

Original

Influence of Socioeconomic Status and Education Level in the Prognosis of Breast Cancer Patients

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Abstract

Objectives :To evaluate the influence of socioeconomic status (SES) and educational level in the prognosis of breast cancer patients in a Brazilian Cancer Hospital. **Patients and Methods:** Retrospective cohort study, by searching patients files treated from January 1994 to February 1995. **Results:** A total of 226 patients were included, only 13.1% diagnosed with stage I disease. Patients more often diagnosed with early stage disease had a college degree (79%), as compared with illiterate/incomplete elementary education (45%) ($p=0.002$). Younger age was associated with a better education level. With a median follow-up of 80 months, 37% of patients had died. In univariate analysis, advanced clinical stage ($p<0.001$), lack of a college degree ($p<0.01$) and postmenopausal status ($p=0.05$), but not SES ($p=0.36$) were associated with a worse overall survival. In a multivariate model, only clinical stage remained significant. **Conclusions:** Patients with breast cancer presented with advanced disease at diagnosis, which implied a worse overall survival. Higher education was found to be associated with early stage disease. Early diagnosis may reflect a better health awareness, which may depend on the cultural background.

Keywords:Breast Neoplasms, social class, education, prognosis, survival analysis

Introduction

In Brazil, breast cancer is the most frequent tumor in females, excluding non-melanoma skin cancer, with an estimate of 49,240 new cases in 2010 and 11,06 deaths per 100,000 women in 2007.¹

Socioeconomic status (SES) has been found by some²⁻⁷ but not others⁸ to influence survival of breast cancer patients. SES is a construct that depends on a combination of variables, including occupation, education, income, wealth, and place of residence.⁹ A low SES may directly compromise survival by hampering access to medical care and delaying diagnosis or indirectly, by influencing tumor biology. Aggressive breast tumors have

been associated, for example, with a carbohydrate rich diet, which is common in low SES groups.¹⁰ Brazil is a very unequal country, with great disparities in income and educational level.¹¹ Studies on the relationship between SES and health outcomes could be useful to ameliorate this situation. Surprisingly, little has been published on the relationship between breast cancer and SES in Brazil.¹²⁻¹⁷ Thus, our goal in this work was to study the influence

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of SES parameters on the prognosis of a retrospectively characterized cohort of breast cancer patients treated at Hospital do Câncer A. C. Camargo (HACC), a reference cancer center in São Paulo, Brazil.

Patients and Methods

This was a retrospective cohort study in which patients treated at the “Centro de Tratamento e Pesquisa Hospital do Câncer A.C. Camargo” from January 1994 to February 1995, were included. Inclusion criteria were female sex and histopathological confirmation of invasive breast cancer, except for one patient who had a breast tumor with gross skin invasion (T4b) and distant metastasis (in the absence of a diagnostic biopsy). Exclusion criteria included the presence of a concomitant cancer, with the exception of non melanoma skin cancer and carcinoma in situ of the uterine cervix, previous anti-cancer treatment in another institution, carcinoma in situ of the breast and bilateral breast cancer. Two hundred twenty six patients met the criteria and had their charts reviewed.

The following variables were recorded: age, skin color, menopausal status at diagnosis, level of education (illiterate, elementary, high school, college), place of residence, health insurance plan, public (Sistema Único de Saúde, SUS) or private, and routine clinical-pathological variables, including clinical staging according to AJCC, 1992.¹⁸

Patient follow up for death was performed from diagnosis until June 2003. Since no direct indicator of income level was present in the patient records, the patients' address was used as an indirect indicator, based on the “Atlas Ambiental do Município de São Paulo”, a government report that classifies the city neighborhoods according to sanitary conditions, housing, education and crime rates.¹⁹ Patients were thus categorized as low, medium or high SES based on the place of residence.

Statistical Analysis

Groups were compared by Fischer's exact test or Pearson Chi square test, as appropriate. Survival was estimated by the Kaplan Meir method and curves were compared by the log rank test. A multivariate Cox regression analysis was performed to identify predictors of survival. SPSS 10.0 software was used, $p < 0.05$ was considered significant.

Results

Characteristics of Patients and Tumors

Regarding sociodemographic variables, patient age (mean $\pm$ SD) was 56 ± 13.3 years. Most patients were white and resident (60%) in the city of São Paulo. Health insurance plan was divided equally between public and private. In relation to educational level, only 17% had a college degree. Among patients living in the city of São Paulo, 56% were classified as medium SES, according to their neighborhood of residence (Table 1).

Table 1 – Sociodemographic characteristics of a cohort of 226 breast cancer patients

Variable	Group	N	%
Age at diagnosis (years)	30 to 49	78	34.5
	50 to 60	61	27.0
	>60	87	38.5
Color	White	189	83.6
	Non-white	37	16.4
Health plan	Public	116	51.3
	Private	110	48.7
Education*	Illiterate	91	42.7
	Elementary	55	25.8
	High school	31	14.6
	College	36	16.9
Socioeconomic status**	High	16	12.0
	Medium	74	55.6
	Low	43	32.3

*Information available from 213 patients; ** Information available from 133 patients.

Stage information was available for 206 patients and showed that a minor fraction (13.1%) of them were diagnosed with stage I disease.

The most frequent (89.8%) histological type was infiltrating ductal carcinoma, with estrogen receptors positive in approximately two thirds of cases. In relation to menopausal status, most (67.3%) patients were postmenopausal (Table 2).

Factors Associated with Stage at Diagnosis

Table 2 – Characteristics of patients and tumors

Variable	Category	N	%
Clinical stage*	I	27	13.1
	II	78	37.9
	III	73	35.4
	IV	28	13.6
Histological type**	Ductal	203	89.8
	Lobular	8	3.5
	Mucinous	2	0.9
	Papillary	3	1.3
	Other	6	2.7
	Unknown	4	1.8
Estrogen receptor status****	Positive	112	74.3
	Negative	56	33.3
Menopausal status****	Premenopausal	69	33.3
	Postmenopausal	138	66.7

* Information available from 206 patients; ** Information available from 226 patients; *** Information available from 168 patients; **** Information available from 207 patients

Patients with a college degree were more often diagnosed with early stage disease (79%), as compared to patients who were illiterate or had an incomplete elementary education (45%) ($p=0.002$). No relationships were found between clinical stage and SES ($p=0.74$), type of health insurance plan ($p=0.07$), skin color ($p=0.34$) and menopausal status ($p=0.10$) (Table 3).

Factors Associated with Education Level or Socioeconomic Status

There was a strong association between younger age and higher education: 26/76 premenopausal patients had a college degree, in contrast to only 10/139 in the postmenopausal group. However, there was no association between SES and education level; SES and estrogen receptor status and educational level and estrogen receptor status; ($p=0.39$; $p=0.91$; $p=0.37$, respectively; Pearson Chi square test). Neither there was any association between SES and adjuvant treatments that might affect survival (adjuvant chemotherapy, $p=0.20$; anthracycline use, $p=0.42$; endocrine therapy, $p=0.91$; radiotherapy, $p=0.50$; Pearson Chi square test).

Overall Survival Analysis

With a median follow-up of 80 months, 37% of patients had died. In univariate analysis, early clinical stage (110.0 versus 39.4 months, $p<0.001$), having a college education (not reached versus 83.4 months, $p<0.01$) and premenopausal status (not reached versus 93.7 months, $p=0.05$) were associated with better overall median survival (figure 1). In contrast, SES status ($p=0.36$), skin color ($p=0.55$) and type of health insurance plan ($p=0.09$) were not predictors of survival. In a Cox proportional hazards model that included clinical stage, educational level, menopausal status, and type of health insurance plan, only clinical stage remained significant. Patients categorized as advanced clinical stage (III/IV) presented a hazard ratio for death of 3.9 (CI 95%: 2.5 – 6.3) in relation to the early stage (I/II) patient group (Table 4).

Table 3 – Clinical stage distribution of a cohort of breast cancer patients according to educational level and socioeconomic status.

Variable	Stage						Total	p
	I/II		III		IV			
	N	%	N	%	N	%		
<i>Education</i>								
Illiterate/elementary incomplete	37	44.6	30	36.1	16	19.3	84	0.002
Elementary	20	39.2	21	41.2	10	19.6	50	
High school	17	56.7	13	43.3	-	-	30	
College	26	78.8	5	15.2	2	6.1	33	
<i>Socioeconomic status</i>								
High	7	53.8	4	30.8	2	15.4	13	0.743
Medium	35	51.5	19	27.9	14	20.6	68	
Low	22	56.4	13	33.3	4	10.3	39	

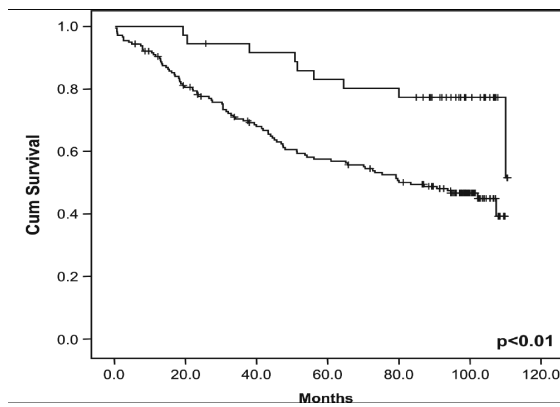


Figure 1 – Overall survival plot according with educational level. Cum Survival: cumulative survival (proportion). Lower curve: illiterate, elementary, high school (n=177); Upper curve: college (n=36); +: censored. $P < 0.01$ (Kaplan Meier)."

Table 4 – Hazard Ratios (HR) with 95% confidence intervals (CI 95%) for death of any cause in a cohort of 226 breast cancer patients.

Variable	Group	HR (CI 95%)	p
Clinical Stage	III/IV	3.9 (2.5-6.3)	<0.001
	I/II	1.0	
Menopausal status	Pre	0.8 (0.5-1.3)	0.47
	Post	1.0	
Educational level	High school or lower	1.8 (0.8-4.0)	0.11
	College	1.0	
Health insurance	Private	0.8 (0.5-1.2)	0.45
	Public	1.0	

Discussion

Breast cancer is a public health problem in Brazil and efforts to control the disease must take into consideration sociodemographic issues, considering the sharp social inequalities in this country.²⁰ Here we found that approximately two thirds of a Brazilian breast cancer patient cohort was diagnosed with advanced stage disease. Similar results were reported from other developing countries in South America²¹ and others like Iran, Malaysia and Arab nations.²²⁻²⁴ This is in striking contrast to data from North America, where patients are usually diagnosed with small tumors.²⁵

Here we showed that a better educational level was associated with early stage disease, in agreement with others.^{4,26} In this work, however, no associations were found between SES and stage distribution, in contrast to a study from the USA.²⁷ We speculate that early

diagnosis may reflect a better health awareness, which may depend on the cultural background and access to routine mammograms.

We also found that premenopausal patients, as compared to postmenopausal, were more often diagnosed with early stage disease. This is in disagreement with other study.²⁸ A possible explanation was that, in our patients, younger age was strongly associated with a better educational level. This could reflect major changes in Brazilian society, where an improvement in educational level has been detected in recent years.²⁹

We did not show any relationship between skin color and stage at diagnosis, in contrast to previous works³⁰ which demonstrate that young black women presented with advanced stage disease and aggressive histological features, as opposed to white women. Skin color, however, was self reported in this study, and the Brazilian population is racially mixed,³¹ a factor that could attenuate ethnic influence in disease biology.

Here, we did not find a relationship between SES and survival, as opposed to other studies.⁵⁻⁷ The underlying reasons, however, are not clear. They could be related to environmentally induced differences in tumor biology, like ER expression,³²⁻³³ which was not confirmed in our patients. Another possibility is that low SES is related to a poorer control of comorbidities and consequent mortality.⁶ In this study, a lower educational level was associated with lower survival in univariate analysis, but lost significance in a multivariate model, in which only tumor stage remained significant. In contrast to our findings, illiteracy was found to be an independent predictor of worse survival in a Brazilian cancer registry study.¹⁷ This could possibly be explained by a larger sample size effect.

In summary, patients with a low educational level presented with advanced tumors, thus this group must be targeted by Brazilian health planners for breast cancer awareness.

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