

Analysis Of Lalonde Determinants As Factors Associated With Breast Cancer

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Abstract

Breast cancer is a multifactorial disease, in which genetic and environmental factors contribute to its appearance. This article analyzes the determinants of health related to breast cancer in a population of patients of a health care provider. An analytical, retrospective, case-control study was conducted in women with histologically confirmed diagnosis of breast cancer and matched controls, attended in a health care provider institution (IPS) in the period 2000 and 2017. Logistic regression models were performed, calculating the odds ratio of risk of dying from breast cancer contrasted with biological, environmental, lifestyle and health services, in a crude and adjusted way (ORa) and their 95% confidence intervals.

Keywords: breast neoplasia, public health, social determinants of health, health systems, case-control studies

INTRODUCTION

Cancer is a process of uncontrolled growth and spread of cells that can appear in any part of the body and can invade the surrounding tissue causing metastasis [1]. Among all types of cancer, breast cancer is a disease of great impact worldwide, representing the fifth leading cause of death in general and the first in women. It is the most frequent in women, both in developed and developing countries, due to changes in factors such as lifestyle, which favor a higher risk [2].

According to statistics, breast cancer is the second most common cancer in the world, and the most frequent cancer in women, with an estimated 1.67 million new cases diagnosed in 2012 (25% of all cancers) [3]. According to predictions based on population growth, it is estimated that by 2030 there will be more than

596,000 new cases and more than 142,100 deaths from breast cancer.

This type of cancer is the one with the highest number of cases reported among high-cost pathologies, according to a study conducted in 2009. The International Agency for Research on Cancer (IARC) through High Cost Accounts (CAC) reported that the prevalence of breast cancer in Colombia in 2015 was 159.3 x 100,000 inhabitants (6). For this reason, the ten-year plan for cancer control in Colombia 2012-2021 includes it among its public health priorities [4].

The determinants that predispose a pathology are proposed by Marc Lalonde in four main factors which are: human biology, lifestyle, environment and organization of health care [5, 6, 7]; which would be important to evaluate to determine, correlate and maintain relevant,

timely and comparable information to improve the decisions that accompany national and regional policies for the prevention of this type of cancer.

This evaluation would be indispensable for the modification of the determinants of health, disease prevention and to achieve future interventions that can be carried out having the research conducted as support.

Thus, breast cancer is a growing problem of great magnitude for public health because, when it occurs, it has great repercussions at the psycho-affective, social and economic levels, and impacts not only the health of the woman, but also the family, society and the health system. That is why statistics support the need for more studies and research on this type of disease, which has a high incidence and mortality rate in Colombia, in order to intervene in the factors or determinants of this type of cancer.

METHODOLOGY

A retrospective analytical case-control study was carried out, taking as a theoretical basis the model of social determinants of health proposed by Marc Lalonde. The aim was to test the association between conditions pertaining to each dimension presented in this model and breast cancer in patients of a health service provider institution in the department of Sucre. In relation to the study group, there were 105 cases represented by the records of women diagnosed with this type of cancer and who were patients of this health care institution. For the 105 controls, persons with similar characteristics to the cases (breast CA patients) were taken into account and it was ensured that they complied with the sine qua non conditions of this type of study, regardless of their condition of exposure, it was guaranteed that they were consultants of the

same institution (from the same base population), but that at the time of selection of the cases, this group had the same risk of developing the event.

Sample design and sample size

The sample size consisted of 210 users, including teachers and their families. The case group of the study consisted of 105 living and deceased individuals, with a confirmed histopathological diagnosis of breast cancer, registered in the patient database of the Health Care Provider Institution, between the years 2000 and 2017.

Data collection and processing techniques

A previously anonymized database of users provided by the health services institution was used. This database identified living and deceased users with a confirmed diagnosis of cancer in the period from 2000 to 2017 and healthy users or users with a diagnosis different from the one proposed in the study (breast CA) and without correlation with it. Information was extracted for each of the variables included in the study, with the prior written consent of the institution's management and commitment to confidentiality.

The data were entered into a database designed by the researchers in the office software, Excel 2013, in which the variables of interest were organized and grouped according to the four dimensions of Lalonde's model of health fields: human biology, lifestyles, environment and health care organization.

Once the database was created, it was coded according to the nature, reference categories and level of measurement; it was exported to the SPSS version 22.0 statistical package,

coding again and assigning values to the qualitative variables, in order to generate output tables and facilitate the interpretation of the results. With regard to the processing of the information, specifically that which has to do with the association objectives of the type of study addressed, it was processed in the crosstabs window, explore, binary and multivariate logistic regression.

Data análisis

Prior to the analysis of the information, quality control was performed on the information obtained, verifying the completeness of the information, clarity of the data and consistency with the objectives of the study. Once the variables and sample size were selected according to the objective and scope of the study, the database was created in Excel 2013 and subsequently exported to the SPSS version 22 statistical package, a statistical tool useful for processing the information and generating output tables, graphs and other outputs necessary for the analysis.

The analysis of the information occurred in three moments, a first moment for the objectives describing the biological, environmental, lifestyle and health care related conditions. A second moment for the objective that seeks to establish binomial associations between the variables of the four dimensions and the event studied. And a third and final moment to adjust the variables according to exposure for both cases and controls.

Descriptive analysis

Once the variables were classified and organized in the database by type of determinant, the analysis of each variable was carried out. According to the operationalization table, and taking into

account the nature and distribution of the variables, a descriptive analysis was performed; for qualitative variables, relative frequency measures such as proportions, rates and ratios were used. Similarly, for continuous variables and according to their distribution, measures of central tendency, position and dispersion such as arithmetic mean, median, standard deviation, coefficient of variation, interquartile range, etc., were estimated.

RESULTS

Biological determinants

All the records found for the persons who were part of the cases were female, as were those selected to be part of the group of controls. The average age for the entire group was 53.3 (+/- 10.3) years at the time of diagnosis. The youngest participant was diagnosed at 25 years of age and the oldest at 87 years of age. The average age for the cases was 53.8 (+/- 11.2) years. The age group in which breast cancer was most frequently diagnosed was 49-58 years of age, with 37.1% (39/105) of women affected, followed by the age group between 39-48 years with 26.6% (28/105).

In the population without a diagnosis of cancer, the history of breast cancer was 6% (6/105), and as in patients with cancer, the highest frequency was found in siblings (50%) (3/6). A family history of another type of cancer was present in one third of those diagnosed with cancer 32.4% (34/105), with the highest frequency of kinship with brothers and uncles, 23.5% (8/34) each. On the other hand, in the population without cancer, this antecedent only had 9% (9/105), being equal in kinship conditions between siblings and grandparents with 33% (3/9) each. Regarding the presence of benign diseases prior to the

diagnosis of cancer, about 47% (49/105) of the participants had this history.

The average age at menarche was 12.8 years (+/-1.18), and 25.7% (54/210) of the individuals presented menarche at an early age (before 12 years of age). As for menopause, the average age of those who had presented it was 50.1 years (+/-3.64), and the late manifestation of menopause (> 55 years) occurred in 1.92% (3/156) of individuals. In addition, 80.4% (169/210) of the women had between one and three children and nulliparity was present in 15.2% (16/105) of the cancer cases.

Environmental determinants

For this type of determinant, it was found that 81.9% (86/105) of the participants with cancer did not take oral contraceptives prior to cancer and 93.3% (98/105) were not ordered hormone replacement drugs in the years prior to cancer. Something similar was observed in individuals without cancer, where the percentage of people who used oral contraceptives was 15.2% (16/105) and the use of hormone replacement therapy was only 4% (4/105). For other environmental determinants such as marital status and occupation, it was found that most of the study participants were married (74.7%; 157/210) and were engaged in teaching (63.3%; 133/105).

Lifestyle determinants

When assessing the lifestyles of the study participants, it was found that 50.5% (53/105) of the participants with breast cancer were obese or overweight prior to the diagnosis of cancer, while in the population without breast cancer, the presence of obesity or overweight was relatively low (15.2%; 16/105). In both sick and healthy patients, 95.2% (100/105) did

not engage in any type of physical activity. The history of smoking was similar in both groups, 7.62% (8/105) and 6.67% (7/105) respectively. Alcoholism was not present in the population without the disease and was only found in 1.9% (2/105) of those diagnosed with cancer.

Determinants of health services

For this type of determinant it was found that breast mass was the most common sign in the study population, with 78.1% (82/105) of the cases, and 39% (41/105) consulted the doctor within 1 month of the presence of the first symptom. Regarding the location of the cancer, in 50.4% (53/105) of the cases the affected breast was the left breast and in 6.6% (7/105) it was bilateral. Of the study participants, 34.2% (36/105) started treatment 1 to 2 months after the diagnosis was confirmed and only 4.7% (5/105) started treatment after 6 months. The most frequent clinical stage at diagnosis was IIA with 31.4% (33/105), followed by IIIB with 27.6% (29/105). The most frequent histological type was invasive or infiltrating ductal carcinoma with 73% (77/105), and in 89% (93/105) of the cases, the breast cancer had not metastasized to other organs. Of the individuals diagnosed, 10.4% (11/105) died of breast cancer.

Association of Health Determinants with Breast Cancer

With the application of the statistical method, it was possible to determine the significant association between some health determinants and breast cancer in people attended in a Health Care Provider Institution in an exception regime in the department of Sucre, in the period between 2000 and 2017.

Not all the variables of the different dimensions were included in the bivariate

analysis, taking into account aspects such as biological plausibility, control in the replicability of the information and the high correlation between them. For the latter, the variables that belong to the health services dimension, since all the variables of this component are related to the event studied.

In the bivariate analysis of health determinants and breast cancer, significant associations were established with all the antecedents included, such as benign breast diseases, such as fibromas and fibroadenomas ($p=0.02$) $OR=2.0$ [1.7-2.3], family history of breast cancer ($p=0.000$) $OR=9.3$ [3.7-23.3], family history of another type of cancer and personal history of another type of cancer or malignant

tumor ($p=0.02$). Similarly, age at menarche (less than 13 years) and overweight ($p=0.000$) $OR=5.6$ [2.9-10.9], contrary to variables such as age at menopause (less than 55 years), number of children (less than 3 children), use of oral contraceptives, hormone replacement therapy, tobacco and alcohol consumption, which did not have a significant association, among other variables.

In relation to family history other than breast cancer and its association with the event studied, statistical significance was observed between cases and controls, and those with this history have 5.1 times the risk of developing breast cancer than those who do not have this type of history (Table 1).

Table 1. Breast cancer and family history other than the event.

		Breast cancer		Total
		Yes	No	
Different family backgrounds	Yes	34	9	43
	No	71	96	167
Total		105	105	210
# Test	χ^2 (1gl)	P	Minimum expected frequency	
Pearson	18,27	0,000*	21,50	
R for V	19,2	0,000*		
# Measures:		Value	IC 95%	
OR		5,10	[2,3; 11,3]	
OR MH		5,10	[2,3; 11,3]	

* SPSS: OR (IC 95%) =5,1 [2,3-11,3], significant

Likewise, statistically significant differences were observed between having a family history of breast cancer and the event studied

($p=0.000$), with a considerable increase in the risk of those with such a history $OR= 9.3$ [3.7-23.3].

Regarding the statistical and epidemiological association between menarche and the event studied, differences were found between cases and controls with respect to this condition,

observing that the young age at first menstruation is a protective factor for developing breast cancer, with respect to women whose menarche was after 13 years of age (Table 2).

Table 2. Breast cancer and age at menarche.

		Breast cancer		Total
		Yes	No	
Age at menarche	< 13 years	74	99	173
	>13 years	29	6	35
Total		103	105	208**
# Test	χ^2 (1gl)	P	Minimum expected frequency	
Pearson	18,71	0,000*	17,3	
R for V	20,05	0,000*		
# Measures:		Valor	IC 95%	
OR		0,15	[0,06; 0,39]	
OR MH		0,15	[0,06; 0,39]	

* SPSS: OR (IC 95%) =5,1 [2,3-11,3], significant

** Two missing values for the variable

Breast cancer and environmental determinants

When establishing the association between environmental determinants and the probability of breast cancer, it was observed that there were no differences between the cases studied and the controls related to the marital status of the persons studied ($p=0.43$) OR= 1.09 [NC-NC].

In relation to occupation, differences were found between the groups, and the fact that the

women were engaged in housework was found to be a protective factor for the development of breast cancer, compared to women whose occupation was teaching. No differences were observed between cases and controls with respect to being exposed to the use of oral contraceptives prior to diagnosis ($p=0.57$); nor in those women who may or may not have received hormone replacement therapy prior to diagnosis ($p=0.35$).

Breast cancer and lifestyle determinants

The four conditions considered for this dimension were included in the bivariate analysis. Statistically significant differences were observed between cases and controls in relation to overweight, showing that women with a positive diagnosis for breast cancer have 5.6 times more risk of suffering the disease than those with a normal weight. No differences were observed between the groups studied and lifestyle habits such as tobacco consumption ($p=0.78$), physical activity prior to breast cancer diagnosis ($p=1.000$), or alcohol consumption ($p=0.15$).

Breast cancer and determinants of health services

The last dimension considered in the binary model corresponds to the determinants of health services, but given the variables included for this dimension and considering that the nine (9) conditions have a direct correlation with cases, it is not possible to establish statistical or epidemiological differences between cases and controls and the variables of this dimension.

CONCLUSIONS

In the present study it was determined that there is a significant relationship between some health determinants and breast cancer in women attended in a Health Service Provider Institution under the exception regime in the department of Sucre. Among the health determinants related to human biology, family history of breast cancer, family history of another type of cancer, history of benign breast disease such as fibroids or fibroadenomas, and nulliparity may be related to the development of breast cancer.

In the set of health determinants related to lifestyle, it was found that obesity or overweight corresponds to the main factor of this type related to breast cancer. Health determinants related to the environment, such as: consumption of oral contraceptives, hormone replacement therapy, marital status and occupation do not present an association with the development of breast cancer in the study population. As for health determinants related to health services, no statistical or epidemiological association with breast cancer was found.

Breast mass was the most common sign in the studied population, the most affected breast was the left one. The most common histological type was invasive or infiltrating ductal carcinoma and in most cases the breast cancer had not metastasized to other organs. Of the patients diagnosed, 10.4% died from this type of cancer.

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