195 (59.4)	98 (60.9)
Surgery	<i>n</i> = 485	<i>n</i> = 237
Breast conserving surgery (BCS) or mastectomy	470 (96.9)	229 (96.6)
No surgery	12 (2.5)	7 (3.0)
Of those with surgery:	<i>n</i> = 470	<i>n</i> = 229
BCS	230 (48.9)	119 (52.0)
Mastectomy	240 (51.1)	110 (48.0)
Of those with BCS:	<i>n</i> = 230	<i>n</i> = 119
Radiation	121 (52.6)	61 (51.3)
No radiation	109 (47.4)	57 (47.9)
Adjuvant therapy		
ER positive or PR positive	<i>n</i> = 247	<i>n</i> = 98
Hormonal therapy alone	110 (44.5)	47 (48.0)
Hormonal therapy plus chemotherapy	34 (13.8)	12 (12.2)
Chemotherapy alone	53 (21.5)	23 (23.5)
No therapy	50 (20.2)	16 (16.3)
ER negative and PR negative	<i>n</i> = 81	<i>n</i> = 63
Chemotherapy alone or with hormonal therapy	58 (71.6)	43 (68.2)
Hormonal therapy alone	12 (14.8)	10 (15.9)
No therapy	11 (13.6)	10 (15.9)

BCS, breast conserving surgery; ER, estrogen receptor; PR, progesterone receptor.

* Standard breast cancer treatment is defined as per NIH consensus recommendations (24).

Table 4

The odds of standard initial treatment for early breast cancer among blacks as compared to whites

Treatment received	Odds ratio (95% confidence intervals) [†]	
	Unadjusted	Adjusted
Standard breast cancer treatment	1.09 (0.77, 1.54)	0.95 (0.68, 1.33)
Surgery		
BCS or mastectomy versus no surgery	0.83 (0.32, 2.15)	0.70 (0.26, 1.91)
Of those with surgery:		
BCS versus mastectomy	1.13 (0.82, 1.55)	1.16 (0.82, 1.65)
Of those with BCS:		
Radiation versus no radiation	0.96 (0.62, 1.50)	1.11 (0.69, 1.80)
Adjuvant therapy		
ER positive or PR positive		
Hormonal therapy alone versus no therapy	1.33 (0.69, 2.58)	1.02 (0.49, 2.10)
Hormonal therapy alone versus hormonal therapy plus chemotherapy	1.21 (0.58, 2.54)	1.46 (0.61, 3.50)
ER negative and PR negative		
Chemotherapy alone versus no therapy	0.82 (0.32, 2.11)	0.62 (0.21, 1.85)

[†] adjusted for age, marital status, comorbidity, tumor stage, grade and histology. BCS, breast conserving surgery; ER, estrogen receptor; PR, progesterone receptor.