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Obesity and breast cancer in North-eastern women

Obesidade e câncer de mama em mulheres Nordestinas

Obesidad y cáncer de mama en mujeres Nordestinas

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ABSTRACT

Objective: To investigate the temporal trend and relationship between the prevalence of obesity and breast cancer incidence rates in women living in the capitals of the Northeast Region of Brazil between 2008 and 2018. **Methods:** Ecological study using the prevalence of obesity from the Surveillance of Chronic Diseases by Telephone Survey and the breast cancer estimate from the National Cancer Institute. The percentage change over the period was used to verify the prevalence of change in the variables investigated. Prais-Winsten regression was used to identify the temporal trend of the percentage of variation over the period and the extent to which the prevalence of obesity explains the average variation in the incidence rate of breast cancer. Spearman's correlation was used to determine the correlation between obesity prevalence and estimates of breast cancer incidence rates. **Results:** There was an upward trend in the prevalence of obesity and breast cancer incidence rates in the capital cities, except Maceió, Recife, and São Luiz. In Aracaju, Fortaleza, and Teresina, there was a correlation between obesity prevalence and breast cancer incidence rate, and a 1% increase in obesity prevalence increased the average breast cancer incidence rate by 5.8%, 8.0% and 6.3% in the respective capitals. **Conclusion:** There was an increasing trend in the percentage change over the period in obesity and breast cancer incidence in capital cities in the Brazilian Northeast, and the increase in obesity was also associated with an increase in breast cancer incidence.

Descriptors: Breast Neoplasms; Obesity; Indicators of Chronic Diseases.

RESUMO

Objetivo: *Investigar tendência temporal e relação entre as prevalências de obesidade e as taxas de incidência de câncer de mama em mulheres residentes nas capitais da Região Nordeste do Brasil, entre 2008 e 2018.* ***Métodos****: Estudo ecológico com a prevalência de obesidade da Vigilância de Doenças Crônicas por Inquérito Telefônico e a estimativa do câncer de mama do Instituto Nacional do Câncer. O percentual de variação no período foi usado para verificar a prevalência da mudança nas variáveis investigadas. Utilizando regressão de Prais-Winsten identificou-se tendência temporal do percentual de variação no período e o quanto a prevalência de obesidade explica a variação média da taxa de incidência do câncer de mama. Para a correlação entre as prevalências de obesidade e as estimativas das taxas de incidência de câncer de mama, utilizou-se Correlação de Spearman.* ***Resultados:*** *Houve tendência crescente para prevalência da obesidade e taxas de incidência do câncer de mama nas capitais, com exceção de Maceió, Recife e São Luiz. Em Aracaju, Fortaleza e Teresina, houve correlação entre prevalência de obesidade e taxa de incidência de câncer de mama e o incremento de 1% na prevalência de obesidade que aumentou 5,8%, 8,0% e 6,3% a média da taxa de incidência do câncer de mama, nas respectivas capitais.* ***Conclusão:*** *Houve tendência crescente no percentual de variação no período de obesidade e incidência de câncer de mama em capitais do Nordeste brasileiro e o aumento na obesidade esteve associado ao também aumento na incidência de câncer de mama.*

Descritores: *Neoplasias da Mama; Obesidade; Indicadores de Doenças Crônicas.*

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RESUMEN

Objetivo: *Investigar tendencia temporal y relación entre las prevalencias de obesidad y las tasas de incidencia de cáncer de mama en mujeres residentes en las capitales de la Región Nordeste de Brasil, entre 2008 y 20018.* ***Métodos:*** *Estudio ecológico con prevalencia de obesidad de la Vigilancia de Enfermedades Crónicas por Encuesta Telefónica y la estimativa del cáncer de mama del Instituto Nacional del Cáncer. El porcentaje de variación en el período fue utilizado para verificar la prevalencia de cambios en las variables investigadas. Utilizando regresión Prais-Winsten se identifico tendencia temporal del porcentaje de variación en el período y cuanto la prevalencia de obesidad explica la variación* ***média de*** *la tasa de incidencia del cáncer de mama. Para la correlación entre las prevalencias de obesidad y las estimativas de las tasas de incidencia de cáncer de mama, fue utilizada la Correlación de Spearman.* ***Resultados:*** *Hubo tendencia crecente para prevalencia de obesidad y tasas de incidencia del* ***câncer de mama*** *en las capitales, con excepción de Maceió, Recife y São Luiz. En Aracaju, Fortaleza y Teresina, hubo correlación entre prevalencia de obesidad y tasa de incidencia de cáncer de mama y el incremento de 1% en la prevalencia de obesidad que aumentó 5,8%, 8,0% y 6,3% la media de la tasa de incidencia del cáncer de mama, em las respectivas capitales.* ***Conclusión:*** *Hubo tendencia crecente en el porcentaje de variación en el periodo de obesidad e incidencia de cáncer de mama en capitales del Nordeste brasileño y el aumento en la obesidad estuvo asociado al incremento También en la incidencia de cáncer de mama.*

Descriptores: *Neoplasias de Mama; Obesidad; Indicadores de Enfermedades Crónicas.*

INTRODUCTION

Malignant breast neoplasm is the most common worldwide, with more than 2.3 million new cases and mortality of approximately 680 thousand/year in 2020[1]. In Brazil, for the triennium 2023-2025, the estimated risk for breast cancer in females is approximately 66.54 new cases, and mortality is 16.47 cases per 100 thousand women, while, for the Northeast Region, the estimated risk is 52.20 cases per 100 thousand women[2].

The temporal trend in mortality from breast cancer in Brazilian states in the period from 1996 to 2010 showed that there is an increasing trend. It is relevant to highlight that the states of Sergipe, Rio Grande do Norte, Pernambuco, and Ceará had the highest mortality rates from breast cancer between 2006 and 2010, with respectively 10.86; 9.68; 11.98, and 10.77 per 100,000 women[3].

One of the main risk factors for breast cancer is obesity, which affects more than 1 billion adults worldwide and 22.4% of the Brazilian population, with the highest prevalence observed among women (22.6%)[4,5]. This disease has systemic complications, which involve low-intensity chronic inflammation, investigated for favoring the process of carcinogenesis and consequent development of breast cancer[6]. Many mechanisms explain this relationship, which involves a higher number of inflammatory cytokines, an imbalance between adipocytokines, and a greater amount of circulating hormone[7].

In Brazil, we do not have a specific population-based study to address the relationship between obesity and breast cancer in recent years and, considering the particularities of each Brazilian region, in terms of their vulnerabilities and health risks arising from social, economic, political, cultural and environmental determinants, understanding this relationship in the Northeast Region is relevant for prevention and health promotion actions, which improve the conditions and ways of living of these women, in the individual and collective aspects, related to care from prevention, diagnosis and treatment of the disease. Therefore, the objective of the present study was to investigate the temporal trend and the relationship between the prevalence of obesity and the incidence rates of breast cancer in women living in the capitals of the Northeast Region of Brazil between the years 2008 and 2018.

METHODS

It is an ecological, time series, descriptive study, which has as its unit of analysis the Brazilian capitals of the Northeast Region, using data relating to the prevalence of obesity and estimates of crude incidence rates for breast cancer in women residents in Maceió, Salvador, Natal, Fortaleza, São Luís, Aracajú, Recife, Teresina, and João Pessoa, from 2008 to 2018.

For the present study, we used information on the nine capitals of the Northeast Region related to the prevalence of obesity in women over 18 years old, collected from the Chronic Disease Surveillance by Telephone Survey - VIGITEL (2008 to 2018)[5] and information regarding estimates of incidence rates for breast cancer obtained from the database provided by INCA (2008 to 2018)[2].

The VIGITEL survey is a health investigation that is part of the MS Surveillance of Risk and Protective Factors for Chronic Noncommunicable Diseases system and aims to monitor estimates of risk and protective factors for chronic diseases in Brazilian capitals. Investigations are conducted by trained interviewers, and the questions address individuals' demographic and socioeconomic issues, including self-reported weight and height[5]. VIGITEL's sampling begins with the draw of 5,000 telephone lines per city, systematically and stratified by ZIP code, based on the electronic registration of telephone companies. The lines are redrawn and divided into replicas of 200 lines, where each replica reproduces the same proportion of lines per city region or telephone prefix. Next, among the drawn lines, those that are eligible are identified, that is, active residential lines; and those that are considered ineligible, which correspond to business lines, which are non-existent or found to be out of service, which do not respond to attempted calls made on different days and times, and which, possibly, correspond to closed homes[5].

Active residential lines, with the consent of their users, undergo an enumeration of individuals aged 18 or over who reside in the household and then draw one of the adults living in the household to answer the questionnaire[5]. In 2008, VIGITEL carried out 54,353 interviews, and in 2018, 73,648. Of these, in 2008 and 2018, 11,155 and 11,910 women residing in the capitals of the Northeast were interviewed, respectively[5]. The interviews were conducted using a questionnaire adapted to collect telephone information that addressed sociodemographic, clinical, anthropometric, and lifestyle characteristics. The prevalence of obesity was estimated based on the questions: "Do you know your weight (even if it is an approximate value)?" and "Do you know your height?"[5].

Information on the incidence of breast cancer was obtained through access to reports from the National Cancer Institute (INCA), a body of the Ministry of Health that develops and coordinates integrated actions for the prevention and control of cancer in Brazil. INCA statistics are based on two models, the first of which assumes different linear changes over time and between different age groups in a historical series, with at least six and up to a maximum of 15 years of information and at least 50 cases of cancer per year. In the second model, the Institute uses the Incidence/Mortality ratio, which is obtained by dividing the number of new cases of cancer in the last five years from the Population-Based Cancer Registries (RCBP) by the number of deaths in the same period and location[2].

The variables obesity prevalence and breast cancer incidence in crude rates, collected from the VIGITEL and INCA databases, respectively, are shown in the present study in relative frequencies. The Percentage Variation (PVP) was calculated for all variables studied[8]. Furthermore, historical series graphs were constructed to present the results.

Prais-Winsten linear regression was used to analyze temporal trends, with correction for serial correlation, allowing us to estimate the biennial percentage variation in trends in breast cancer incidence rates and obesity prevalence between the years 2008 and 2018. On this occasion, two regression models were adjusted, one with the prevalence of obesity as the dependent variable and the other with the incidence of breast cancer as the dependent variable in both years as an independent variable (2008, 2010, 2014, 2016, 2018). The dependent variables were previously transformed into a logarithmic scale, and then the beta coefficients obtained in the regression were applied to the equation "(1 - eβ) x 100".

The correlation between the prevalence of obesity and the crude incidence rates of breast cancer was verified in each capital, using the Spearman rank correlation coefficient (Spearman rho). It was also verified that through Prais-Winsten regression, to what extent the increase of one percentage point in the prevalence of obesity explains the percentage variation of one unit in the average crude incidence rate of breast cancer. To this end, the crude incidence rate was considered a dependent variable and underwent a logarithmic transformation. The resulting beta coefficients were submitted to an exponential function and then presented in percentage variation by applying the equation "(1 - eβ) x 100". Data analyses were carried out using the Stata program, version 16.0, considering the significance level $p < 0.05$ and a confidence interval of 95%.

The data used are secondary, universally accessible, without the nominal identification of individuals, and there is no need for approval from the Research Ethics Committee (CEP).

RESULTS

The prevalence of obesity between 2008 and 2018 increased in all capitals of the Northeast Region, with emphasis on the city of Teresina (86%), which showed the highest percentage increase, and the city of Aracaju (20%), in which the smallest increase was observed. The percentage variations in the period of crude breast cancer incidence rates in the capitals of the Northeast Region also increased between 2008 and 2018, except for Recife, which showed a reduction of 2.91%. It is noteworthy that the highest increase was observed in the capital of Fortaleza (102.18%) (Table I).

Table I – Percentage variation in the prevalence of obesity and crude incidence rates of breast cancer in women living in the capitals of the Northeast Region over the period. VIGITEL and INCA, 2008 and 2018.

Capital	Prevalence of Obesity [1]			Incidence of Breast Cancer [2]		
	Frequencies (%)		Percentage Change (%)	Gross rate per 100 thousand women		Percentage Change (%)
	2008	2018	2008-2018	2008	2018	2008-2018
Aracaju	16.0	19.2	20.0	62.21	71.09	14.27
Fortaleza	14.4	21.3	47.9	49.64	100.36	102.18
João Pessoa	11.8	21.6	83.1	49.51	57.41	15.96
Maceió	13.1	20.3	55.0	35.55	50.95	43.32
Natal	11.6	21.6	86.2	45.3	52.32	15.50
Recife	12.6	22.6	79.4	87.9	85.34	-2.91
Salvador	15.0	20.1	34.0	50.87	65.24	28.25
São Luís	11.3	15.7	38.9	28.74	49.26	71.40
Teresina	9.7	18.1	86.6	36.14	55.46	53.46

Source1: Vigitel, Brazil, 2008 – 2018. Source2: Inca, Brazil, 2008 – 2018.
Note: prepared by the authors themselves based on data from the sources mentioned above

According to the temporal trend in the evolution of the prevalence of obesity, the growing effect of this condition is observed in the capitals of the Northeast Region. In 2008, it was observed that the capital, Aracajú (16.0%), recorded the highest prevalence. In 2010, the highest prevalence was found in the capital of João Pessoa (18.1%). In 2012, this scenario was evident in Natal (22.3%). For the years 2014 and 2016, this scenario was observed in Maceió, corresponding to 20.6% and 22.5%, respectively. In 2018, the highest prevalence was in Recife (22.6%) (Figure 1).

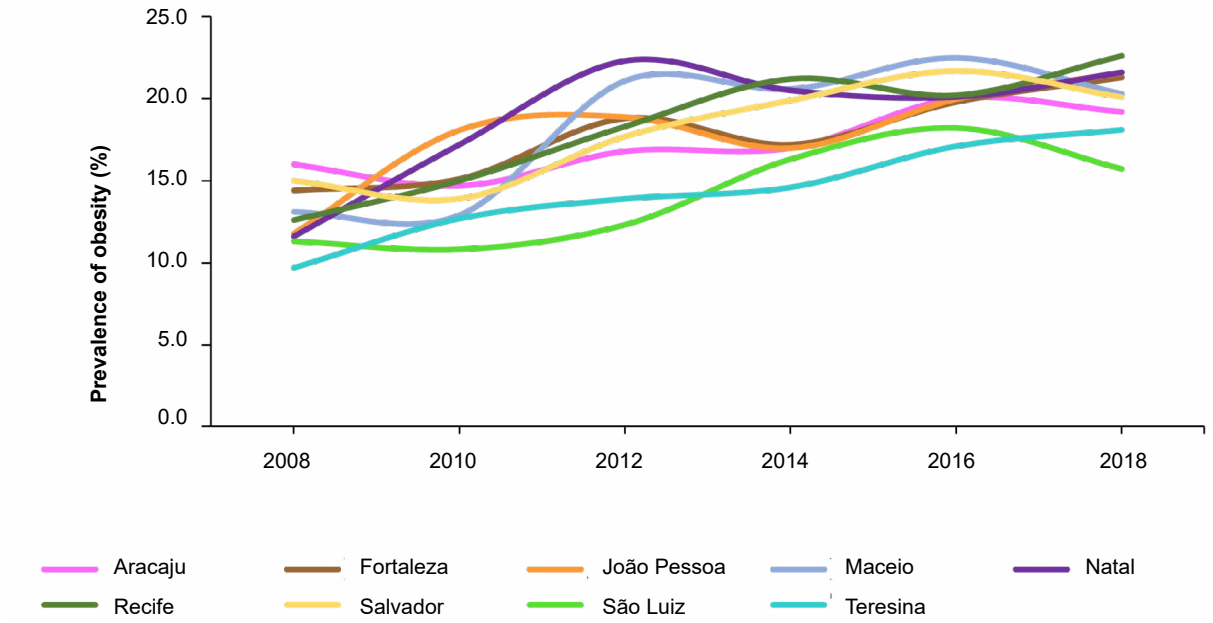

Figure 1 – Trend in the evolution of obesity prevalence in adult women, living in the capitals of the Northeast Region in the years 2008 to 2018.
Source: Vigitel, Brazil, 2008 - 2018.
Note: prepared by the authors themselves based on data from the sources mentioned above

When analyzing the epidemiological scenario of malignant breast neoplasia, the increasing effect of crude incidence rates of breast cancer in women residing in the nine capitals of the Northeast Region is observed, with the highest rate being evident in the capital of Recife in 2008 (87.90/100 thousand women), 2010 (84.25/100 thousand women), 2012 (80.19/100 thousand women), 2014 (90.25/100 thousand women) and 2016 (84.89/100 thousand

women). In 2018, the capital of Fortaleza had the highest incidence rate, corresponding to (100.36/100 thousand women) (Figure 2).

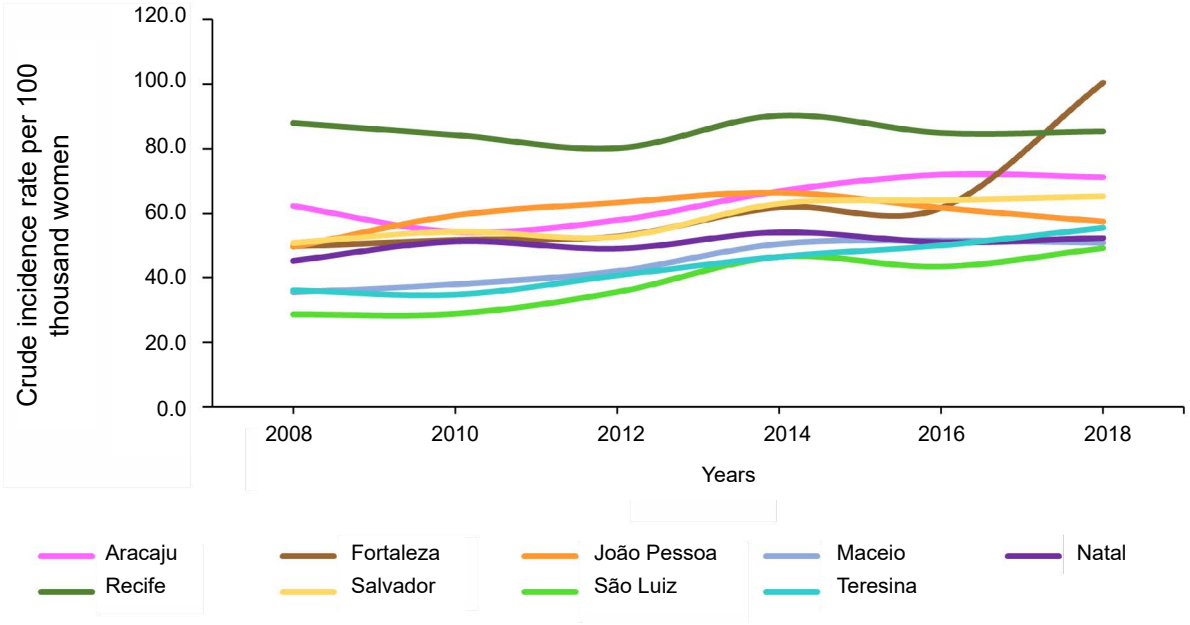

Figure 2 – Trend in the Incidence of Breast Cancer in the capitals of the Northeast Region between 2008 and 2018.
Source: Inca, Brazil, 2008 – 2018.
Note[1]: prepared by the authors themselves based on data from the sources mentioned above;
Note[2]: Crude incidence rate of breast cancer per 100 thousand women.

In Table II, it is possible to see that most cities show an increasing tendency for the indicators studied, prevalence of obesity, and incidence rates of breast cancer. The highest biannual percentage variations in the prevalence of obesity were observed in Maceió and Recife, both with an increase of 12.09% every two years. In the city of São Luís, the highest biennial percentage variation in the incidence of breast cancer was observed, with a biennial increase of 12.99%. The only cities that did not show an increasing trend in incidence were Recife and João Pessoa, while the only city that did not show an increasing prevalence of obesity was Natal.

Table II – Temporal trends in the incidence of breast cancer and the prevalence of obesity, according to the capitals of the Northeast Region. Brazil, 2008-2018.

Capital	Prevalence of obesity [1]			Incidence of breast cancer [2]		
	Biennial percentage change [a]			Biennial percentage change [a]		
	%	$CI_{95\%}$	Tendency	%	$CI_{95\%}$	Tendency
Aracaju (n=6)	6.38	(4.20; 8.62)	Growing	5.19	(0.22; 10.42)	Growing
Fortaleza (n=6)	7.87	(5.24; 10.57)	Growing	9.87	(4.38; 15.66)	Growing
João Pessoa (n=6)	8.82	(0.75; 17.55)	Growing	2.74	(-4.76; 10.83)	Stationary
Maceió (n=6)	12.09	(1.71; 23.54)	Growing	8.54	(4.16; 13.11)	Growing
Natal (n=6)	11.09	(-2.28; 26.29)	Stationary	2.02	(0.12; 3.97)	Growing
Recife (n=6)	12.09	(5.38; 19.23)	Growing	0.2	(-1.97; 2.41)	Stationary
Salvador (n=6)	9.83	(4.80; 15.11)	Growing	5.86	(3.71; 8.07)	Growing
São Luís (n=6)	11.51	(4.04; 19.53)	Growing	12.99	(7.17; 19.15)	Growing
Teresina (n=6)	11.98	(8.42; 15.66)	Growing	10.51	(8.03; 13.06)	Growing

Source1: Vigitel, Brazil, 2008 – 2018. Source2: Inca, Brazil, 2008 – 2018.
Note: Biennial percentage variation, 95% confidence intervals, and trends obtained by Prais-Winsten regression, with the incidence or prevalence rates of each capital in question as the dependent variable and, as the independent variable, the year observed (2008, 2010, 2012, 2014, 2016 and 2018). The dependent variables were previously transformed into a logarithmic scale and then the resulting beta coefficients were presented in percentage variation, based on the equation "(1 - eβ) x 100".
Nota[b]: prepared by the authors themselves based on data from the sources mentioned above

In Table III, we present the correlations between obesity prevalence measures and breast cancer incidence rates in all capitals of the Northeast Region, and we observed strong and positive correlations in Aracaju (ρ=0.94), Fortaleza (ρ =0.83) and Teresina (ρ=0,94). In the same table, from the regression analysis, we found that the prevalence of obesity explains, in a statistically significant way, the percentage variation in the average incidence rate of breast cancer in Fortaleza (8.05%), São Luís (7.05%), 38%), Teresina (6.32%), Aracaju (5.80%), Maceió (3.88%), Salvador (3.25%) and Natal (1.11%).

Table III – Correlation and association between the prevalence of obesity and the incidence of breast cancer, according to the capitals of the Northeast Region. Brazil, 2008, 2010, 2012, 2014, 2016 and 2018.

Capital	Correlation coefficient[a]		Percentage change [b]		
	ρ	p-value	%	$CI_{95\%}$	p-value
Aracaju (n=6)	0.94	**0.005**	5.80	3.41; 8.24	**0.002**
Fortaleza (n=6)	0.83	**0.042**	8.05	3.29; 13.03	**0.009**
João Pessoa (n=6)	0.03	0.957	1.69	-1.64; 5.12	0.235
Maceió (n=6)	0.71	0.111	3.88	2.16; 5.63	**0.003**
Natal (n=6)	0.31	0.544	1.11	0.35; 1.88	**0.015**
Recife (n=6)	0.26	0.623	0.09	-0.99; 1.18	0.837
Salvador (n=6)	0.77	0.072	3.25	2.20; 4.31	**0.001**
São Luís (n=6)	0.71	0.111	7.38	4.64; 10.20	**0.001**
Teresina (n=6)	0.94	**0.005**	6.32	3.61; 9.09	**0.003**

Source[1]: Vigitel, Brazil, 2008 – 2018. Source2: Inca, Brazil, 2008 – 2018.
Note[a]: Spearman's rank correlation coefficient (rho) comparing the prevalence of obesity and the crude incidence rate of breast cancer. The correlation was verified in each capital studied, totaling nine tests.
Note[b]: Percentage variation in the average crude incidence rate of breast cancer that is explained by the increase of one percentage point in the prevalence of obesity. The coefficients, 95% confidence intervals, and p-value were obtained through Prais-Winsten regression, correcting for serial autocorrelation in the time series. The dependent variable underwent a logarithmic transformation. The resulting beta coefficients were presented in percentage variation, based on the equation "(1 - eβ) x 100".
Note[c]: prepared by the authors themselves based on data from the sources mentioned above

DISCUSSION

The results presented in this study show an increasing tendency in the prevalence of obesity and breast cancer incidence rates in the capitals of the Northeast between 2008 and 2018, except for Maceió, Recife, and São Luiz. Furthermore, for the cities Aracajú (ρ=0.94), Fortaleza (ρ=0.83), and Teresina (ρ=0.94), there was a strong correlation between the prevalence of obesity and the incidence rate of breast cancer and, in these capitals, a 1% increase in the prevalence of obesity increased the average incidence rate of breast cancer by 5.8%, 8.0%, and 6.3%.

Obesity is a relevant global public health problem with multifactorial causes, which has significant impacts on the profile of morbidity and mortality in developed and underdeveloped countries[1]. The high Body Mass Index (BMI) in obese individuals is considered one of the risk factors for the development of Chronic Noncommunicable Diseases (NCDs), such as breast cancer, which represents the most common neoplasm in women in the world and the first in Brazilian regions, without considering non-melanoma skin tumors[9].

In the present study, we present the significant prevalence of obesity among women living in the Brazilian northeast in the years 2008 and 2018, as well as the systematic increase in these prevalences in this region of Brazil, results that align with another study with Brazilian women[10], in which the higher prevalences of obesity were recorded in the capitals of the North, Central-West and Northeast Regions. The North and Northeast regions of Brazil, from a socio-historical, economic, and political point of view, have different levels of development from the other regions of the country, receiving less public and private investment, with a lower concentration of services and more difficult access to health and education[11]. Thus, the higher prevalence of obesity in these regions may be related to the conditions of education[10], health, access to food, and availability of public spaces for physical activity, among many others, which are dependent not only on individual actions but also public policies involving health and food security[12].

Furthermore, our findings indicate that the percentage variation in obesity increased in all capitals of the Northeast Region between 2008 and 2018, with emphasis on the city of Teresina (86%), which showed the highest increase,

and the city of Aracaju (20%), in which the smallest increase was observed. These results confirm the data found by representative surveys carried out in Brazil, such as the Family Budget Survey (POF); the percentage of adult Brazilian women with obesity was 14.5% in 2002/2003, rising to 18.0% in 2008/ 2009[13,14]. According to the findings of the National Health Survey (PNS) carried out in 2013, this percentage reached 24.4%, changing to 29.5% in 2019, confirming the trend of increasing prevalence of obesity in Brazil[15].

Besides this, our findings indicate an increasing temporal trend in the prevalence of obesity in almost all capitals in the Northeast Region, among which Maceió and Recife showed the highest increase. It shows that increasing trends in obesity may have different behaviors depending not only on the geographic region but also on the Brazilian city. It happens due to possible differences related to the ways of organizing work production and society in a given historical context that contribute to the health-illness process, such as violence, unemployment, lack of basic sanitation, difficulty in accessing education, hunger, and disorderly urbanization, which, consequently, enhance broader ways of intervening in health in each Brazilian city[16].

When analyzing the epidemiological scenario of new cases of breast cancer in the Brazilian capitals of the Northeast Region in the present study, we found a systematic increase in all capitals of the Northeast Region between 2008 and 2018. However, it is known that this increase has its own variation for each capital, and this may indicate possible inequalities in access to treatment and diagnosis of the disease over these years. A similar study[17] carried out in the North Region with cases of breast cancer from 2016 to 2023 showed that breast and uterine cancer have particularities regarding this topic in each Brazilian region. Again, Brazil's continental dimensions bring unquestionable cultural, geographic, economic, and social diversity, which leads to regional inequalities that impact the distribution of resources and health and education infrastructure. Thus, in the least favored regions of the country, we have a low level of education and high difficulty in accessing diagnosis and adequate treatment, which contributes to the incidence of cancer[18], similar to obesity.

Our study also revealed that the capital, Fortaleza, showed the highest increase (102.91%), and São Luís had the highest growth trend (12.99%) in crude breast cancer incidence rates between 2008 and 2018. Our findings are similar to another study carried out [19] from 1990 to 2009, which demonstrated an increase in the incidence of breast cancer cases in women aged 55 to 64 years. Even with the implementation of the SUS in 1998[18], which brought a relevant change in the healthcare scenario in Brazil, the number of breast cancer diagnoses continues to grow, which can be understood by greater access to diagnostic exams in health services, but also due to greater exposure to modifiable risk factors, such as obesity, sedentary lifestyle and inadequate diet[20] among Brazilian women.

Unlike the increase observed between 2008 and 2018 in Fortaleza in crude breast cancer incidence rates, the present study points out that Recife is the capital that showed a stationary trend and reduction in the percentage of these rates. Despite this scenario, according to a study carried out in Recife on women with breast cancer[21], 45% of them had a more aggressive histological profile and a worse prognosis, suggesting that, even in lower proportions, the disease must be investigated and treated in an appropriate manner detailed given its severity and its impact on the biopsychosocial-cultural aspects of patients[22].

This study points out that a 1% increase in the prevalence of obesity increases the average cancer incidence rate in some northeastern capitals. The relationship between these diseases in the literature is established[23], with obesity being a risk factor for the development of cancer, where obese women are three times more likely to develop breast cancer when compared to eutrophic women[24]. This intimate relationship occurs due to low-intensity systemic chronic inflammation, insulin resistance, and hormonal changes due to excess body fat, which favors an environment suitable for the breast cancer process[23].

Therefore, it is essential, when we talk about health promotion, to discuss the treatment of obesity, individually and collectively, to prevent breast cancer and its progression, based on the analysis of the systemic determinants of this condition. It is necessary to observe the changes in the diet of the Brazilian population in recent decades with greater consumption of ultra-processed products, with high caloric density and large amounts of sodium, sugar, and saturated fats, to the detriment of homemade preparations and fresh foods consumption. Furthermore, it is necessary to highlight another determinant of obesity, which is climate change, which compromises agriculture related to the production of fruits and vegetables, increasing the cost of these foods, which can contribute to the consumption of ultra-processed foods, favoring food insecurity and directly impacting the health of the population[25]. Furthermore, the food production and distribution system has reflected social inequalities and threats to the health of Brazilian women, who, as a result of poverty, for example, have less access to health, information, and healthy foods.

Associated with dietary aspects is sedentary behavior, with 22.5% of Brazilian women spending more than 3 hours a day using screens, which can also contribute to failure to manage weight and maintain or increase the prevalence

of obesity[26]. In addition to behavioral factors, socio-cultural and political issues place Brazilian women in a condition of needing an exhaustive daily work routine, associated with the lack of sufficient number and quality of leisure areas in the capitals and little incentive in health services for daily practices of health promotion related to physical activity.

With these changes conditioned by the environment and social inequalities, we find a greater caloric consumption and low nutritional value, which are associated with a sedentary lifestyle, contribute to weight gain, excess adipose tissue, and consequent development of obesity that will be treated late in PHC[27].

Constant care in promoting women's health throughout all life cycles is essential to ensure the prevention of obesity and breast cancer. Public authorities have created strategies to reverse the obesity scenario in Brazil, such as the creation of the Strategic Action Plan for Coping with Chronic Diseases and Non-Communicable Diseases in Brazil 2021-2030, which highlights some goals and actions listed in the axes of health surveillance, prevention, health promotion, and comprehensive health care to combat these diseases and conditions and their modifiable risk factors, including obesity and inadequate nutrition, of which we can highlight the regular monitoring of food and nutrition indicators through health information systems, studies, and population surveys, in addition to the development of clinical protocols for obesity, concerning controlling weight gain, food consumption and physical activity in Primary Health Care (APS)[20].

The problem surrounding breast cancer in Brazil is recent and began with its inclusion in the Women's Health Comprehensive Assistance Program (PAISM) in the 1980s. Since then, other actions to control the disease have been encouraged, among which the National Policy for the Prevention and Control of Cancer in the Health Care Network for People with Chronic Diseases within the scope of the Unified Health System and the Mammography Quality Program. However, even though these initiatives exist, Brazilian regions that face the worst scenarios of social inequality present the most advanced diagnoses for the disease, a condition that makes treatment difficult and brings higher risks of mortality[28,29]. In this scenario, our results reinforce that government initiatives also need to be regionalized so that the economic, social, cultural, and geographic particularities of our country are respected and health promotion actions are more effective.

Therefore, we understand that regional studies that see obesity as a risk factor for other chronic diseases, as well as epidemiological studies that show the causal relationship between these diseases, are essential to move forward with more assertive actions to prevent diseases and promote health. Our findings also reaffirm the importance of constant surveillance to continuously evaluate these indicators with a focus on NCDs and their risk factors in a regionalized manner, and thus present to public managers the epidemiological scenario of the population's health so that there is awareness, implementation, adequacy and definition of goals aligned with the Sustainable Development Goals (SDGs)[30] necessary to promote the health and well-being of the Brazilian population.

Despite the relevant results, some limitations of the study need to be highlighted, such as the fact that the secondary data used to determine the prevalence of obesity were reported by telephone by the participants, with potential information bias. Furthermore, we did not use adjusted rates in breast cancer incidence data because INCA did not make these values available in its estimates from 2008 to 2016, and our analyses were carried out only with crude rates. However, our results point to an increase in the prevalence of obesity concomitant with an increase in crude incidence rates of breast cancer.

CONCLUSION

We conclude that there was an increasing trend in the PVP of obesity and incidence of breast cancer in the capitals of the Brazilian Northeast, and the increase in obesity is associated with an increase in the incidence of breast cancer between the years 2008 and 2018. Finally, we also highlight the continuous need to monitor obesity to apply strategies based on public health promotion policies that can reduce risk factors related to breast cancer in the capitals of the Northeast Region.

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CONTRIBUTIONS

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