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Breast cancer survival of Hispanic women in the USA is influenced by country of origin

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Abstract

Aim—People of Hispanic origin comprise nearly 16 percent of the (US) population. With the growing population of Hispanics in the USA, an important epidemiological question is whether their country of origin affects survival in Hispanic women living in the USA at the time of diagnosis of breast cancer.

Methods—We searched the Surveillance Epidemiology and End Results (SEER) database for Hispanic women with a single primary breast cancer with known country of origin diagnosed between 1973 and 2008. Univariate and multivariate analyses were performed to evaluate whether the country of origin was an independent predictor of survival.

Results—In total, 48 849 female breast cancer patients of Hispanic origin were included in the SEER database. Nearly 23 percent of them had an origin in Mexico, 9 percent in South or Central America 3 percent in Puerto Rico, 2 percent in Cuba, 0.3 percent in the Dominican Republic and 3 percent in other countries, including Europe. About 60 percent of patients were identified as Hispanic by their surname or classified as Spanish/Hispanic not otherwise specified. Median survival of patients in these groups was 204, 240, 142, 169, 82.4, 115.5 and 210 months,

respectively ($P < 0.0001$ by log-rank test). Univariate and multivariate analysis showed that the country of origin was an independent predictor of survival in Hispanic women with breast cancer.

Conclusion—The country of origin is an independent predictor of overall survival among Hispanic women diagnosed with breast cancer.

Keywords

breast cancer; Hispanic; Latino; Spanish

INTRODUCTION

According to the US Census Bureau, people of Hispanic origin comprise persons of any race who have their origin in Mexico, Puerto Rico, Cuba, Central or South America or have some other proof of Hispanic origin like a surname. It is estimated that there are roughly about 47.8 million people of Hispanic origin in the USA as of 2010 comprising about 16 percent of the total population).¹ According to the American Cancer Society the age-adjusted rate of breast cancer from 2004–2008 among Hispanic women was 91 per 100 000 women, with an average annual percentage change (AAPC) of 0.6 percent. The mortality among Hispanic women with breast cancer during this period was 15.3 per 100 000 person-years with a AAPC of –2 percent.² While the overall picture suggests increasing incidence with declining mortality in this group of patients, it would be helpful to know whether women from certain countries have a better (or worse) outcome, as countries differ markedly in their social customs, cultural practices and genetic predilection to disease.

Previous studies have shown that many Hispanic women tend to face social and cultural barriers that sometimes prevent them from seeking screening tests like mammograms. These include a fatalistic attitude towards cancer, a spiritual belief that occurrence of cancer is God's will and hence early detection will not alter the outcome, and an inhibition against breasts being imaged or examined by physicians, particularly male doctors.³ It is possible that these attitudes may also influence the therapeutic options chosen by patients who are diagnosed with breast cancer. Residence in the USA may alter the risk of breast cancer among women, as shown in a study by Keegan *et al.*, who noted that Hispanic women from California who were born in the USA had a significantly higher prevalence of risk factors for breast cancer than those born outside the USA.⁴ Another study concluded that Hispanic women who were more acculturated to US society were more likely to receive a mammogram or clinical breast examination than those who were less acculturated.⁵ Thus, it appears that the epidemiology of breast cancer among Hispanic women is complex and involves sociocultural factors in addition to genetic and environmental influences. The objective of our study was to investigate whether the country of origin had an influence on the survival of Hispanic women living in the USA once they were diagnosed with breast cancer. We hypothesized that the country from where these patients trace their origin influences their prognosis. In order to investigate this hypothesis, we analyzed data on female Hispanic breast cancer patients available in the US Surveillance Epidemiology and End Results (SEER) database.

METHODS

The lead author (SC) had obtained permission from the SEER database to use SEER data. No further approval was required from the institutional research board. We first searched the SEER database for female breast cancer patients included in the database between 1973 and 2008. Next, non-Spanish, non-Hispanic patients were excluded. Once all the cases had been retrieved, they were first filtered by the number of primary cancers (one vs multiple). Those patients with breast cancer as the only primary cancer were then placed into seven groups based on their country of origin: Cuba (group 1), Dominican Republic (group 2), Mexico including Chicano (group 3), Puerto Rico (group 4), South or Central America (group 5), other Spanish/Hispanic origin including European (group 6), and those whose Hispanic origin was identified only from their surname or who were Hispanic but did not meet any of the aforementioned criteria (Spanish/Hispanic/Latino not otherwise specified [NOS]) grouped into a single group 7.

The prevalence, incidence and relative survival of breast cancer patients was determined using SEER Stat software version 7.0.5.⁶ Additional analyses were conducted with PASW Statistics package vers. 18.0 (IBM, Armonk, NY, USA). The Kaplan–Meier method was used to estimate the overall survival (OS) distribution and the multivariate analysis of OS employed the Cox proportional hazards model. In the multivariate analysis patients with missing data were allocated to a separate group called “unknown” and included in the final analysis. OS was defined as the time from first detection of the malignancy to date of death or last follow up. Age and median family income were transformed into categorical variables for univariate and multivariate analysis. Country of origin, tumor histology, grade, stage, hormone receptor expression status and therapy (surgery and radiation) were considered as categorical variables. An ANOVA was used to compare mean values for continuous variables while a χ^2 test was applied to categorical variables. For multiple comparisons between groups, an adjusted *P*-value was calculated after applying a Bonferroni correction. Data are presented as means (or proportions) with 95% confidence intervals. A *P*-value <0.05 was considered significant.

RESULTS

The incidence and prevalence of breast cancer among women of Hispanic/Spanish/Latino origin was 8.5 (standard deviation [SD]: 0.2) (95% CI: 8.1–8.8) per 100 000 person-years and 0.49 percent (as of 1 January, 2008), respectively. In comparison, the incidence and prevalence of breast cancer in non-Hispanic/Spanish/Latino women was 11.5 (SD: 0.1) (95% CI 11.3–11.6) per 100 000 person-years and 0.72 percent, respectively. A total of 60 478 patients meeting the inclusion criteria was identified from the SEER database. This included 48 849 patients with only one primary tumor and 11 629 patients with breast cancer as one of two or more primaries. Of those in whom breast cancer was the only primary cancer, 4648 (10%) were non-Spanish, non-Hispanic and in 245 cases the patients' ethnicity was unknown. These were excluded from the study. Finally, 43 956 patients who were of Spanish/Hispanic origin and in whom breast cancer was the only malignancy were left for analysis (Fig. 1). Of these, most (23%) were of Mexican and South or Central American origin (9%). About 3 percent of the women were from Puerto Rico, 2 percent from Cuba and

0.3 percent from the Dominican Republic. Over 3 percent of patients were Spanish patients from other countries, including Europe. About 60 percent of patients were classified as Spanish, Latino or Hispanic (NOS), or identified as Spanish by their surname only (Table 1).

Patient and tumor characteristics

Age at diagnosis of breast cancer—We first sought to determine the mean age of onset of breast cancer among Hispanic women. The highest mean age of onset for breast cancer was noted in Spanish women of Cuban origin (mean $\pm$ SD 63.6 $\pm$ 13.8 years) while women who were from Mexico had the lowest age at onset (mean $\pm$ SD 53.4 $\pm$ 13.9 years) with other groups being intermediate. The mean age of onset in women of Cuban origin was significantly higher than that in all other groups (adjusted $P < 0.0001$) (Table 1).

We further subdivided the patients in each of the groups where a country of origin was known (6/8 groups) into three age groups: 0–30 years, 31–60 years and 61 years. Patients aged 31–60 years comprised the major portion of newly diagnosed breast cancer cases (65%), with younger and older patients comprising a smaller number (2 and 33%, respectively). Group 1 was distinct in that most (62%) patients in this group were aged 61 years and older at the time of the breast cancer diagnosis.

Histologic type of breast cancers—Breast cancers were classified into six histological types, as suggested by Gathani *et al.*⁷ Invasive ductal carcinoma (6%), invasive lobular (26%), invasive tubular (3%), invasive mixed ductal, lobular carcinoma (29%), mucinous (9%), other invasive carcinomas (25%) and Paget's disease (3%).⁷ Women from South or Central America had the highest percentage of invasive ductal carcinomas (9%). Lobular carcinomas and Paget's disease were most common in women from the Dominican Republic (36 and 4%, respectively) (Table 1).

Tumor grade—About 13 percent of all breast cancers were well differentiated, 32 percent moderately differentiated, 37 percent poorly differentiated and 2 percent undifferentiated. In about 16 percent of patients, information on tumor grade was unavailable. The mean age of onset of well, moderately, poorly differentiated and undifferentiated tumors was 59.2 ($\pm$ 13.0), 56.7 ($\pm$ 13.7), 52.6 ($\pm$ 13.7) and 52.0 ($\pm$ 13.7) years, respectively. The age of onset of well and moderately differentiated breast cancers was significantly higher than that of poorly differentiated and undifferentiated breast cancers ($P < 0.0001$). The age of onset of well differentiated breast cancer was also significantly higher than that of moderately differentiated breast cancer ($P < 0.0001$). The highest proportion of well differentiated tumors was seen among women with an origin in Cuba (14%) while women from the Dominican Republic had the highest proportion of poorly differentiated cancers (51%) (Table 1).

Tumor stage—About 30 percent of breast cancers in the study population had localized disease at the time of diagnosis, 41 percent had regional spread of the tumor and 4 percent had metastatic disease at the time of diagnosis. In about 26 percent of patients, information on tumor stage was missing. The mean (SD) age of diagnosis of localized versus regional or distant spread tumors was 53.0 (13.4) years, 56.9 (13.6) years and 57.1 (15.1) years

respectively. Age at diagnosis of patients with localized tumors was significantly less than in that of patients with regional or distant spread ($P < 0.0001$). Women from the Dominican Republic constituted the highest proportion of cases with both localized and metastatic cancer at diagnosis (38 and 6%, respectively).

Hormone receptor status of the tumor—Overall, nearly 28 percent of breast cancers were estrogen receptor (ER) positive while 11 percent were ER negative. In about 20 percent of cases, ER expression was either borderline, not done, ordered but without a documented result or unknown. The corresponding percentages for progesterone receptor (PR) expression were 23 percent, 14 percent and 21 percent, respectively. In about 42 percent of patients, information on hormone receptor expression in their tumors was missing. Women in group 6 (other countries including Europe) had the highest incidence of ER and PR positivity (43 and 33%, respectively, Table 1).

Treatment characteristics of breast cancer patients

Surgery at site of primary tumor—Based on whether surgery was performed at the primary site or not, we identified three groups of patients: those in whom surgery was not recommended (4%, group 1), those in whom it was recommended but not performed (either because of patient's refusal or other unknown reason, 2%, group 2) and those in whom surgery was recommended and performed (93%, group 3). In about 0.7 percent of patients, information on cancer-directed surgery was either missing or it was not known whether it was performed. The mean age (SD) of patients in these three groups was 58.8 (± 16.2), 60.2 (± 16.2) and 55.3 (± 13.8) years, respectively. The difference in mean age was significant ($P < 0.0001$) for all groups except groups 1 and 2, where it was marginally significant ($P = 0.069$). Patients who underwent surgery were significantly younger than those who did not ($P < 0.0001$). Group 6 had the highest percentage of patients in whom surgery was recommended but not performed (6%) while in the other groups it ranged from 1.8–2.7 percent.

Nearly 8 percent of patients underwent a total or bilateral mastectomy, 5 percent underwent a modified radical mastectomy, 38% underwent a partial mastectomy, 0.2 percent underwent a radical or extended radical mastectomy and 0.04 percent underwent a subcutaneous mastectomy. In about 45 percent of patients, the type of breast cancer surgery was unknown (data not shown).

Radiation therapy—Overall, about 43 percent of all patients received therapeutic radiation of some sort (including beam radiation alone or in combination with implants, radioisotopes or radioactive implants). In about 1 percent of all patients radiation was recommended but they refused. In about 53 percent of patients, radiation was not recommended and not administered. In 4 percent of patients, information on radiation therapy was missing. All six groups with known countries of origin (i.e. groups 1–6) had a similar proportion of patients receiving radiation (ranging from 44 to 49%). The mean age (SD) at diagnosis of patients who received radiation therapy was 54.2 (± 13.0) years, which was significantly lower than that of patients who either received no radiation (56.7 ± 14.7) or who refused it (61.8 ± 16.3) ($P < 0.0001$).

Radiation therapy with or without surgery—About 1 percent of all patients received radiation therapy prior to surgery, about 40 percent received it after surgery and about 0.3 percent received it both before and after surgery. In about 58 percent of cases neither radiation nor surgery was given, while in 0.3 percent of cases both were given but the sequence was unknown (data not shown).

Impact of country of origin on survival in Hispanic women with breast cancer

Having examined the demographic, tumor and treatment characteristics of Hispanic breast cancer patients, we next investigated the impact of country of origin on the OS of these patients.

The Kaplan–Meier univariate analysis revealed that women who had their origin in South or Central America had the longest median OS (240 months) while those from the Dominican Republic the shortest (82.4 months). The country of origin was a significant predictor of OS in Hispanic women with breast cancer. Patients in whom surgery was recommended and performed showed a significantly longer median survival than those in whom it was either not recommended or who refused it despite recommendation (median survival 219, 25 and 36.5 months, respectively). The type of surgery, radiation therapy (in those in whom it was recommended) and radiation after surgery were other treatment-associated factors that predicted a longer survival among Hispanic breast cancer patients (Table 2).

A multivariate analysis revealed that the country of origin was a significant independent predictor of survival (Fig. 2). Women from South and Central America had a 25 percent lower risk while those from Puerto Rico had a 26 percent higher risk of death compared to those from Cuba. The other factors that remained significant independent predictors of OS in these patients included a higher median family income, age < 30 years at the time of diagnosis, localized and well differentiated tumors, tumor histology (patients with tubular carcinoma had a nearly 31% less chance of death than those with ductal carcinoma), radiation therapy (patients refusing radiation despite recommendation had a 52% greater risk of death), surgery (nearly 45% lower risk of death in patients in whom surgery was recommended and performed versus those who refused surgery), type of breast cancer surgery and the sequence of radiation therapy with surgery (radiation therapy after surgery was associated with a 14% lower risk while that before surgery increased the risk of death by 33%). ER and PR expression was an independent favorable prognostic factor in these patients (Table 3)

DISCUSSION

In the SEER database, people of Spanish surname or origin are classified into six groups based on their country of origin (Cuba, Dominican Republic, Mexico, Puerto Rico, South/Central America and other countries including Europe). There are two additional categories—patients who are Hispanic by surname only and those who do not fall into any of the aforementioned categories (Spanish/Hispanic NOS). Importantly, people of Spanish origin can be of any race. Several studies have shown that ethnicity is an important determinant in the prognosis of breast cancer. For instance, one study showed that in the USA, white Hispanic women present with a more advanced stage of breast cancer and consequently have

poorer survival rates than white non-Hispanic women.⁸ A literature review showed that although Hispanic women have a lower incidence of breast cancers than white women, they are more likely to present with larger tumors, owing in large part to the lower incidence of mammogram screening among them. This was attributed to several social factors including a lack of education, poverty and cultural beliefs.⁷ Hispanic women were generally found to fear cancer and this, coupled with the embarrassment associated with screening techniques and a fatalistic view of malignancies, led them to seek medical attention later than their non-Hispanic counterparts.⁹ A large study comprising over 19 000 Hispanic women found that those with health insurance were more likely to be screened by a mammogram than those without insurance (73 vs 55%).¹⁰ Thus, people of Spanish origin, who comprise a broad group with origins in at least six different areas, appear to have a unique epidemiology of breast cancer. Knowledge of this epidemiology and factors affecting prognosis in women of this group could be invaluable in developing focused strategies for the early detection and effective management of breast cancer in them.

We observed that, overall, most breast cancer patients of Spanish origin were diagnosed between the ages of 31 and 60 years and had an infiltrating lobular or mixed ductal-lobular carcinoma of a moderate to poorly differentiated grade that had undergone regional spread at the time of diagnosis. When the women were subdivided by their Spanish origin, we noted some interesting differences. While Hispanic patients with an origin in the Dominican Republic were not significantly different in their age of onset of breast cancer than other groups of women at the time of diagnosis, they had the shortest median OS (Tables 1,2). Was this because of a reduced response to therapy or a genetic predisposition that caused a more aggressive form of the tumor in them? A clue to the underlying explanation comes from the observation that most women in this group had poorly differentiated or undifferentiated breast cancers at presentation (53%). There is a dearth of literature on the factors, particularly genetic, underlying breast cancer risk in women from the Dominican Republic. The mechanisms underlying shorter survival in this group of Hispanic women needs to be elucidated.

Previous studies have shown that women of Spanish origin have several cancer-specific mutations. A screening of 410 Spanish families with breast or ovarian cancer and 214 individuals with breast cancer for germ line mutations in *BRCA2* revealed 12 mutations that were unique to Spanish families only. Each of these mutations is believed to have originated in a specific geographical part in Spain.¹¹ Differences in *BRCA1* and *BRCA2* genes are found depending on the country of origin of the patients. For instance, in one study among Cuban women, the prevalence of *BRCA1/2* mutations was collectively 3 percent.¹² Another study found that the prevalence of *BRCA1* mutations was higher in Hispanic women (3.5%) than in African Americans (1%), Asian Americans (0.5%) and non-Hispanic whites (2%).¹³ Whether these differences contribute to a difference in tumor behavior in a given subgroup is an interesting question that will need to be addressed in forthcoming studies.

Therapy is a key determinant of outcome in breast cancer. We noted that patients receiving surgery survived longer than those in whom it was either not recommended or who refused it. Further, patients who underwent surgery were significantly younger than those who did not. The origin of Spanish women appeared to play a role in the decision to undergo surgery;

with women of Cuban origin constituting the highest percentage of patients undergoing cancer-directed surgery (95%). Nevertheless, they did not have the longest OS. Clearly, multiple factors play a role in determining the outcome in these patients. Other predictors of improved survival included radiation with or without surgery (compared to no surgery). Although the sample was too small for conclusions to be drawn, radiation therapy after surgery seemed to provide a greater survival benefit than before it.

Among social factors, income is considered a major factor involved in the decision of a patient to seek health maintenance and therapeutic options.^{14,15} We observed that the median family income was an independent predictor of improved survival in Hispanic breast cancer patients. Further investigations, including studies of the contribution of other social factors like the level of education, exposure to the mass media, availability of hospitals and support from the family to the improved access of health care by those surviving longer are needed.

In conclusion, we have investigated the epidemiology of breast cancer among women identified as Spanish by country of origin in the SEER database. Our results suggest that their country of origin is an important determinant of prognosis in addition to other patient-related and treatment-related factors. Whether these are due to socioeconomic and cultural differences or genetic susceptibilities, or to a combination of these factors, remains to be investigated.

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Figure 1.
Schematic flow-sheet of patient selection.

Figure 2.

Effect of country of origin on overall survival in Hispanic women with breast cancer. DR, Dominican Republic; Others, other countries including Europe; PR, Puerto Rico; SCA, South/Central America; Spanish NOS, Hispanic by surname and Hispanic/Spanish not otherwise specified.

Table 1

Epidemiology of breast cancer in Hispanic women

Variable	Cuban	Dominican Republic	Mexican	Puerto Rican	South/Central American	Other countries including Europe	Hispanic by surname only/Spanish or Hispanic NOS
Group	1	2	3	4	5	6	7
Number (%)	653 (2)	120 (0.3)	10 110 (23)	1224 (3)	3934 (9)	1397 (3)	26 518 (60)
Mean age (SD) at diagnosis	63.6 (13.8)	55.8 (13.3)	53.4 (13.9)	56.9 (13.5)	54.6 (13.1)	58.6 (14.7)	56.1 (14.1)
Age at diagnosis (range)	29–95	30–88	17–100	21–95	19–96	19–101	18–105
Age groups (%)							
0–30 years	0.6	0.8	2	1	2	2	2
31–60 years	38	65	70	60	66	54	62
61 years	62	34	28	39	33	44	37
Median family income in US\$ (%)							
2000–4000	0.1	0.1	15	0.3	0.9	8	15
4001–6000	70	58	73	44	69	56	57
6000 and above	29	38	19	55	30	14	32
Histological type (%)							
Ductal carcinoma	5	0	6	5	7	9	6
Lobular carcinoma	30	36	23	24	23	30	27
Tubular carcinoma	3	0.0	3	2	3	3	3
Mixed ductal and lobular carcinoma	29	24	29	26	32	20	28
Mucinous carcinoma	8	12	9	9	8	8	9
Paget's disease	3	4	3	2	4	1	2
Other invasive carcinomas	22	24	29	33	23	30	24
Stage of breast cancer (%)							
Localized	29	38	36	31	33	19	28
Regional	45	53	39	39	42	27	42
Distant	5	6	5	5	3	4	3
Unknown	21	4	21	25	22	50	27
Grade of tumor (%)							
Well differentiated	14	6	11	9	12	12	14

Variable	Cuban	Dominican Republic	Mexican	Puerto Rican	South/Central American	Other countries including Europe	Hispanic by surname only/Spanish or Hispanic NOS
Moderately differentiated	33	27	38	30	34	32	32
Poorly differentiated	36	51	42	43	40	34	34
Undifferentiated	2	3	2	2	2	2	2
Unknown	16	14	12	16	12	19	18
ER expression (%)							
Positive	35	3	27	29	30	43	27
Negative	10	0.8	12	13	12	17	10
Unknown	55	96	61	58	58	40	63
PR expression (%)							
Positive	27	3	23	23	24	33	22
Negative	16	0.8	15	19	15	22	14
Unknown	57	96	63	59	61	45	64
Surgery (%)							
Not recommended	3.5	5	5	6	5	4	4
Recommended but not performed	2	3	2	3	2	6	2
Performed	95	92	93	92	94	90	94
Extent of cancer directed breast surgery (%)							
None	23	17	32	28	24	35	23
Partial mastectomy	17	11	14	16	18	5	12
Subcutaneous mastectomy	0	0	0	0	0	0.4	0.4
Total and bilateral mastectomy	36	35	36	28	26	33	34
Modified radical mastectomy	24	37	18	31	29	23	29
Radical and extended radical mastectomy	0	0	0.5	1	0.6	0.8	0.6
Radiation therapy (%)							
None	52	53	49	52	49	49	55
Administered	44	43	45	46	45	48	41
Refused	0.9	0.0	0.9	0.7	0.9	0.7	0.8
Unknown	3	4	5	2	5	2	3
Radiation sequence with surgery (%)							
Neither	56	58	57	57	56	54	60

Variable	Cuban	Dominican Republic	Mexican	Puerto Rican	South/Central American	Other countries including Europe	Hispanic by surname only/Spanish or Hispanic NOS
Radiation preceding surgery	0	0	0.8	0.2	0.4	0.6	0.8
Radiation after surgery	42	41	42	43	43	45	39
Radiation before and after surgery	0.3	0.8	0.2	0.1	0.3	0.6	0.2
Intraoperative radiation plus radiation before/after surgery	0	0	0	0	0.1	0	0
Both given, but sequence unknown	0.8	0.8	0.2	0.7	0.3	0.1	0.2

NOS, not otherwise specified.

Table 2

Univariate analysis of factors influencing overall survival in Hispanic women with breast cancer

Variable	Median survival (months)	Proportion of patients surviving at 5 years (SE)	P-value (log-rank test)
Spanish origin			
Cuba	169.0	73 (2)	<0.0001
Dominican Republic	82.4	70 (2)	
Mexico	204.0	73 (1)	
Puerto Rico	142.0	67 (2)	
South/Central America	240.0	81 (1)	
Other countries	115.5	59 (1)	
Hispanic by surname/Hispanic or Spanish NOS	209.9	77 (0)	
Age group			
0–30 years	222	68 (2)	<0.0001
31–60 years	314	80 (0)	
61 and above	131	69 (0)	
Median family income in US\$			
2000–4000	178.1	70 (1)	<0.0001
4001–6000	205.6	76 (0)	
6001 and above	217.5	78 (0)	
Histological type			
Ductal carcinoma	283.5	78 (2)	<0.0001
Lobular carcinoma	174.9	79 (1)	
Tubular carcinoma	348.0	92 (2)	
Mixed ductal and lobular carcinoma	236.0	85 (1)	
Mucinous carcinoma	204.1	84 (1)	
Other invasive carcinomas	110.0	57 (1)	
Paget's disease	195.3	69 (3)	
Stage of breast cancer			
Localized	120.0	89 (0)	<0.0001
Regional	120.0	74 (1)	
Distant	23.5	20 (1)	
Grade of tumor			
Well differentiated	248.7	90 (1)	<0.0001
Moderately differentiated	225.8	82 (4)	
Poorly differentiated	195.4	95 (70)	
Undifferentiated	266.5	68 (2)	
ER expression of tumor			
Positive	231.6	82 (0)	<0.0001
Negative	216.0	68 (1)	
PR expression of tumor			
Positive	216.0	82 (0)	<0.0001
Negative	215.4	71 (0)	

Variable	Median survival (months)	Proportion of patients surviving at 5 years (SE)	P-value (log-rank test)
Surgery			
Not recommended	25.4	25 (1)	<0.0001
Recommended but not performed	36.5	34 (2)	
Performed	219.3	79 (0)	
Extent of cancer-directed breast surgery			
None	34.6	34 (1)	<0.0001
Partial mastectomy	120.0	87 (0)	
Subcutaneous mastectomy	96.0	80 (13)	
Total and bilateral mastectomy	120.0	82 (1)	
Modified radical mastectomy	120.0	79 (1)	
Radical and extended radical mastectomy	124.9	63 (8)	
Radiation therapy			
None	178.9	73 (0)	<0.0001
Administered	232.5	80 (0)	
Recommended but refused	83.4	56 (3)	
Radiation sequence with surgery			
No radiation or cancer-directed surgery	171.2	71 (0)	<0.0001
Radiation before surgery	113.7	62 (3)	
Radiation after surgery	252.3	8 (0)	
Radiation before and after surgery	68.5	48 (5)	
Intraoperative radiation	168.0	86 (13)	

ER, estrogen receptor; NOS, not otherwise specified; PR, progesterone receptor.

Table 3

Multivariate analysis of factors influencing overall survival in Hispanic women with breast cancer

Factor	HR (95% CI)	P-value
Spanish origin		<0.0001
Cuban	1.0 (reference)	–
Dominican Republic	1.25 (0.73–2.16)	0.42
Mexican	1.01 (0.86–1.17)	0.11
Puerto Rican	1.26 (1.06–1.51)	0.009
South/Central American	0.75 (0.64–0.89)	0.001
Other countries	1.37 (1.16–1.62)	<0.0001
Median family income in US\$		<0.0001
2000–4000	1.0 (reference)	–
4001–6000	0.86 (0.81–0.91)	<0.0001
6001	0.80 (0.75–0.86)	<0.0001
Age		<0.0001
0–30 years	1.0 (reference)	–
31–60 years	0.85 (0.74–0.96)	0.013
61 years	1.77 (1.55–2.02)	<0.0001
Tumor stage		<0.0001
Localized	1.0 (reference)	–
Regional	0.42 (0.39–0.45)	<0.0001
Distant	3.18 (2.91–3.49)	<0.0001
Grade		<0.0001
Well differentiated	1.0 (reference)	–
Moderately differentiated	1.45 (1.32–1.59)	<0.0001
Poorly differentiated	2.11 (1.92–2.31)	<0.0001
Undifferentiated	2.00 (1.73–2.32)	<0.0001
Estrogen receptor expression		<0.0001
Positive	1.0 (reference)	–
Negative	1.25 (1.16–1.35)	<0.0001
Progesterone receptor expression		0.002
Positive	1.0 (reference)	–
Negative	1.14 (1.06–1.23)	0.001
Tumor histology		<0.0001
Infiltrating ductal carcinoma	1.0 (reference)	–
Lobular carcinoma	1.07 (0.91–1.26)	0.41
Tubular carcinoma	0.69 (0.48–0.99)	0.044
Mixed ductal and lobular carcinoma	0.91 (0.77–1.08)	0.29
Mucinous carcinoma	1.10 (0.90–1.35)	0.34
Paget's disease	1.19 (0.92–1.53)	0.187
Radiation therapy		<0.0001
Recommended and administered	1.0 (reference)	–

Factor	HR (95% CI)	P-value
Not recommended hence not administered	0.99 (0.89–1.11)	0.91
Recommended but patient refused	1.52 (1.25–1.84)	<0.0001
Breast surgery		<0.0001
Not recommended	1.0 (reference)	–
Recommended but not performed	0.69 (0.62–0.77)	<0.0001
Performed	0.24 (0.21–0.26)	<0.0001
Extent of cancer directed surgery		<0.0001
None	1.0 (reference)	–
Local tumor destruction	1.12 (0.98–1.27)	0.07
Partial mastectomy	2.16 (0.54–8.71)	0.28
Total mastectomy	1.34 (1.15–1.57)	<0.0001
Modified radical mastectomy	1.49 (1.28–1.74)	<0.0001
Radical mastectomy	2.36 (1.44–3.85)	<0.0001
Radiation with surgery		<0.0001
No radiation or cancer directed surgery	1.0 (reference)	
Radiation before surgery	1.33 (1.09–1.62)	0.004
Radiation after surgery	0.86 (0.76–0.96)	0.011
Radiation before and after surgery	1.88 (1.43–2.48)	<0.0001
Intraoperative radiation	0.50 (0.07–3.59)	0.49

CI, confidence interval; HR., hazard ratio.