Racial inequalities in advanced clinical staging in women with breast cancer treated at a referral hospital in Rio de Janeiro, Brazil[1]

Desigualdades raciais no estadiamento clínico avançado em mulheres com câncer de mama atendidas em um hospital de referência no Rio de Janeiro, Brasil

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Abstract

This study sought to analyze the association between race/skin color and clinical staging in women with breast cancer at a referral hospital for cancer treatment of the Brazilian National Health System. This is a cross-sectional study of 863 women aged 18 or more, with incident breast cancer and clinical staging up to IIIC enrolled at a cancer referral hospital in Rio de Janeiro, Brazil, and interviewed between November 2016 and October 2018. Sociodemographic, lifestyle and clinical variables were evaluated. We used the propensity score with the weighting technique to balance comparison groups for potential confounders. The association between race/skin color and clinical staging was analyzed using generalized estimation equations after balancing. A significance level of 5% was adopted in all analyzes. We observed that 35.9% of women declared themselves white; 21.3%, black; and 42.8%, brown. Black women were 63% more likely to have stage II and III when compared to white women (OR=1.63; 95% CI 1.01-2.65). In conclusion, black women are diagnosed with more advanced tumors when compared to white women.

Keywords: Ethnicity and Health; Socioeconomic Factors; Breast Neoplasms; Propensity Score.

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Resumo

Este estudo teve como objetivo analisar a associação entre raça/cor da pele e estadiamento clínico em mulheres com câncer de mama em um hospital de referência para tratamento oncológico do Sistema Único de Saúde. Trata-se de estudo seccional com 863 mulheres de 18 anos de idade ou mais, com câncer de mama incidente e estadiamento clínico até IIIC, matriculadas em um hospital de referência no Rio de Janeiro e entrevistadas entre novembro de 2016 e outubro de 2018. Foram coletadas variáveis sociodemográficas, de hábitos de vida e clínicas. Utilizou-se o escore de propensão com a técnica de ponderação para balancear os grupos de comparação quanto aos potenciais confundidores. A associação entre raça/cor da pele e estadiamento clínico foi analisada por meio das equações de estimação generalizada após balanceamento. O nível de significância de 5% foi adotado em todas as análises. Observou-se que 35,9% das mulheres se declararam brancas; 21,3%, pretas; e 42,8%, pardas. Mulheres de cor da pele preta apresentaram 63% mais chance de ter estadiamento II e III quando comparadas com as brancas (OR=1,63; 95%CI 1,01-2,65). Conclui-se que mulheres pretas são diagnosticadas com tumores mais avançados quando comparadas com mulheres brancas.

Palavras-chave: Raça e Saúde; Fatores Socioeconômicos; Câncer de Mama; Escore de Propensão.

Introduction

Recent data reveal that, in the world, breast cancer is the most incident neoplasia on women, with over eight million cases in 2018, and an estimated risk of 182.6 cases per 100,000 women.[2] In the United States, 281,550 new cases are expected in 2021, which represent 30% of new tumors diagnosed in the American female population (Siegel; Miller; Jemal, 2021).

In Brazil, the Brazilian National Cancer Institute (INCA) estimates 66,280 new breast cancer cases per year in the 2020-2022 triennium, with an estimated risk of 61.6 cases per 100,000 women per year. Breast cancer is also the most frequent type of cancer in Brazilian women, except for the non-melanoma skin cancer (INCA, 2019).

Given its epidemiological relevance, breast cancer is a priority in the health agenda in the country when it comes to non-communicable chronic diseases. Thus, the Brazilian Ministry of Health recommends diagnosing the disease through early detection strategies (INCA, 2015).

In addition to the clinical aspects of the tumor, sociodemographic characteristics may affect access to early detection technologies (Santos; Chubaci, 2011; Talley; Williams, 2015; Wyatt; Pernenkil; Akinyemiju, 2017). Some authors (Bailey; Loveman; Muniz, 2013; Faro; Pereira, 2011; Lopes, 2005) mention the inequalities in accessing health services according to the individual's race/skin color.

Werneck (2016) argues that groups vulnerable to racial inequality are subject to poor public or private health care. The author also mentions low access to distinct levels of health care, including preventive measures, diagnosis, and treatment by users from racially discriminated groups.

A study using data from the 2002 National Household Sample Survey (PNAD) found that self-declared white women had higher odds of consuming health care services when compared to women of color (OR=1.14; 95%CI 1.03-1.26). The outcome variable considered an affirmative

2 GCO - GLOBAL CANCER OBSERVATORY. Tables by cancer. *World Health Organisation*, Lyon, 2018. Available on: <http://globocan.iarc.fr/>. Accessed: 1 dez. 2020.

response when asked about the use of any sort of health care service in the 15 days preceding the interview (Travassos et al., 2002.)

Silva et al. (2013), in a study with 2,930 women with breast cancer in different age ranges in a cancer-specialized institution in Espírito Santo state, found that self-declared black (OR=2.52; 95%CI 1.40-4.52) and brown women (OR=1.54; 95%CI 1.27-1.87) presented higher odds of advanced staging diagnoses when compared to white women.

These findings arouse interest in analyzing the interrelations between sociodemographic variables and the clinical staging of breast cancer at diagnosis in women undergoing treatment in a Brazilian Unified Health System (SUS) cancer-specialized hospital in Rio de Janeiro, Brazil.

Methods

We conducted a cross-sectional study with data from a research project that investigated level of physical activity, nutritional status, and quality of life of women undergoing breast cancer treatment. Both Research Ethics Committees from the Brazilian National Cancer Institute and the National School of Public Health from the Foundation Oswaldo Cruz approved this research project.

Women diagnosed with breast cancer enrolled for treatment at the Brazilian National Cancer Institute were eligible to participate in the study. They were interviewed between Abril 2016 and October 2018. We conducted the recruitment on an individual and consecutive basis, as women attended the appointment for defining of the systemic treatment with the oncologist or in their admission day for surgery. Those who met the criteria and agreed to participate signed and informed consent form. Research assistants, who received a training based on a semi-structured questionnaire developed for the project, interviewed participants.

The inclusion criteria were: women of 18 years old and older, diagnosed with incident breast cancer with clinical staging up to IIIC (with curative-intent care). We excluded those classified as underweight women, according to the body mass index (BMI), in addition to self-declared yellow or indigenous women, because of the relative frequencies, which would difficult data weighting. We also excluded those who presented missing values for sociodemographic variables relevant in the construction of the propensity score.

We assessed the following variables concerning the sociodemographic status: age (continuous and categorized in “under 50 years”, “between 50 and 69 years”, and “70 years and older”; race/skin color (self-declared by the patients as “white”, “black”, or “brown”); income (household income in the past month as continuous in minimum monthly wage and categorized as "less than one monthly minimum wage", "between 1 and 2.99 monthly minimum wages", "between 3 and 4.99 monthly minimum wages", "5 or more monthly minimum wages"; marital status (“married/living with a partner”, “divorced/separated”, “widow”, single”); educational level (“illiterate”, “unfinished elementary school”, “elementary school”, “unfinished high school”, “finished high school”, “unfinished higher education”, “higher education”); work status (at the time of diagnosis and classified as formal or informal, dichotomized in “yes” or “no”); place of origin (categorized as “state capital”, “metropolitan area”, or “state’s interior”).

Concerning lifestyle variables, we collected: smoking (at the moment of diagnosis and categorized as “never smoked”, “former smoker”, and “currently smoking”; intake of alcoholic beverages (at the moment of diagnosis and dichotomized in “yes” or “no”); physical activity for leisure (dichotomized in “yes” or “no” through the question: “do you practice or did you practice a physical activity or sport by the time of diagnosis?”); menopause status (dichotomized in “pre-menopause” or “post-menopause”).

We collected the following clinical variables: clinical staging at diagnosis (staging determined by the physician in the first appointment according to the TNM (INCA, 2004) classified in: 0, I, IIA, IIB, IIIA, IIIB e IIIC); histological type (assessed through the report on the glass slides review performed by the hospital, dichotomized in “invasive ductal carcinoma (IDC)” and “other

histological types"). In addition, we collected weight (measured on the recruitment day using a 180kg digital scale); height (measured on the recruitment day using a compact stadiometer attached to the wall); BMI (measured using the weight/height^2 formula and classified according to the World Health Organization (WHO, 1997) score: 18.5-24.9 normal weight; 25.0-29.9 overweight; over 30.0 obesity); comorbidity (assessed by the Cumulative Illness Rating Scale-Geriatric (CIRS-G) score, elaborated by Miller et al. (1992). We used the classification of comorbidity by the total score, which represents the total score obtained in each organic system, and categorized according to Zelada Rodríguez et al. (2012), in four levels: no comorbidity, mild comorbidity – between zero and two points -, moderate comorbidity – between three and eight points – and severe comorbidity – equal or greater than nine points).

We made the descriptive analysis of the study population through the calculation of frequencies and measures of central tendency and of dispersion for categorical and continuous variables, respectively.

To investigate the association between race/skin color and clinical staging to the diagnosis, we used the propensity score with the weighting technique to balance the groups. The calculation of this score results in the probability of an individual having an outcome while keeping other variables in balance, either except for the presence or not of exposure, and it is useful to increase the strength of association measures in observational studies. Furthermore, the use of the propensity score to correct the estimative of treatment effect on the outcome reduces selection bias, when it is not possible to apply randomization, as in observational studies.

In this article, the exposure variable was the race/skin color of women with breast cancer who self-declared white, black, and brown. We considered as the outcome the clinical staging dichotomized in 0/I e II/III (Day; Williams; Khaw, 1989). In addition, for the creation of the score, we categorized the "educational level" variable as "low educational level" (illiterate, unfinished elementary school); "middle educational level" (elementary school/unfinished high school); "high educational level" (finished high school/unfinished higher education/finished higher education). The co-variables "marital status" and "smoking" were dichotomized in "no partner" or "have a partner" and "never smoked" or "former smoker/currently smoking", respectively.

We conducted two separated analysis: white women (control group) versus black women (treatment group), and white women (control group) versus brown women. To verify the possible unbalanced co-variables between the control and treatment groups, we performed hypothesis tests with the calculation of chi-square values. After selecting the unbalanced co-variables for the two comparisons, we used logistic regression to create the propensity scores using the maximum pseudo-likelihood method.

After creating the scores, we chose the weighting technique to estimate the effects in the treatment because of the low number of observations in each stratum of race/skin color. We calculated the weights for each individual in the study from the inverse propensity score, as follows: Treatment Group = [1/propensity score] and Control Group = [1/(1-propensity score)]. Thus, women who had higher odds of exposure presented a lower weight, whereas those with the lower odds had a greater weight.

Lastly, to calculate the odds ratios (OR) we used the generalized estimating equation method, which consists of models that allow estimating parameters of correlation among data. We used the SPSS version 22.0 for Windows software for the analysis, considering a 5% level of significance.

Results

Of the 942 women eligible to the study, we excluded 27 (2.8%) self-declared yellow or indigenous, 10 (1.1%) underweighted women and 42 (4.5%) who lacked data concerning relevant variables for the score construction. The study population consisted of 863 women, of whom 35.9% self-declared to be white, 21.3% self-declared to be black, and 42.8% self-declared to be brown.

The average age was of 53.98 ± 11.72 years and the average income was of 2.59 ± 2.55 monthly minimum wages. Most women were either married or living with a partner (50.8%), finished high school (31.7%), lived in Rio de Janeiro city (54.9%), and had a job by the time of diagnosis (62.6%) (Table 1).

Table 1 – Study population sociodemographic characteristics (N=863)

Variables	Average (SD)	
Age		
	53.98 (11.72)	
Income[A]		
	2.59 (2.55)	
Variables	**N**	**%**
Age		
Under 50 years	325	37.7
Between 50 and 69 years	454	52.6
70 years and older	84	9.7
Income		
<1 monthly minimum wage	136	15.8
≥1 a <3 monthly minimum wage	488	56.5
≥3 a <5 monthly minimum wage	148	17.1
≥5 monthly minimum wage	91	10.5
Race/skin color		
White	310	35.9
Black	184	21.3
Brown	369	42.8
Marital status		
Married/living with a partner	438	50.8
Divorced/separated	102	11.8
Single	215	24.9
Widow	108	12.5
Educational level		
Illiterate	15	1.7
Unfinished elementary school	242	28.0
Elementary school	115	13.3
Unfinished high school	82	9.5
High school	274	31.7
Unfinished higher education	40	4.6
Higher education	95	11.0

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Table 1 – Continuation

Variables	N	%
Place of origin		
State capital	474	54.9
Metropolitan Area (except for Rio de Janeiro)	344	39.9
State's interior	45	5.2
Work status		
Yes	540	62.6
No	323	37.4

SD: standard deviation; [A] average of the 2016, 2017, and 2018 monthly minimum wages: R$ 924,00.

Concerning the practice of physical exercises, 62.7% did not practice a leisure-time physical activity; most women were non-smokers, with no intake of alcohol by the time of diagnosis. The average weight of the population was 72.87 ± 14.77kg (41.6-147.8kg), being 76.2% of them classified as overweight/obesity according to the BMI. The most prevalent histological type was IDC, while 51.7% of the population presented moderate comorbidity. Of the study population, 18.9% presented clinical staging between 0 and I, while 81.1% were over II (Table 2).

Table 2 – Clinical characteristics and lifestyle habits (N=863)

Variables	Average (SD)	
Body Mass Index (kg/m²)		
	29.02 (5.47)	
Weight (kg)		
	72.87 (14.77)	
Variables	**N**	**%**
Body Mass Index (kg/m²)		
Normal weight	206	23.9
Overweight	332	38.5
Obesity	325	37.7
Comorbidity		
No comorbidity	136	15.8
Mild comorbidity	255	29.5
Moderate comorbidity	446	51.7
Severe comorbidity	26	3.0
Smoking		
Never smoked	579	67.1
Former smoker	207	24.0
Currently smoking	77	8.9

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Table 2 – Contination

Variables	N	%
Intake of alcoholic beverages		
No	634	73.5
Yes	229	26.5
Physical activity for leisure		
No	541	62.7
Yes	322	37.3
Menopause status*		
Post-menopause	545	64.8
Pre-menopause	296	35.2
Clinical staging [B]		
0	39	4.5
I	124	14.4
IIA	211	24.4
IIB	150	17.4
IIIA	117	13.6
IIIB	211	24.4
IIIC	11	1.3
Hystological type*		
IDC	730	85.5
Others	124	14.5

SD: standard deviation; *missing data; [B] according to TNM (tumor size, number of lymph nodes, distant metastasis; IDC: Invasive Ductal Carcinoma.

The following variables were unbalanced between white and black women: educational level (p=0.05), place of origin (p=0.05), work status (p=0.02) and intake of alcoholic beverages (p=0.03); whereas between white and brown women, income (p=0.01), educational level (p=0.04), intake of alcoholic beverages (p=0.02), and physical activity for leisure were unbalanced and were taken to the construction of the propensity score (Table 3).

We tested the balance of the co-variables again after the weighting, which was then satisfactory, except for the place of origin variable for white versus black (p<0.01) and the income variable for white versus brown (p<0.01) (Table 3). However, we chose to keep these co-variables in the creation of the propensity score.

Women who self-declared to be black were 63% more likely to have advanced clinical staging (II and III) when compared to those who self-declared to be white (OR=1.63; 95%CI 1.01-2.65). Self-declared to be brown women were 40% more likely to have advanced clinical staging when compared to white women; however, this finding had no statistically significance (OR=1.40; 95%CI 0.95-2.06) (Table 4).

Table 3 – Population characteristics according to race/skin color before and after the application of the propensity score

Variable	white versus black women (N=494)				white versus brown women (N=679)			
	White N (%)	Black N (%)	p-value[1]	p-value[2]	White N (%)	Brown N (%)	p-value[1]	p-value[2]
Age			0.58	0.39			0.14	**0.02***
Under 50 years	104 (33.5)	70 (38.0)			104 (33.5)	151 (40.9)		
Between 50 and 69 years	174 (56.1)	95 (51.6)			174 (56.1)	185 (50.1)		
70 years and older	32 (10.3)	19 (10.3)			32 (10.3)	33 (8.9)		
Income			0.50	0.73			**<0.01***	**<0.01***
<1 monthly minimum wage	45 (14.5)	32 (17.4)			45 (14.5)	59 (16.0)		
≥1 a <3 monthly minimum wage	158 (51.0)	99 (53.8)			158 (51.0)	231 (62.6)		
≥3 a <5 monthly minimum wage	65 (21.0)	35 (19.0)			65 (21.0)	48 (13.0)		
≥5 monthly minimum wage	42 (13.5)	18 (9.8)			42 (13.5)	31 (8.4)		

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Table 3 – Contination

Variable	white versus black women (N=494)				white versus brown women (N=679)			
	White N (%)	Black N (%)	p-value[1]	p-value[2]	White N (%)	Brown N (%)	p-value[1]	p-value[2]
Marital Status			0.67	0.82			0.61	0.19
Married/ living with a partner	156 (50.3)	89 (48.4)			156 (50.3)	193 (52.3)		
Divorced/separated	154 (49.7)	95 (51.6)			154 (49.7)	176 (47.7)		
Educational Level			**0,05***	0,85			**0,04***	0,53
Low educational level	74 (23.9)	62 (33.7)			74 (23.9)	121 (32.8)		
Medium educational level	74 (23.9)	42 (22.8)			74 (23.9)	81 (22.0)		
High educational level	162 (52.3)	80 (43.5)			162 (52.3)	167 (45.3)		
Place of origin			**0,05***	**< 0,01***			0,47	0,24
State capital	171 (55.2)	95 (51.6)			171 (55.2)	208 (56.4)		
Metropolitan Area (except for Rio de Janeiro)	117 (37.7)	84 (45.7)			117 (37.7)	143 (38.8)		
State's interior	22 (7.1)	5 (2.7)			22 (7.1)	18 (4.9)		
Work status			**0.02***	0.85			0.23	**0.04***
Yes	181 (58.4)	127 (69.0)			181 (58.4)	232 (62.9)		
No	129 (41.6)	57 (31.0)			129 (41.6)	137 (37.1)		
Body Mass Index			0.50	0.30			0.47	0.32
Normal weight	82 (26.5)	40 (21.7)			82 (26.5)	84 (22.8)		
Overweight	113 (36.5)	71 (38.6)			113 (36.5)	148 (40.1)		
Obesity	115 (37.1)	73 (39.7)			115 (37.1)	137 (37.1)		
Cormobidity			0.07	0.80			0.58	0.06
No comorbidity	47 (15.2)	23 (12.5)			47 (15.2)	66 (17.9)		
Mild comorbidity	92 (29.7)	59 (32.1)			92 (29.7)	104 (28.2)		
Moderate comorbidity	157 (50.6)	101 (54.9)			157 (50.6)	188 (50.9)		
Severe comorbidity	14 (4.5)	1 (0.5)			14 (4.5)	11 (3.0)		

continue...

Table 3 – Continuation

Variable	white versus black women (N=494)				white versus brown women (N=679)			
	White N (%)	Black N (%)	p-value[1]	p-value[2]	White N (%)	Brown N (%)	p-value[1]	p-value[2]
Smoking			0.49	0.46			0.09	0.40
Never smoked	218 (70.3)	124 (67.4)			218 (70.3)	237 (64.2)		
Former smoker/ Currently smoking	92 (29.7)	60 (32.6)			92 (29.7)	132 (35.8)		
Intake of alcoholic beverages			**0.03***	0.94			**0.02***	0.95
Yes	244 (78.7)	129 (70.1)			244 (78.7)	261 (70.7)		
No	66 (21.3)	55 (29.9)			66 (21.3)	108 (29.3)		
Physical activity for leisure			0.66	0.80			**0.05***	0.99
Yes	203 (65.5)	124 (67.4)			203 (65.5)	214 (58.0)		
No	107 (34.5)	60 (32.6)			107 (34.5)	155 (42.0)		

p-value[1]: p-value before the weighting; p-value[2]: p-value after the weighting; * statistically significant values.

Table 4 – Odds Ratios after balancing using the propensity score with the weighting technique between race/skin color and clinical staging to the diagnosis (N=863)

Exposure variable(treatment)	OR (95%CI)	p-value
White women	1	
Black women[A]	**1.63 (1.01-2.65)**	**0.05***
White women	1	
Brown women[B]	1.40 (0.95-2.06)	0.09

OR: odds ratio 95%CI: 95% confidence interval; *statistically significant values; [A] variable included in the propensity score: educational level, place of origin, work status, and intake of alcoholic beverages; [B] variable included in the propensity score: income, educational level, intake of alcoholic beverages, and physical activity for leisure.

Discussion

In this research, after applying the propensity score with the weighting technique, results showed that self-declared black women were more likely to have advanced clinical staging when compared to self-declared white women.

The study by Silva et al. (2013) showed similar results, although the association lost statistical significance when adjusted for education, marital status, and origin of referral. Lipscomb et al. (2016), in their investigation of 7,503 women aged 20 years and older, who were newly diagnosed with breast cancer in seven cities in the United States, reported that black women had an 81% more chance of being diagnosed at advanced stages of disease (IIIB, IIIC, and IV) when compared to white women (p<0.001). Furthermore, other studies had similar findings (Abrahão et al., 2015; Cabral et al., 2019).

Despite the methodological differences between the studies, their results corroborate the findings of the present investigation. We emphasize that we obtained the information used in this study through interviews conducted by trained interviewers, which may suggest better data quality compared to data collected from hospital records.

Although Brazil does not have an effective population screening program. The Ministry

of Health, through the Guidelines for the Early Detection of Breast Cancer in Brazil publication, preconizes biennial mammography for women between 50 and 69 years (INCA, 2015). However, lack of information, difficulties in accessing health care services - whether because of geographic or sociocultural matters, especially for women who rely on the SUS - and hardships in social support may constitute barriers for the good functioning of screening programs and the early detection of this neoplasia (Abrahão et al., 2015; Stapleton et al., 2011).

Thus, after balancing using the propensity scores with the weighting technique, we concluded that the association between race/skin color and advanced clinical staging (II and III) suggests a possible inequality for black women in regards to access to diagnostic technologies (Bickell, 2002; Goes; Nascimento, 2013; Ogunsina et al., 2017; Schneider; D'Orsi, 2009).

In this sense, black women would undergo less screening tests, and therefore diagnosed at later stages of the disease. Chor et al. (2011), based on the 2008 PNAD data, analyzed the execution of at least one mammography throughout life in women of 40 years and older in Brazil. The authors showed that, among those with low educational levels, self-declared black women had a 30% lower chance (OR=0.70; 95%CI 0.60-0.82), while brown women had a 24% lower chance (OR=0.76; 95%CI 0.69-0.84) of having the mammography, respectively, when compared to white women.

Goes and Nascimento (2013), also used data from PNAD, aiming to analyze racial inequalities and the access of women aged over 25 to preventive health care services in Bahia. The authors showed that only 7.9% of black women considered the level of access to be good, i.e., they had all preventive tests (clinical breast tests, mammography, and cervical screening) and used either health insurance or SUS services. The study also described that institutional racism constitutes a barrier to black women when accessing preventive health services.

In addition to hindering early diagnosis, racial inequality can increase the risk of suffering from cancer, given that less favored ethnic groups could be more exposed to cancer risk factors, such as sedentary lifestyle, overweight, smoking habits, intake of alcoholic beverages, genetic predisposition, among others (INCA, 2019; Silva et al., 2015). In this study, black and brown women showed a higher prevalence of overweight, former smoker or currently smoking smoking and intake of alcoholic beverages.

Another suggested explanation for the association between race/skin color and more advanced breast cancer clinical staging at diagnosis is that black women have larger tumors, and mammography, when performed, may have low specificity in comparison to white women (Yankaskas; Gill, 2005). However, studies on mammography efficacy in this population showed inconsistent findings and may be solely a result of racial inequalities in access to health services.

Yet another noteworthy result of this article is that, despite the indication of biennial mammography for women aged between 50 and 69 years, the variable "age" was not unbalanced in any of the two models applied in this study. Although the highest prevalence in this age group was among white women (56.1%), there was no statistically significant difference in the hypothesis test.

A survey conducted with 98 older women from three Convivence Centers located in the Eastern zone in São Paulo city found that 22.4% of them said they did not know the existence of a test to detect early breast cancer (Santos; Chubaci, 2011). These data indicate the need of deepening the available knowledge on the sociodemographic profile of women who are using these services and explore the inequalities that may occur during the process of rendering health care to them, thus contributing for improvements in the implementation and effectiveness of public policies aimed at breast cancer.

Despite the use of the propensity score with the weighting technique for controlling the confounding bias in studies encompassing women with breast cancer, until now we have not found articles that used this stronger approach in the subject concerning racial inequalities and breast cancer.

This study presents limitations. Among them, the lack of analysis of variables related to the dates of the diagnostic tests and start of treatment, which are relevant to the study subject. Some covariables failed to present a good adjustment after the weighting balance given the small sample size. The exclusion of patients with level IV staging hindered the comparability with literature. Furthermore, given the Brazilian miscegenation, it is possible that self-declared brown women have been influenced by subjective questions that do not meet the official definitions of this race/skin color. Lastly, we shall be careful when generalizing the results, given we performed the study with a population coming from a breast cancer-specialized hospital.

However, we can also emphasize the study strengths. These are the use of weighting for the creation of the propensity score, a stronger technique when compared to matching technique, which becomes an alternative for reducing biases and increasing the precision of observational studies; the standardization of the research team for interviews and data collection through several trainings, thus avoiding possible information bias. Lastly, the opportunity of bringing back and deepening the debate on social inequalities in Brazil's current landscape.

Final considerations

In this work, we were able to identify the association between black race/skin color and advanced clinical staging (II and III) when compared to white race/skin color after using the propensity score with the weighting technique weighting ("educational level", "place of origin", "work status" and "intake of alcoholic beverages") (OR=1.63; 95%CI 1.01-2.65).

These findings can be justified by racial disparities in access to health services and early detection of breast cancer, requiring the prioritization of more vulnerable racial groups in public health policies. For future investigations, we recommend the analysis of other important covariates for the study subject, such as the trajectory and the time interval between the biopsy exams and the beginning of breast cancer treatment.

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Authors' contribution

Rodrigues, Mattos, and Bergmann conceived and outlined the project and assessed the data quality. Rodrigues and Carmo analyzed data. All authors wrote the article, collaborated in the critical review of content and approved the final manuscript.

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