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Breast Cancer among Hispanic and non-Hispanic White Women in Arizona

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Abstract: **Background.** Breast cancer in Hispanic women is poorly understood and data on tumor hormone receptor status in this population are limited. **Methods.** Using data from the Arizona Cancer Registry, we assessed differences in tumor characteristics between Hispanic and non-Hispanic White (NHW) women using logistic regression modeling. 25,494 invasive breast cancer cases (23,657 NHWs and 1,837 Hispanics) reported to the cancer registry in 1995 to 2003 were included in the analysis. **Results.** In age-adjusted models, compared with NHW women, Hispanics were more likely to have high-grade cancers, larger tumors, a greater number of positive lymph nodes, and advanced stage at diagnosis. Hispanic women were less likely to have tumors that are both estrogen and progesterone receptor positive (ER+/PR+), particularly those under age 60. **Conclusions.** The profile of tumor presentation in Hispanic women in Arizona is consistent with a more aggressive disease pattern and less favorable prognosis than that of NHWs.

Key words: Breast neoplasms; carcinoma, ductal, breast; Hispanics; Mexican Americans; Arizona; southwestern United States.

Rates of breast cancer vary, with incidence and mortality rates in more industrialized nations exceeding those in lower-income countries by a factor of five or more.[1] In the United States, breast cancer incidence differs significantly among racial/ethnic groups, with rates higher among non-Hispanic Whites (NHWs) and lower among racial/ethnic minority groups, including Hispanics.[2] Among Hispanic women, breast cancer is the most commonly diagnosed cancer and is the leading cause of cancer

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death.[3] Data from the Surveillance, Epidemiology, and End Results (SEER) program indicate that for the period of 1992–2002, incidence rates remained stable in both Whites and Hispanics; furthermore, although cancer deaths have declined for both groups, the decline is less pronounced for Hispanics.[4] In addition, although breast cancer rates are lower in Hispanic than in NHW women in the U.S.,[2] published data indicate that the disease presentation among Hispanic women includes earlier age at diagnosis,[5-7] larger tumor size,[6] more advanced stage,[6-11] higher proportion of adverse prognostic indicators[9,12] and co-morbidities,[9] and poorer overall survival.[8,9,5,7] Reasons for these differences in clinical presentation include lower socioeconomic status leading to poor access to health care, cultural factors, population structure, and biological factors resulting in a more aggressive phenotype.[2,10,11,13]

Breast tumors can be divided into distinct subtypes,[14] partially defined by their hormone receptor status, which represent biologically distinct malignancies that likely arise from differences in environmental or genetic susceptibility.[15] A number of studies have shown that steroid hormone dependent tumors differ with respect to their biology and that these differences are clinically relevant in terms of treatment selection, response, and patient prognosis.[16] Furthermore, although most estrogen receptor positive (ER+) tumors are also progesterone receptor positive (PR+) and sensitive to hormone suppressive therapies, tumors that are ER+/PR- appear to differ in their sensitivity to these agents, particularly the aromatase inhibitors, compared to those that are positive for both receptors,[17,18] suggesting heterogeneity within steroid hormone positive tumors. Thus, not unexpectedly, recognized reproductive or hormone-based risk factors also appear to differentially associate with specific disease sub-types when stratified on hormone receptor status.[19,20] For example, Ma et al.,[19] recently reported that age at first birth and a higher number of children significantly reduced the risk of ER+/PR+ but not ER−/PR− breast cancers. In contrast, breastfeeding and late age at menarche decreased the risk of both receptor subtypes of breast cancer but with a stronger effect size for steroid receptor positive tumors than receptor negative tumors.

Little is known about the hormone receptor profile of breast tumors of Hispanic women in the U.S. Results based on national registry data indicate that Hispanic women with breast cancer may be less likely to have hormone receptor positive tumors than NHWs,[10,21,22] and less frequently have hormone receptor status determined.[22] These results are similar to those previously reported for African American women, who suffer the highest relative mortality from breast cancer across all racial/ethnic groups.[23]

Given the clear evidence for considerable diversity among breast tumors in terms of etiology, biology, and clinical significance, it is important to identify the type-specific presentation of breast cancer in diverse populations in order to gain a better understanding of the disease spectrum within and between populations. Given the paucity of information on characteristics of invasive breast cancers diagnosed in Hispanic women in the U.S., we used data from the Arizona Cancer Registry to assess differences in age, stage, histological grade and type, tumor size, as well as hormone receptor status between Hispanic and NHW women.

Methods

Data were obtained from incident breast cancer cases reported to the Arizona Cancer Registry, which is part of the Centers for Disease Control and Prevention's National Program of Cancer Registries. The registry is a member of the North American Association of Central Cancer Registries, which sets standards for data quality.[24] All hospitals, clinics, and physicians in Arizona report cancer cases, clinical characteristics, and selected demographic information for cases to the Arizona Cancer Registry. Analysis was limited to female invasive breast cancer cases whose racial/ethnic group was either NHW or Hispanic (of any race), who were 18 years of age or older, and who had complete and quality-checked data available for the period from January 1, 1995 to December 31, 2003.

Age at diagnosis and Hispanic ethnicity of the cases were collected from case report forms submitted to the Arizona Cancer Registry, which are reported directly by the hospitals, clinics, or physicians. Ethnicity data were missing from the case report for 10.5% of invasive breast cancer cases. Of these, 5.3% could be inferred based on surname using the Generally Useful Ethnic Search System (GUESS) developed by the New Mexico Tumor Registry,[25] and the remaining 5.2% could not be classified and were excluded from the analyses. Tumor characteristics collected from case reports include the following: tumor size, histology, number of positive lymph nodes, number of lymph nodes examined, histologic grade and stage, histologic type, and ER and PR status. Using number of lymph nodes examined and number of positive nodes, the nodal ratio (i.e., percentage of positive nodes) was calculated by the investigators.[26] Stage at diagnosis was classified according to the SEER summary staging criteria.[27] Grade was reported as well-differentiated (grade 1), moderately differentiated (grade 2), and poorly differentiated or undifferentiated (grade 3). Histological types were classified according to the International Classification of Diseases for Oncology, Second and Third Editions (ICD-O-2 and ICD-O-3, respectively),[28,29] where cases diagnosed from 1995 to 2000 were coded using ICD-O-2 and those diagnosed from 2001 to 2003 were coded using ICD-O-3. These codes were used to categorize the cases into seven invasive histologic type categories: ductal carcinoma, lobular carcinoma, mixed ductal/lobular carcinoma, tubular adenocarcinoma or cribriform carcinoma, medullary carcinoma, mucinous adenocarcinoma, and inflammatory carcinoma. A category of *other invasive* histological types was created, which included adenoid cystic carcinoma, adenosquamous carcinoma, apocrine adenocarcinoma, metaplastic carcinoma, secretory carcinoma, and squamous cell carcinoma not further specified. Where the histological type code used was too vague to be categorized (e.g., neoplasm or carcinoma with no other specification of type), the cases were classified as Other/Unclassified. Twenty-nine cases of lymphoma were excluded. For the analyses of ER and PR status, borderline data were excluded.

Associations between Hispanic ethnicity and invasive breast cancer characteristics were evaluated by multinomial logistic regression using the Stata version 9.2 statistical software (College Station, TX). Ethnicity was modeled as the independent variable and non-Hispanic Whites served as the reference group. Odds were defined against one category of the dependent variable (i.e., tumor characteristics), which serves as the

contrast for all other categories. Given the difference in the age distributions between Hispanics and NHWs and because several breast cancer characteristics are known to be associated with age,[30-32] odds ratios (ORs) and 95% confidence intervals (CIs) are adjusted for age at diagnosis by including age as a continuous variable in the models.

Results

A total of 25,494 cases (23,657 NHWs and 1,837 Hispanics) comprised the study population of invasive breast cancer cases. Age and clinical characteristics of the study population according to Hispanic ethnicity are presented in Table 1. Although all characteristics were statistically different between the two ethnic groups, these were largely driven by the large sample size and were not noted in the table. Hispanic women with invasive breast cancer were more likely to be younger than NHWs; the mean, median, and interquartile range values are 56.3, 55, and 46–67 years, respectively, for Hispanics and 63.4, 65, and 53–74 for NHWs ($p<.0001$). A greater proportion of Hispanic compared to NHW women had poorly or undifferentiated cancers, larger size tumors, a higher number of positive lymph nodes, and higher percentage of distant disease. Although the proportion of unknown or missing data varies across specific characteristics, this was not materially different between Hispanic and NHW cases.

Table 2 presents the distribution of data for hormone receptor status for Hispanic and NHW women. We present the data as reported by the registry in order to gain

Table 1.

AGE AND CLINICAL CHARACTERISTICS OF WOMEN DIAGNOSED WITH INVASIVE BREAST CANCER: ARIZONA CANCER REGISTRY, 1995–2003

Characteristic	Non-Hispanic Whites (n=23,657)	Hispanics (n=1,837)
Age at diagnosis, years n (%)		
18–39	991 (4.2)	207 (11.3)
40–49	3,269 (13.8)	453 (24.7)
50–59	4,983 (21.1)	441 (24.0)
60–69	5,678 (24.0)	372 (20.3)
70–79	5,965 (25.2)	263 (14.3)
80+	2,771 (11.7)	101 (5.5)
Mean age at diagnosis (s.d.)	63.4 (13.7)	56.3 (13.8)
Tumor grade, n (%)		
Grade 1 (well differentiated)	4,387 (18.5)	209 (11.4)
Grade 2 (moderately differentiated)	8,587 (36.3)	595 (32.4)
Grade 3 (poorly or undifferentiated)	7,155 (30.2)	715 (38.9)
Unknown	3,528 (14.9)	318 (17.3)

(Continued on p. 134)

Table 1 *(continued).*

Characteristic	Non-Hispanic Whites (n=23,657)	Hispanics (n=1,837)
Size of primary tumor, n(%)		
<1 cm	4,061 (17.2)	210 (11.4)
≥ 1 and <2 cm	8,602 (36.4)	556 (30.3)
≥2 and <5 cm	7,304 (30.9)	695 (37.8)
≥5 cm	1,356 (5.7)	170 (9.3)
Unknown, microscopic only, diffuse, or no mass found	2,334 (9.9)	206 (11.2)
Mean size (s.d.)	2.1 (1.9)	2.5 (2.5)
Number of positive lymph nodes, n (%)		
0	13,379 (56.6)	863 (47.0)
1–3	4,163 (17.6)	413 (22.5)
4–9	1,560 (6.6)	155 (8.4)
≥10	782 (3.3)	89 (4.8)
Unknown/not done	3,773 (16.0)	317 (17.3)
Mean nodal ratio[a] (s.d.)	.11 (0.23)	.15 (0.26)
Stage, n (%)		
Local	14,798 (62.6)	945 (51.4)
Regional	6,819 (28.8)	696 (37.9)
Distant	682 (2.9)	76 (4.1)
Unknown	1,358 (5.7)	120 (6.5)
Histology, n (%)		
Ductal	17,545 (74.2)	1,454 (79.2)
Lobular	2,689 (11.4)	142 (7.7)
Mixed ductal/lobular	1,926 (8.1)	116 (6.3)
Tubular or cribriform	369 (1.6)	12 (0.7)
Medullary	195 (0.8)	37 (2.0)
Mucinous	679 (2.9)	47 (2.6)
Inflammatory	141 (0.6)	19 (1.0)
Other invasive[b]	113 (0.5)	10 (0.5)

[a]Ratio represents positive/examined.
[b]Includes adenoid cystic carcinoma, adenosquamous carcinoma, apocrine adenocarcinoma, metaplastic carcinoma, secretory carcinoma, and squamous cell carcinoma not further specified.

an appreciation of their full range of reporting, including unknown and missing data. Using cases with complete data on receptor status, results show that women of Hispanic ethnicity have a lower proportion of ER and PR positive tumors than NHW women.

We next conducted age-adjusted polytomous regression models for stage, size of tumor, grade, and histology type in relation to Hispanic ethnicity (Table 3). Compared with NHW women, Hispanics are significantly more likely to be diagnosed with moderately differentiated (OR=1.38; 95% CI=1.17–1.62) or poorly differentiated or

Table 2.

HORMONE RECEPTOR STATUS OF WOMEN DIAGNOSED WITH INVASIVE BREAST CANCER: ARIZONA CANCER REGISTRY, 1995–2003

Receptor status	Non-Hispanic Whites (n=23,657)	Hispanics (n=1,837)
ER status, n (% of all cases)		
Positive	13,520 (57.2)	931 (50.7)
Negative	3,499 (14.8)	385 (21.0)
Borderline	33 (.1)	5 (.3)
Ordered, results unknown	816 (3.5)	63 (3.4)
Testing not done	942 (4.0)	97 (5.3)
Unknown/no data	4,847 (20.5)	356 (19.4)
ER+, n (% of known results)[a]	13,553 (79.5)	936 (70.9)
ER−, n (% of known results)	3,499 (20.5)	385 (29.1)
PR status, n (% of all cases)		
Positive	11,606 (49..06)	786 (42.8)
Negative	5,244 (22.17)	519 (28.3)
Borderline	59 (.25)	11 (.6)
Ordered, results unknown	816 (3.45)	64 (3.5)
Testing not done	947 (4.0)	94 (5.1)
Unknown/no data	4,985 (21.07)	363 (19.8)
PR+, n (% of known results)	11,665 (69.0)	797 (60.6)
PR−, n (% of known results)	5,244 (31.0)	519 (39.4)
ER and PR positive, n (% of known results)	11,167 (66.8)	762 (58.4)

[a]Known results indicate test was done and result was positive or negative (excludes borderline).
ER = estrogen receptor
PR = progesterone receptor

undifferentiated disease (OR=1.74; 95% CI=1.48–2.04), with tumors 5 cm or larger in size (OR=2.18; 95% CI=1.76–2.70), with a higher number of positive lymph nodes (OR=1.57; 95% CI=1.25–1.98 for ≥10 positive nodes vs. none), and with distant disease (OR=1.65; 95% CI=1.29–2.12). As noted in the methods, we categorized the reported invasive cancer histological types into seven groups and an other category. Using ductal invasive carcinomas as the referent group, Hispanic women were significantly less likely than NHW women to have lobular (OR=.73; 95% CI=.61–.87), mixed ductal and lobular (OR=.77; 95% CI=.63–.93), and tubular or cribriform histological types (OR=.42; 95% CI=.24–.75). However, the proportion of medullary invasive breast cancer was significantly higher in Hispanics than in NHWs (OR=1.82; 95%

Table 3.

ODDS RATIOS FOR AGE AND INVASIVE[a] BREAST CANCER CHARACTERISTICS ACCORDING TO HISPANIC ETHNICITY

Characteristic[c]	Non-Hispanic Whites (n=23,657)	Hispanics (n=1,837)	Odds ratio[b] (95% CI)
Tumor grade, n (%)			
Grade 1 (well differentiated)	4,387 (21.8)	209 (13.8)	1.00
Grade 2 (moderately differentiated)	8,587 (42.7)	595 (39.2)	1.38 (1.17–1.62)
Grade 3 (poorly or undifferentiated)	7,155 (35.6)	715 (47.1)	1.74 (1.48–2.04)
Size of primary tumor, n (%)			
<1 cm	4,061 (19.1)	210 (12.9)	1.00
≥1 and <2 cm	8,602 (40.3)	556 (34.1)	1.24 (1.05–1.46)
≥2 and <5 cm	7,304 (34.3)	695 (42.6)	1.71 (1.46–2.01)
≥5 cm	1,356 (6.4)	170 (10.4)	2.18 (1.76–2.70)
Number of positive lymph nodes, n (%)			
0	13,379 (67.3)	863 (56.8)	1.00
1–3	4,163 (20.9)	413 (27.2)	1.37 (1.21–1.55)
4–9	1,560 (7.9)	155 (10.2)	1.34 (1.12–1.61)
≥10	782 (3.9)	89 (5.9)	1.57 (1.25–1.98)
Stage, n (%)			
Local	14,798 (66.4)	945 (55.0)	1.00
Regional	6,819 (30.6)	696 (40.5)	1.40 (1.26–1.55)
Distant	682 (3.1)	76 (4.4)	1.65 (1.29–2.12)
Histology, n (%)			
Ductal	17,545 (74.2)	1,454 (79.2)	1.00
Lobular	2,689 (11.4)	142 (7.7)	.73 (.61–.87)
Mixed ductal/lobular	1,926 (8.1)	116 (6.3)	.77 (.63–.93)
Tubular or cribriform	369 (1.6)	12 (.7)	.42 (.24–.75)
Medullary	195 (.8)	37 (2.0)	1.82 (1.27–2.62)
Mucinous	679 (2.9)	47 (2.6)	1.08 (.80–1.47)
Inflammatory	141 (.6)	19 (1.0)	1.38 (.85–2.24)
Other invasive[d]	113 (.5)	10 (.5)	1.21 (.63–2.33)

[a]Includes all cases with stage 1 or greater and invasive histology.
[b]Odds ratios are adjusted for age at diagnosis using polytomous logistic regression where the independent variable is ethnicity and non-Hispanic Whites serve as the reference category. Odds are defined against one category of the dependent variable, which serves as the contrast for all other categories. N varies because of missing data or unknown values.
[c]Sample size for characteristics varies due to different proportion of missing data for each.
[d]Includes adenoid cystic carcinoma, adenosquamous carcinoma, apocrine adenocarcinoma, metaplastic carcinoma, secretory carcinoma, and squamous cell carcinoma not further specified.

CI=1.27–2.62). No significant differences were shown for mucinous or inflammatory breast cancers.

Associations for hormone receptor status show that breast cancers diagnosed in Hispanic women are approximately 25% less likely to be positive for ER or PR than those diagnosed in NHWs (Table 4). In our analysis of the different receptor combinations, using women negative for ER and PR (ER−/PR−), Hispanic women were less likely to have ER+/PR− (OR=.82), ER−/PR+ (OR=.65), and ER+/PR+ (OR=0.69) tumors. Because we observed differences in age as well as hormone receptor status between the two ethnic groups, we assessed whether the differences in ER/PR receptor status differed by age. As shown in Figure 1, larger and more uniform differences in hormone receptor status are shown for women younger than 60 years of age.

Discussion

Although breast cancer incidence and mortality rates are lower in Hispanic than in NHW women, the most recent data from the American Cancer Society indicate that

Table 4.

ODDS RATIOS FOR ESTROGEN RECEPTOR AND PROGESTERONE RECEPTOR STATUS AMONG INVASIVE BREAST CANCER CASES ACCORDING TO HISPANIC ETHNICITY

Hormone receptor status[a]	Non-Hispanic Whites	Hispanics	Odds ratio[b] (95% CI)
ER status, n (%)			
Negative	3,499 (20.5)	385 (29.1)	1.00
Positive	13,553 (79.5)	936 (70.9)	.75 (.66–.85)
PR status, n (%)			
Negative	5,244 (31.0)	519 (39.4)	1.00
Positive	11,665 (69.0)	797 (60.6)	.74 (.66–.83)
ER and PR status, n (%)			
ER−/PR−	3,057 (18.3)	355 (27.2)	1.00
ER+/PR−	2,135 (12.8)	161 (12.3)	.82 (.67–1.00)
ER−/PR+	352 (2.1)	27 (2.1)	.65 (.43–.98)
ER+/PR+	11,167 (66.8)	762 (58.4)	.69 (.60–.79)

[a]Sample size varies due to missing or unknown ER or PR values.
[b]Odds ratios are adjusted for age at diagnosis using polytomous logistic regression where the independent variable is ethnicity and non-Hispanic Whites serve as the reference category. Odds are defined against one category of the dependent variable, which serves as the contrast for all other categories. N varies due to missing or unknown ER or PR values.
ER = estrogen receptor
PR = progesterone receptor

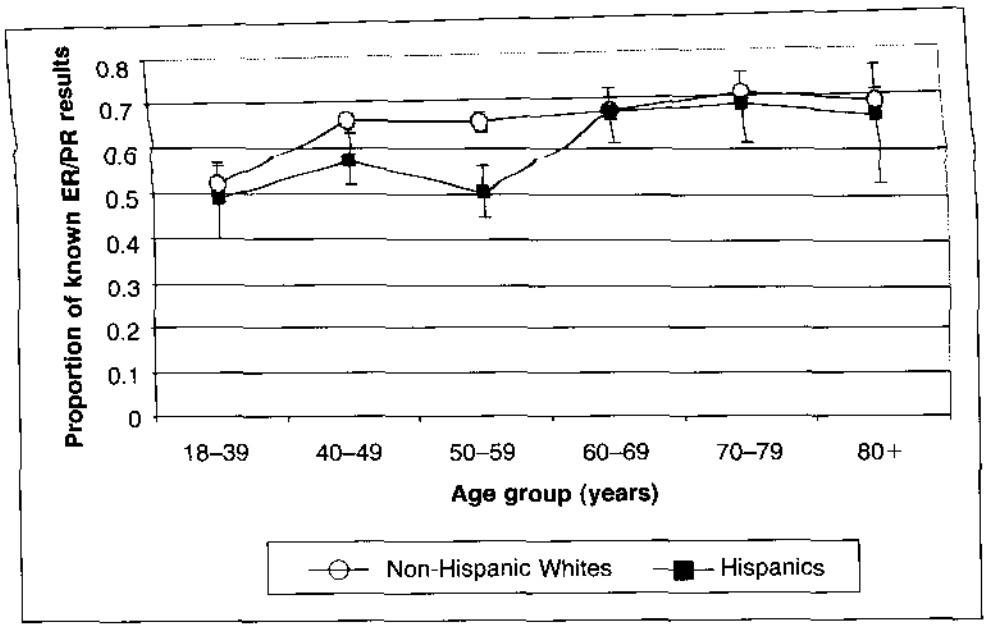

Figure 1. Proportion of ER and PR positive invasive breast cancers in Hispanic and non-Hispanic White women according to age.
ER = estrogen receptor
PR = progesterone receptor

Hispanic women with breast cancer are 22% more likely to die of their disease than NHWs.[4] The higher mortality from breast cancer among Hispanic women might be due to differences in the pattern of prognostic and predictive factors. Results of our analyses corroborate important differences with respect to age, clinical characteristics, and hormone receptor status between Hispanic and NHW women residing in Arizona who present with breast cancer.

As has been reported in African American women,[23,33-35] our study found that Hispanic women were more likely to be younger at diagnosis than NHWs. This perhaps reflects differences in the age distribution of the two populations, where the median age of Hispanic females in Arizona is 24.3 and that of NHWs is 41.6 years.[36] Early age at diagnosis is associated with poorly differentiated tumor types and low ER and PR positivity.[23,37,38] In agreement with published reports,[2,6-11,22] results of our data show that women of Hispanic descent diagnosed with breast cancer present with larger tumors, higher grade disease, and more advanced stage. Tumor size and lymph node status are considered to be the two most important prognostic indicators for breast cancer,[39,40] and along with presence of distant metastasis, provide the basis for the current tumor staging system.[41] It is well recognized that survival is substantially lower among women with distant stage disease than those with localized disease.[42]

Hormone receptor positive tumors are known to be associated with a more favorable outcome, particularly tumors that are both ER and PR positive, given that this characteristic largely predicts response to hormonal therapies and reflects less aggressive

biology.[43,44] Few data exist on hormone receptor status in Hispanic breast cancer cases, [illegible] from population-based studies. In our study, Hispanic women were less likely to have tumors that were positive for both ER and PR, which was also shown in the SEER registry data.[10,22] Furthermore, when we explored whether a crossover effect occurred around the age of menopause, we found that the difference by hormone receptor status positivity was confined to younger women. The reason for this difference is unclear.

Our data on histological type indicate that Hispanic women present with a lower proportion of lobular and tubular carcinomas, which are known to be associated with a lower malignant potential.[45] We speculate that less common use of postmenopausal hormone replacement therapy among Hispanics[46,47] may partly explain the observed lower rates of lobular breast cancer, low grade disease, and tumors with good prognostic features in this population given the recent findings of Borgquist et al.;[48] however, this deserves further study. Interestingly, similar to SEER data, Hispanic women in Arizona were more likely than NHWs to be diagnosed with medullary breast carcinomas.[22] Medullary carcinomas are a rare, pathologic distinct subtype of breast cancer with low ER and PR positivity[49] that tend to present in younger women[45,50] and that are strongly associated with germ-line or acquired mutations in the *BRCA1* gene.[45] Paradoxically, despite features of aggressiveness, medullary carcinomas have been associated with a more favorable prognosis.[51,52] This may be explained in part by the recent demonstration that medullary breast carcinomas have strong basal-like features[53] and thus may exhibit enhanced sensitivity to chemotherapy regimens compared with other breast tumor subtypes.[54,55] Analyses from SEER data show that while Caucasian women had a significantly lower risk of death from medullary breast carcinomas, this was not the case for African American women.[23] This specific disparity in outcome may reflect medical inadequacies and care access impediments affecting underserved populations,[56] differences in biologic characteristics and behavior of tumors arising in different ethnic groups,[57] or a combination of these. At present, the prognosis for Hispanic women with medullary carcinomas is unknown. However, limited access to care and delays and inadequacies in treatment in the Hispanic population may adversely affect outcomes for medullary carcinomas, as has been observed in African American women.

For the present study, it is unknown if the observed differences between NHW and Hispanic breast cancer cases are due to differences in the population's reproductive characteristics, given that these data are not available in the Arizona Cancer Registry. Additionally, using registry data, we are unable to assess the importance of factors such as access to care and other socioeconomic and cultural factors suggested to influence disease outcomes differentially between populations.[58,59] Data from the Behavioral Risk Factor Surveillance System (BRFSS) clearly underscore major differences in key determinants of breast cancer outcomes between Hispanics and NHWs in Arizona.[60] These include lower annual income, lower level of education, and a higher proportion with no health care coverage among Hispanics than among Whites. Although it has been reported that rates of mammography screening among Hispanics are low, especially among Mexican Americans,[61] recent BRFSS data for Arizona do not point to low mammography use (77.6% for Whites and 76.8% for Hispanics) as a major determinant of our findings.

Whether differences related to poverty, acculturation, and other socioeconomic factors are responsible for differences in disease presentation between Hispanics and NHWs, or whether these differences are biological in nature and reflect the younger age of the population and distinct subtype specific presentation, is a topic of considerable debate. In the Annual Report to the Nation on the Status of Cancer,[2] it was noted that the proportion of regional/distant breast cancer increased with increasing poverty index among Hispanics but not NHWs. In addition, Miller et al.,[10] found that 50 to 80% of the elevated risk for advanced disease among ethnic minority populations could be explained by sociodemographic factors. However, these results are in contrast to data from Lantz et al.,[11] where early-stage breast cancer diagnosis was significantly less common in Hispanics than in NHWs independent of socioeconomic factors. More recently, Watlington, et al.[13] compared clinical breast cancer characteristics between Hispanic and NHWs in a setting of equal access to care and found differences similar to those found in our study. The authors conclude that their findings support the presence of underlying biologic differences in the disease between the groups. Understanding the complex dynamic that exist between breast tumor biology in subpopulations (i.e., presence of more aggressive disease types) and the influence of poverty and culture (e.g., inadequate treatment) is essential to effectively reducing disparities between populations.

A major strength of our study relates to its population-based design, given that we relied on data reported to the Arizona Cancer Registry. Because 82% of the Hispanic population in Arizona is of Mexican descent,[36] this minimizes potential heterogeneity within the Hispanic category related to risk factors and disease outcome; however, this also limits the generalizability of our results to this specific Hispanic group. Limitations of our data also pertain to the incomplete and missing data for several of the characteristics of interest. Although the proportion of missing data are similar for both ethnic groups, if these missing data reflect a pattern different from those with complete data, our results will be inaccurate. In addition, the lack of standardization for ER and PR expression as well as centralized pathological review is a weakness in the data.

Limitations with respect to ascertainment of ethnicity must also be acknowledged. Since data on Hispanic ethnicity are reported to the registry from the health care settings, there is potential for misclassification.[62-64] Results of a study conducted in the Greater Bay Area Cancer Registry, a SEER site, show that only 53% of people self-identified as Hispanic (by personal interview) were classified as such by the registry.[63] Furthermore, in a recent publication, misclassification was shown to be associated with younger age at diagnosis, having been married, being female, being foreign-born, and cancer diagnosis in a larger hospital,[62] variables that are applicable to our study population. Unfortunately, we are unable to assess the extent of misclassification in our population. As noted in the methods, when data are missing for ethnicity (applicable to 10.5% of our study population) the records are run through the GUESS program, which has been shown to be a highly sensitive means of identifying Hispanics of Mexican and Central American descent.[63]

The significance of our study is underscored by the rapid increase in the number of people of Hispanic origin in the U.S. According to the 2004 U.S. Census, Hispanics became the largest minority group during the preceding decade, with 41.3 million individuals (14% of the overall population).[65] With the continued projected growth

and aging of the Hispanic population within the U.S. over the coming decades, a better understanding of the clinical presentation for breast cancer, including the specific subtypes of breast tumors occurring in the Hispanic population, is warranted.

Conclusion

Our study indicates that the profile of breast cancer in Hispanic women is consistent with a pattern of more aggressive disease and less favorable prognosis relative to NHWs. Future studies are needed to address not only differences in breast cancer rates by ethnic group but also the type or spectrum of breast cancer that affects specific populations. It will be important for these future studies that cancer registries across the country continue to improve methods of Hispanic ethnicity ascertainment and classification. As differences in the distribution of breast tumor subtypes emerge among populations, studies that systematically address the etiologic factors and mechanisms involved will be warranted. Undoubtedly, these studies will require large samples that include comprehensive epidemiological and risk factor data, as well as tumor tissue and other biological specimens. For Hispanic women, a further informative step might involve the conduct of studies involving women in the U.S. and those in their country of origin. Increasing our understanding of breast cancer among Hispanics to the level of what is known for NHW women has important implications for guiding approaches to optimizing screening, diagnostic, and treatment programs for Hispanic women in the U.S.

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