DIETARY PATTERN OF WOMEN WITH BREAST CANCER: A POSTERIORI STUDY

Padrão alimentar de mulheres com câncer de mama: um estudo a posteriori

Patrón alimentario de mujeres con cáncer de mama: estudio a posteriori

Original Article

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ABSTRACT

Objective: To identify a posteriori dietary pattern of women with breast cancer. **Methods:** Observational, cross-sectional and analytical study. It evaluated 100 women with breast cancer, undergoing chemotherapy/radiotherapy, treated at a cancer center in the city of Fortaleza, from July to December 2012. The study collected clinical data (subtype, clinical stage - CS, treatment), socioeconomic (educational level and monthly income) and anthropometric data (weight, height, body mass index - BMI), and food consumption. To evaluate the consumption, a quantitative food frequency questionnaire (FFQ), validated for women of the Brazilian Northeast, was applied, and the daily consumption of each food was set in grams/ml, being grouped according to their nutritional composition into 10 groups, following the food pyramid adapted to the Brazilian population. The dietary pattern was defined by food components from the exploratory factor analysis of those ten food groups, using the SPSS, version 20.0. **Results:** Mean age of 50.9±10.2 years, with prevalence of ductal carcinoma (n=83; 83%) in CS III (n=60; 60%). The mean BMI indicated overweight (28.3±4.4 kg/m^2) and waist circumference was above the recommended (98.6±10.9 cm). Four food components were identified, and 21% of the diet variance was explained by food component 1 (Risk), with the matrix composed of red and processed meat, oils, fats and cereals. **Conclusion:** The patients' dietary pattern was characterized by a risk diet, which can positively contribute to the disease recurrence.

Descriptors: Food Consumption; Breast Cancer; Diet; Nutrition Assessment.

RESUMO

Objetivo: *Identificar o padrão alimentar a posteriori de mulheres com câncer de mama.* **Métodos:** *Estudo observacional, transversal e analítico. Foram avaliadas 100 mulheres com câncer de mama, submetidas à quimioterapia/radioterapia, atendidas em um centro de câncer, na cidade de Fortaleza-CE, de julho a dezembro de 2012. Coletaram-se dados clínicos (subtipo, estadiamento clínico – EC, tratamento), socioeconômicos (escolaridade e renda mensal), antropométricos (peso, estatura, índice de massa corporal – IMC) e de consumo alimentar. Para avaliação do consumo, foi utilizado um questionário quantitativo de frequência alimentar (QQFA) validado para mulheres do Nordeste, e o consumo diário de cada alimento foi definido em gramas/ml, sendo agrupados, de acordo com sua composição nutricional, em 10 grupos, seguindo a pirâmide alimentar adaptada à população brasileira. Definiu-se o padrão alimentar por componentes alimentares a partir da análise fatorial explanatória dos dez grupos de alimentos, utilizando-se o SPSS, versão 20.0.* **Resultados:** *Idade média de 50,9±10,2 anos, com prevalência de carcinoma ductal (n=83; 83%) em EC III (n=60; 60%). A média do IMC indicou excesso de peso (28,3±4,4 kg/m^2) e a circunferência da cintura estava acima do recomendado (98,6±10,9 cm). Identificaram-se quatro componentes alimentares e 21% da variância da dieta foi explicada pelo componente alimentar 1 (Risk), com a matriz composta por carne vermelha e processada, óleos, gorduras e cereais.* **Conclusão:** *O padrão alimentar das pacientes foi caracterizado por uma dieta de risco, que pode contribuir positivamente para a recidiva da doença.*

Descritores: *Consumo de Alimentos; Câncer de Mama; Dieta; Avaliação Nutricional.*

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Received on: *03/24/2014*
Revised on: *05/20/2014*
Accepted on: *07/05/2014*

RESUMEN

Objetivo: *Identificar el patrón alimentario a posteriori de mujeres con cáncer de mama.* **Métodos:** *Estudio observacional, transversal y analítico. Fueron evaluadas 100 mujeres con cáncer de mama sometidas a quimioterapia/radioterapia asistidas en un centro de cáncer de Fortaleza-CE, de julio a diciembre de 2012. Se recogieron datos clínicos (subtipo, clasificación clínica – CC, tratamiento), socioeconómicos (escolaridad y renta mensual), antropométricos (peso, estatura, índice de masa corporal – IMC) y de consumo alimentario. Para la evaluación del consumo, fue utilizado un cuestionario cuantitativo de frecuencia alimentaria (QQFA) validado para mujeres del Nordeste, y el consumo a diario de cada alimento fue definido en gramos/ml, siendo agrupados, según su composición nutricional, en 10 grupos, siguiendo la pirámide alimentaria adaptada a la población brasileña. Se definió el patrón alimentario por componentes alimentarios a partir del análisis factorial exploratorio de los diez grupos de alimentos, con la utilización del SPSS, versión 20.0.* **Resultados:** *Edad media de 50,9±10,2 años, con prevalencia de carcinoma ductal (n=83; 83%) en CC III (n=60; 60%). La media del IMC indico exceso de peso (28,3±4,4 kg/m²) y la circunferencia de la cintura estaba por encima del recomendado (98,6±10,9 cm). Se identificaron cuatro componentes alimentarios y el 21% de la variancia de la dieta fue explicada por el componente alimentario 1 (Risk), con la matriz formada por carne roja y procesada, aceites, grasas y cereales.* **Conclusión:** *El patrón alimentario de las pacientes fue caracterizado por una dieta de riesgo que puede contribuir positivamente para la recidiva de la enfermedad.*

Descriptores: *Consumo de Alimentos; Neoplasias de la mama; Evaluación Nutricional.*

INTRODUCTION

Breast cancer is the second most frequent cancer in the world and the first among women, being estimated almost 27 million new cases for 2030, thus becoming a serious public health problem[1]. In Brazil, the estimate for 2015 is 576 thousand new cases of malignant breast neoplasm[1].

The association between dietary factors and breast cancer is widely recognised in the literature. However, the role of food as a development facilitator for this cancer has not been clearly elucidated. Several studies state that the quality of food, characterized by a 'prudent' diet, rich in fruits, legumes, cereals, olive oil and dairy products, seems to pose a possible beneficial effect, contributing to the reduction of the incidence rates of the disease[2,3]. It is believed that such protection can be attributed to the consumption of antioxidant nutrients, such as vitamins (A, C and E), and zinc and selenium minerals, considered bioactive food compounds able to significantly reduce the adverse effects produced by oxygen-reactive species[3,4]. Despite this evidence on the benefits of vegetable consumption to protection against breast cancer, an inverse relationship between that regular consumption and the development of this neoplasm is still displayed[5].

Understanding these controversial results, it is crucial to highlight that individuals do not consume these foods and nutrients separately, but combined into large meals. And it is this combination that promotes the synergic action of several bioactive food compounds, which seems to interfere in the transformation of a healthy cell into a diseased cell[2,5,6].

On this wise, the qualitative characterization of the eating pattern, not merely food or nutrients considered apart, may provide important subsidies for the quality of the diet, this evaluation being increasingly used to analyse the association between the qualitative characteristics of the diet and the development of chronic diseases[7].

Accordingly, the analysis of dietary patterns has constituted a recommended approach to assess the relationship between diet and the risk of chronic diseases such as cancer, which overcomes the limitations of the approach of specific food or nutrients[7]. In this perspective, the objective of this study was to identify the a posteriori dietary patterns of women with breast cancer.

METHODS

Cross-sectional, observational, and qualitative study, comprising women with breast tumour (n=100) treated at a cancer centre in the city of Fortaleza, CE, chosen through convenience, consecutive and nonprobabilistic selection, in the period from July to December 2012. Patients over 19 years, referred to the antineoplastic treatment, without nutritional counselling, were considered eligible. Vegetarian, carriers of previous neoplasia or associated with breast cancer, or those who had completed cancer treatment more than two years ago were not included in the study.

The socioeconomic and clinical data were collected through direct interview or research or medical record, using a questionnaire developed for this purpose, being obtained information on age, education, monthly income in minimum wages (MW), tumour location, clinical staging (CS) and type of antineoplastic treatment.

For the nutritional status definition, the current weight - CW (kg), height (m) and waist circumference - WC (cm) were measured. The CW was measured on a Plenna® brand platform scale, with a 150-kg capacity, with women wearing light clothing and no shoes. For height, it was used a stadiometer with 2 m, following the Frankfurt plane[8]. WC was measured with inelastic and flexible measure tape, being considered high the values ≥80cm[9].

The body mass index (BMI) was defined by the weight-to-height formula[10], using it as a parameter for the nutritional diagnosis, according to the World Health Organization (WHO)[11] for adult women and for the elderly[12].

The dietary pattern was evaluated in two stages: the first consisted of the consumption assessment; the second one included the statistical analysis.

Dietary intake was assessed by a trained interviewer using a quantitative food frequency questionnaire (QFFQ) validated for women of the Brazilian northeast region[13], which included 68 food items. In order to minimize bias of memory, the study considered household measures kits (plates, cups, glasses and cutlery), characteristic of the region's popular use, as well as photographic records, to facilitate the quantification of portions.

Each patient's daily food intake was defined from the usual consumption reported by the QFFQ, organizing the 68 food items in 10 groups, according to the food pyramid adapted to the Brazilian population, also considering the similarity in the nutritional composition.

The food groups were defined as: **Group 1 -** dairy products (milk, yogurt, curd, vitamins, cheese); **Group 2 -** cereals (macaroni, lasagne, pizza, pasta, white rice, sweet potatoes, pumpkin, potato or cassava, wheat or cassava flour, corn couscous, Neston, oats, bread, cookies or crackers, corn, peas, green beans); **Group 3 -** red and processed meat (meat, beefsteak, jerky beef, sausage, ham, egg, chicken giblets); **Group 4 -** white meat (roast chicken, grilled fish); **Group 5 -** fruits and juices (orange, tangerine, banana, papaya, apple, watermelon, melon, strawberry, pineapple, peach, fresh plum, orange juice, fresh fruit juice); **Group 6 -** leguminous plants (beans); **Group 7 -** vegetables and legumes (soups, salad mayonnaise with legumes, tomatoes, lettuce, cabbage, spinach, beet, carrot, cucumber, sweet pepper); **Group 8 -** Oils and fats (fried potatoes, fried cassava, margarine on bread, butter on bread, olive oil, mayonnaise, fried fish, fried chicken); **Group 9 -** alcoholic beverages (beer, sugar cane brandy, whiskey, vodka, wine); **Group 10 -** sweets and soft drinks (sugar added to milk, chocolates, sweets, brigadiers candies, bombons, cakes, pies, ice cream, soda, sweet biscuit). Some foods were excluded because they did not fit in any group (coffee with sugar, coffee without sugar, ketchup, mustard, sweetener, water).

Dietary patterns were obtained by exploratory factor analysis of the ten food groups[14]. Factor analysis is a generic name given to multivariate statistical analysis applied to the identification of factors in a data set. In this method, all variables are considered simultaneously, in connection with each other[14].

Initially, in order to determine the appropriateness of using factor analysis, the uniformity within the sample was tested to examine the variables distribution, by using the Kaiser-Meyer-Olkin (KMO) test. The presence of correlation between the variables followed the Bartlett's test of sphericity, for which were considered acceptable the KMO values above 0.50 and p values <0.05[15].

The principal components analysis was used to extract factors. This method examines the spatial distribution of objects in order to identify the groups and relationships between them. The first factor or component extracted explains the largest possible variance within the dataset. The second component, independent of the first, accounts for most of the remaining variance, and so on, without any correlation with the other.

The choice of the number of factors was first based on the Kaiser's criterion, called eigenvalues above 1.0. It is the most used criterion in the factor analysis, and the theoretical basis supporting it is that each retained factor should explain the largest variance in the original data set. Four factors were identified, according to the applied criterion of eigenvalues > 1.0. The patterns were named considering the food groups that had higher values (positive or negative), over 0.5. Larger positive values indicate a strong association between the groups and patterns. Statistical analysis was performed using SPSS, version 20.0.

This study followed the Resolution 466/12 of the National Health Council, was approved by the Research Ethics Committee of the University of Fortaleza (Opinion no. 204/10), and information collection was initiated after the patients had given their written informed consent.

RESULTADOS

The mean age was 50.9 ± 10.2 years (27-78 years), most women had elementary education (n=54; 54%) and monthly income below the minimum wage (n=59; 59.5%). The highest prevalence was of ductal carcinoma (n=83; 83%) and clinical staging (CS) III (n=60; 60%). Chemotherapy in combination with radiotherapy was the most common treatment, used in 45 (45%) patients (Table I).

The mean BMI was 28.3±4.4 kg/m^2 (20-40 kg/m^2) and the average waist circumference was 98.6 cm (62-128 cm). According to the BMI, nutritional diagnosis of most patients indicated excess weight (overweight and obesity) (n=76; 76%) (Figure 1), and 89 (89%) women had a waist circumference above the recommended.

Regarding the a posteriori dietary pattern evaluation, from the principal components analysis, four independent factors were extracted with eigenvalues criterion > 1.0 (Table II). These factors were named food components and numbered 1, 2, 3, and 4. The first food component had its

Table I - Description of patients according to the socioeconomic and clinical profile. Fortaleza, CE, Brazil, 2012.

Variables	n	%
Education		
Literate	6	6%
Incomplete primary education	54	54%
Complete primary education	8	8%
Incomplete secondary education	4	4%
Complete secondary education	14	14%
University graduate	9	9%
Lacking	5	5%
Monthly income		
<1 mw*	59	59%
1 – 3 mw*	28	28%
>3 mw*	6	6%
No earnings	7	7%
Subtype		
Ductal	83	83%
Lobular	3	3%
Others	1	1%
Not informed**	13	13%
Clinical stage		
I	8	8%
II	16	16%
III	60	60%
IV	3	3%
Not informed**	13	13%
Treatment		
Chemotherapy	24	24%
Radiotherapy	26	26%
Chemotherapy + radiotherapy	45	45%
Not informed**	5	5%

* Minimum wage: $ 311.74; ** No information found in the patient's medical record.

matrix composed by the groups 'red and processed meats' (0.672), 'oils and fats' (0.707) and 'cereals' (0.683), and was named 'Risk'. The second component had its matrix explained by the food groups 'dairy products' (0.653), 'fruits and juices' (0546), and 'vegetables and legumes' (0.780), being called 'Protector'. The third component was represented by 'white meat' (0.580) and 'leguminous plants' (0.850), and named 'Traditional'. The fourth component, characterized by the predominance of 'alcohol' (0.722), 'sweets and soft drinks' (0.636), was called 'Not healthy'. These factors accounted for 60.1% of the total variance of these patients' food intake (Table II).

The 'Risk' component accounted for 21% of the total variance of the diet, whereas the 'Protector' component explained 15.8% of the dietary pattern (Table II).

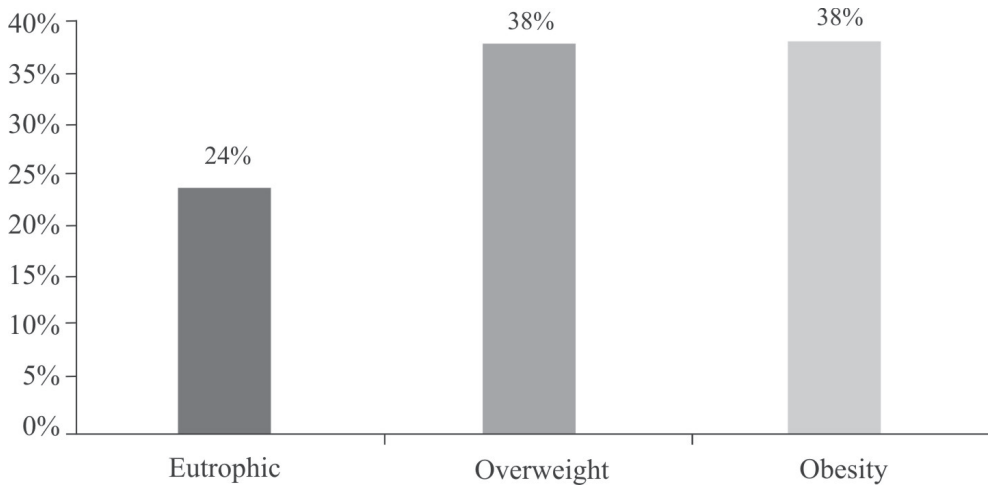

Figure 1 - Description of patients percentage according to nutritional status defined by the Body Mass Index (BMI). Fortaleza, CE, Brazil, 2012.

Table II - Description of the dietary pattern identified by Quantitative Food Frequency Questionnaire (QFFQ) using factor analysis on the total population. Fortaleza, CE, Brazil, 2012.

Food group	Dietary pattern			
	Component 1: Risk	Component 2: Protector	Component 3: Traditional	Component 4: Not healthy
Dairy products	-0.311	0.653	0.164	-0.043
Cereals	0.683	0.208	0.185	0.031
Red and processed meat	0.672	0.193	-0.260	0.224
White meat	0.348	0.373	0.580	-0.104
Fruits and juices	0.165	0.546	0.085	0.327
Leguminosous plants	-0.013	-0.008	0.850	0.122
Vegetables and legumes	0.201	0.780	-0.069	-0.171
Oils and fats	0.707	-0.279	0.138	-0.073
Alcoholic beverages	-0.194	-0.052	0.332	0.722
Sweets and soft-drinks	0.335	-0.010	-0.221	0.636
% explained variance	21.0	15.8	12.9	10.3

DISCUSSION

This is a pioneering study in evaluating the a posteriori dietary pattern of women with breast cancer in the Brazilian northeast. The results showed that the evaluated patients had a dietary pattern characterized by risk, composed of red meat, sausages, oils, fats, and cereals consumption, in addition to the high prevalence of excess weight and abdominal fat.

High BMI has been associated with increased risk of breast cancer in postmenopausal women[16], and a substantial amount of evidence imply that obese women have lower survival after the diagnosis of breast cancer than women with normal weight[17]. Furthermore, the waist circumference measure above the recommended, associated with localized fat in the abdominal region, seems to act as an important risk factor for the development of some

cancers[18]. These findings suggest that the patients in this study, among which, 76.7% were overweight and 89% had WC above recommended, have altered variables that may contribute to possible recurrence of breast cancer.

In spite of the existing evidence, the causal mechanism by which excess weight and adipose tissue affect the cancer prognosis remains to be elucidated, although it has been suggested to be related to the complex and metabolically active endocrine role played by the adipose tissue, which appears integrally involved in the coordination of various biological processes[19].

When such excess is characterized by visceral adiposity, measured by the WC, it creates a more favourable environment for the development of the tumour, since the visceral adipose tissue is involved in low-intensity chronic inflammation, which mobilizes macrophages, promotes increase in tumour necrosis factor (TNF) and interleukin (IL) levels, leads hyperinsulinemia and increased levels of insulin-like growth factor (IGF-1), ending up with a pro-tumorigenic inflammatory state, angiogenesis and insulin resistance[20,21,22].

In agreement with the carcinogenic metabolic alterations in the presence of excess weight, there is also an increase in the circulating levels of estrogen, possibly through increase in fat mass, and increased aromatase expression in subcutaneous adipose tissue, which, associated with reduced plasma levels of sex hormone-binding globulin (SHBG), allow the estrogen to remain free and act on the mammary epithelial cell[20,21].

Once the excess weight is seen as an important negative prognostic factor for survival of women with breast cancer, and there is also association with the disease progression or recurrence, it is important to maintain body weight within normal limits and avoid weight gain and increase in waist circumference throughout adulthood. To this end, the adoption of a healthy lifestyle, staying physically active, and adopting good eating habits are essential[22,23].

In the meantime, the importance of using the dietary pattern to analyse the relationship between diet and cancer has been widely discussed, not only considering specifically the nutrients or foods. It is believed that this analysis can be more reliable, since foods are not consumed in isolation, but in meals consisting of combinations of those foods[24]. Moreover, studies have shown that the dietary patterns analysis is best predictor of disease risk because it reduces the variables into meaningful groups that are easier to analyse[25].

In this study, it was found that the patients' dietary pattern follows the consumption of a risk diet, in which food groups composed of red and processed meats, oils, fats, and cereals constitute the largest percentage of the diet. Therefore, the risk component comprises food that can act as risk factors for the breast cancer recurrence, especially if diet is associated with nutritional diagnosis of obesity. One can see the presence of cereals among the food groups of the evaluated patients. Nevertheless, considering the characteristics of the northeastern food, it is believed that the consumed cereals are probably the refined ones, since the consumption of whole foods, despite of being stimulated by government programs, is not routinely adopted as eating habit in this population.

The role of diet in the breast cancer etiology has been suggested, in part, because of the wide variation in the international cancer rates. It can be attributed to the antioxidant properties of the selected nutrients, their influence on immune and inflammatory cell response in progression through the cell cycle and DNA repair, to the DNA mutations, metabolic detoxification, the stimulation of growth factors, and the potential antiestrogen influence of some nutrients[26].

A diet with high consumption of fruits, vegetables and whole grains, along with antioxidant nutrients, fiber and phytochemicals, has preventive action[22]. On the other hand, the excessive intake of foods with high contents of saturated and polyunsaturated fat, and trans-fat, such as red meat, fried foods, dairy products, bacon, ham, sausages and bologna, is considered a risk for developing the disease[7,27,28]. Conversely, a study comprising women with breast cancer found that greater adherence to healthy eating habits, with a diet rich in fruits, vegetables, whole grains, poultry, fish and low-fat dairy products, was associated with a decrease in the overall mortality[28].

Consequently, adopting a diet that consists mainly of fruits, vegetables, fish and olive oil/sunflower oil, and, furthermore, avoiding foods such as red meat, high-fat processed and canned foods, refined grains, and alcohol contribute to a substantial reduction in breast cancer risk[29].

Consumption of red meat has been strongly associated with increased risk of breast cancer, especially in premenopausal women[29]. Similarly, women whose dietary pattern is characterized by high intake of refined grains, red meats, and pickles are at increased risk of developing the disease[30]. The relationship between the consumption of red and processed meats with breast cancer can be explained by the high content of fats in these foods, liable to stimulate lipid peroxidation and promote oxidative stress in these patients[31]. Likewise, the red meat saturated fat seems to stimulate endogenous production of estrogens, which induce the proliferation of mammary epithelial cells. Allied to this, the cholesterol is associated with increased breast density, which is also a risk factor for disease development. Red meat has potent carcinogens, such as heterocyclic

amines, polycyclic aromatic hydrocarbons and other nitrogen compounds, which may also increase the risk of neoplasia[32].

Supporting that idea, a study performed with women who had early diagnosis of breast cancer found that the dietary pattern - consisting of high intake of refined grains, sweets, red and processed meats, high-fat dairy products, snacks and butter - was related to a higher risk of death from all causes and to breast cancer mortality[17].

The second food component ('Protector') found in this study was characterized by dairy products, fruits, juices and vegetables groups. This is the component with the second representation in these women's dietary pattern, thus a smaller percentage. A dietary pattern rich in fruits and salads may be protective against invasive breast cancer, and this beneficial effect should be greater for the estrogen receptor (ER)-negative or progesterone receptor (PR)-negative tumours[33]. Such protective pattern, however, was not the one found in this study, once the highest percentage of variance is explained by the risk component.

Currently there is consistent evidence that a healthy dietary pattern (rich in vegetables and low in red and processed food meat) is associated with a reduced breast cancer risk[34]. Reinforcing this hypothesis, a dietary pattern characterized by the consumption of legumes, fruits, olive oil, fish, soy, and low fat intake is negatively associated with breast cancer[2].

It is understood that the food intake evaluation is always an important limiting factor in studies that seek to evaluate the diet-disease relationship, given that the food choices are not defined only by the individual's knowledge of what is healthy, because they depend on social, economic and affective aspects. Therefore, one of the limitations of this study is the fact that it comprised only patients of low-income social class, what poses limits to many food choices. Therefore, it is recommended the expansion of the study also for the middle- and high-income populations, in order to include in the investigation of this dietary pattern other social levels, and define the dietary pattern of those women diagnosed with breast cancer who constitute the evaluated population.

Knowing in greater depth the dietary pattern of women living in Brazil's northeast region will certainly help to improve the consumption of a protective diet, considering the regional food and the socioeconomic conditions in which those patients are inserted.

CONCLUSION

The patients' dietary pattern was mainly represented by the consumption of red and processed meat, oils, fats and cereals, characterizing a risk diet, which can positively contribute to the disease recurrence.

ACKNOWLEDGEMENTS

To CRYO for their support, and to the voluntary patients.

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