

# Standards of adherence to cancer prevention guidelines in female breast cancer survivors

## Estándares de adherencia a las guías de prevención del cáncer en mujeres sobrevivientes de cáncer de mama

Manuella Cunha Barbosa, Priscila Carmelita Paiva Dias Mendes Carneiro,  
Ingrid Fernandes de Macêdo Soares, Sâmia Lopes da Costa,  
Soraia Pinheiro Machado, Sara Maria Moreira Lima Verde

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### ABSTRACT

**Objective** The aim of this study was to assess the main patterns of adherence to the cancer prevention guidelines proposed by the 2018 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) by breast cancer survivors.

**Methods** Cross-sectional study that used the Principal Component Factor Analysis to identify the adherence patterns and the highest (Q4) and lowest (Q1) quartiles of each pattern.

**Results** Two main adherence patterns were identified: 'grains/fruits/fiber' —adherence to a healthy body mass index (BMI), a diet rich in grains, vegetables, fruits and beans and total fiber—; a second, 'fast-food/sugar' —adherence to the BMI, limiting the consumption of fast food, processed foods, sugar and starch and the consumption of sugary drinks—. The 'fast-food/sugar' pattern has the greatest influence on BMI (0.4672). Lower weight ( $p=0.005$ ;  $p=0.001$ ) and BMI ( $p=0.001$ ;  $p<0.001$ ) are observed in women at the Q4 of the two patterns, respectively.

**Conclusions** Breast cancer survivors have a pattern of adherence to the guidelines characterized by greater consumption of grains, vegetables, fruits, beans, and fiber; and another characterized by a limited consumption of processed foods and sugary drinks, with a greater impact on BMI.

**Key Words:** Breast neoplasms; obesity; diet, healthy; lifestyle (*source: MeSH, NLM*).

### RESUMEN

**Objetivo** El objetivo de este estudio fue evaluar los principales patrones de adherencia a las pautas de prevención del cáncer propuestas por el World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) de 2018 por sobrevivientes de cáncer de mama.

**Métodos** Estudio transversal que utilizó el Análisis Factorial de Componentes Principales para identificar los patrones de adherencia y los cuartiles más alto (Q4) y más bajo (Q1) de cada patrón.

**Resultados** Se identificaron dos patrones principales de adherencia: 'granos/frutas/fibra' —adherencia a un índice de masa corporal saludable (IMC), una dieta rica en granos, verduras, frutas y frijoles y fibra total—; una segunda, 'comida rápida/azúcar' —adherencia al IMC, limitando el consumo de comida rápida, alimentos procesados, azúcar y fécula y el consumo de bebidas azucaradas—. El patrón 'comida rápida/azúcar' tiene la mayor influencia en el IMC (0,4672). Se observa menor peso ( $p=0,005$ ;  $p=0,001$ ) e IMC ( $p=0,001$ ;  $p<0,001$ ) en mujeres en el Q4 de los dos patrones, respectivamente.

**Conclusiones** Las sobrevivientes de cáncer de mama tienen un patrón de adherencia a las guías caracterizado por un mayor consumo de granos, verduras, frutas, frijoles y fibra y otro caracterizado por un consumo limitado de alimentos procesados y bebidas azucaradas, con mayor impacto en el IMC.

**Palabras Clave:** Neoplasias de la mama; obesidad; dieta saludable; estilo de vida (*fuentes: DeCS, BIREME*).

MB: Nut. M. Sc. Nutrition and Health. Universidade Estadual do Ceará. Fortaleza, Brazil.

manuellacunhabarbosa@gmail.com

PC: Nut. M. Sc. Collective Health.

Universidade Estadual do Ceará. Assistant professor of the Nutrition Course.

Universidade de Fortaleza. Fortaleza, Brazil.

pripdiascarneiro@gmail.com

IS: Nut. M. Sc. Nutrition and Health.

Universidade Estadual do Ceará.

Fortaleza, Brazil.

ingryd.fernandes@aluno.uece.br

SDC: Nut. M. Sc. Nutrition and Health.

Universidade Estadual do Ceará.

Fortaleza, Brazil.

samia.lc@hotmail.com

SM: Nut. Post-doctoral Collective Health.

Adjunct professor of the Nutrition Course

and permanent advisor of the Postgraduate

Programs in Collective Health and Nutrition

and Health. Universidade Estadual do Ceará.

Fortaleza, Brazil.

soraia.arruda@uece.br

SV: Nut. Ph. D. Science. Adjunct professor

of the Nutrition Course and Permanent

professor of the Postgraduate Program in

Nutrition and Health. Universidade Estadual

do Ceará. Fortaleza, Brazil.

sara.maria@uece.br

The importance of a healthy lifestyle for breast cancer prevention in women is well established in the literature (1) and almost 30% of breast cancer cases worldwide could be prevented with weight control, adequate nutrition, and physical activity (2-4). It is estimated that in Brazil 21.3% of breast cancer cases and 22% of deaths are attributable to lifestyle-related risk factors (5). The late recurrence can be associated with the lifestyle (6).

World agencies have dedicated to defining guidelines for cancer prevention and recurrence (7-9) and reinforce that women who follow these recommendations have a reduction of 13% to 60% in breast cancer risk (7). The adoption of a healthy lifestyle is the most effective line of action to prevent recurrence, especially in low- and middle-income countries (5), but it requires personal commitment and effective public policies (10).

Women with breast cancer are predisposed to dietary experiences with a focus on self-care, but treatment-related effects could influence the consumption of unhealthy foods and contribute to weight gain observed in this population (11), and to the distancing from cancer prevention recommendations (7,9). As such, our aim was to assess the main patterns of adherence to the cancer prevention guidelines proposed by the 2018 World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR) by breast cancer surviving patients.

## METHODS

### Study Population and Data Collection

A cross-sectional study was conducted with 100 women diagnosed with clinical stage I-IV breast cancer, older than 20 years, treated at a reference centre in oncology from 2010 to 2011, who were consecutively and non-probabilistically selected. Patients with restrictive diets, those diagnosed with a neoplasm in another cancer site other than the breast, and/or those who could not answer the questionnaires were not included.

Sociodemographic and clinical data were obtained by searching the medical records of each patient and through interviews. Weight and height were measured on a platform weighing scale with attached stadiometer (12). Body mass index (BMI: kg/m<sup>2</sup>) was calculated and the patients were classified as malnourished, normal weight, overweight or obese (13,14). The elderly women were classified as thin, normal weight, and overweight (15). The waist circumference (wc) was measured at midpoint between the last rib and the iliac crest (14), considering the wc measurement  $\geq 88$ cm as high risk for metabolic diseases (16).

Food consumption was investigated using the Quantitative Food Frequency Questionnaire (QFFQ), validated

for northeast Brazilian women (17), consisting of 68 food items and home utensils typically used by the population, as well as a photo album showing food servings, when the instrument was applied. Then, we calculated the daily consumed amount of each food item in grams or milliliters of each item of the QFFQ.

### Assessment of adherence to WCRF/AICR guidelines

We used 6 out of the 10 recommendations by WCRF/AICR (7): having a healthy weight; having a diet rich in whole grains, vegetables, fruits and beans; limiting the consumption of fast food and other processed foods rich in fats, starches and sugars; limiting the consumption of red and processed meats; limiting the consumption of sugary drinks, and limiting the consumption of alcoholic beverages.

To assess adherence to these recommendations the food items in the QFFQ instrument were grouped according to the consumption recommendations. In order to assess how much was consumed of the food mentioned in each recommendation per patient, the daily intake in grams and or milliliters of all component foods in each recommendation was added. Each food item was included in only one recommendation group, even when it had characteristics that indicated its allocation in more than one group. To define whether the patient's consumption followed the one proposed by the recommendations, the cut-off points proposed by the WCRF/AICR Third Expert Report 2018 (7) were used, considering "adherence" when consumption followed the recommended amounts, and "lack of adherence" when the consumption did not follow it.

We expanded the assessment using the WCRF/AICR 2018 Score (18), where a score is assigned to each prevention recommendation, which can vary from 0 to 1, and the maximum value indicates that there is total adherence to the recommendations and the value of 0 (zero) indicates that there is a lack of adherence. In the present study, as we chose to work with only 6 recommendations regarding food and weight management, we considered a total range of scores from 0 to 6.

### Statistical Analysis

The association of sociodemographic and anthropometric variables with adherence to the WCRF/AICR recommendations was tested using Pearson's X<sup>2</sup> test. The relationship between the total score of adherence to the recommendations and the anthropometric variables (weight, BMI and wc) was tested using Spearman's correlation coefficient.

To analyse the identification of the patterns of adherence to the WCRF/AICR guidelines (7), the recommendation score related to the BMI, consumption of fruits and vegetables, total fiber, calories from ultraprocessed

foods and sugary drinks was used. We used the Principal Component Factor (PCF) analysis method, followed by orthogonal varimax rotation. The adequacy of the data to the factor analysis was confirmed using the Kaiser-Meyer-Olkin ( $\kappa_{MO}$ ) coefficient and the Bartlett sphericity test. Each principal component was interpreted based on recommendations with factor loads  $\geq 0.3$  or  $\leq -0.3$ . Inside a component, negative charges indicate an inverse association of the item and positive charges indicate a direct association. For each identified pattern, the factor scores of the assessed women were generated.

Differences between mean weight, BMI and total scores of adherence to the recommendations between patients in the highest (Q4) and in the lowest quartile (Q1) of the patterns of adherence to the recommendation were calculated using the Student's t test. The level of significance was set at 5%. Statistical analyses were performed using Stata software, version 13 and SPSS, version 20.0. The project was approved by the Research Ethics Committee of University of Fortaleza (n. 204/10) and all procedures were in accordance with the ethical standards of the Declaration of Helsinki (19).

## RESULTS

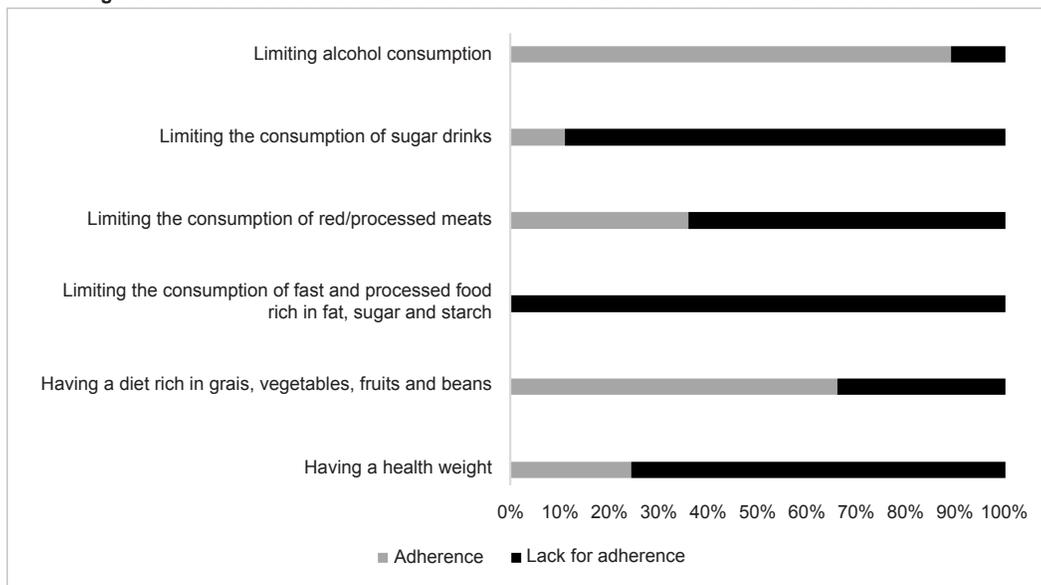
The patients' mean age was 51 (10.1) years, with most of them being over 50 years old (53.0%), whose income was below 1 minimum wage (63.0%), living without a partner (61.2%) and with less than 9 years of study (90.5%). Most women were at stage III or IV of the disease

(73.9%). According to the anthropometric data, 76.0% of the patients had excess weight (overweight/obesity), with an average BMI of 29 (4.42) kg/m<sup>2</sup>; elevated WC was identified in most women (94.4%), with an average of 99 (10.8) cm (Table 1).

Most patients adhered to the recommendation of having a diet rich in grains, vegetables, fruits, and beans (66.0%) and limiting alcohol intake (89.0%). Only a small portion of the studied group adhered to the recommendations of having a healthy weight (26.0%), limiting the consumption of red and processed meats (36.0%), and limiting the consumption of sugary drinks (11.0%). None of the participants followed the recommendation of limiting the consumption of fast and processed foods rich in fat, sugar, and starch (Figure 1). The patients adhered to an average of 2.3 (0.92) recommendations and 93.0% adhered to 2 recommendations or fewer (Table 1).

Adherence to the recommendation of having a healthy weight was associated with the patients' nutritional status ( $p < 0.001$ ), being in the lowest BMI quartile ( $p < 0.001$ ), having moderate to low cardiovascular risk ( $p < 0.001$ ), and having WC < 91.1 cm ( $p < 0.001$ ). Limiting the consumption of red and processed meats showed a direct association with being in the lowest BMI quartile ( $p = 0.02$ ). Following fewer than two recommendations was directly associated with the overweight/obesity nutritional status ( $p < 0.0001$ ), BMI > 25.6 kg/m<sup>2</sup> ( $p = 0.002$ ), high cardiovascular risk ( $p = 0.001$ ) and WC > 91.1 cm ( $p = 0.004$ ). Adherence to the recommendations showed no association with age, income, and level of schooling (Table 1).

**Figure 1.** Prevalence of adherence and lack of adherence to the 2018 WCRF/AICR recommendations



WCRF/AICR: World Cancer Research Fund/ American Institute for Cancer Research.

**Table 1. Patients' sociodemographic and anthropometric profile and association with adherence to the 2018 WCRF/AICR recommendations**

Variables	n (%)	WCRF Recommendations													
		Having a healthy weight		Limiting the consumption of vegetables, fruits and beans		Limiting the consumption of red/processed meats		Limiting the consumption of sugary drinks		Limiting the consumption of alcoholic beverages		Total recommended			
	Yes (N=24) 24%	No (N=76) 76%	P	Yes (N=66) 66%	No (N=34) 34%	P	Yes (N=36) 36%	No (N=64) 64%	P	Yes (N=89) 89%	No (N=1) 11%	P	3 or more (N=7) 7%	Up to 2 (N=93) 93%	
Age (n=100)															
<50 years	47 (47)	11 (45.8)	36 (47.4)	0.895	34 (51.5)	13 (38.2)	0.208	14 (38.9)	33 (51.6)	0.165	43 (48.3)	4 (36.4)	0.454	2 (28.6)	45 (48.4)
≥ 50 years	53 (53)	13 (54.2)	40 (52.6)		32 (48.5)	21 (61.8)		22 (61.1)	31 (48.4)		46 (51.7)	4 (36.4)		5 (71.4)	48 (51.6)
Income (n=98)															
< 1 MW	58 (63)	14 (60.9)	44 (63.9)	0.803	36 (59.0)	22 (71.0)	0.262	19 (57.6)	39 (66.1)	0.416	6 (60.0)	52 (63.4)	0.833	54 (65.1)	4 (44.4)
> 1 MW	34 (37)	9 (39.1)	25 (36.2)		25 (41.0)	9 (29.0)		14 (42.4)	20 (33.9)		4 (40)	30 (36.6)		29 (34.9)	5 (55.6)
Level of schooling (n=95)															
≤ 9 years	86 (90.5)	19 (86.4)	67 (91.8)	0.447	57 (87.7)	29 (96.7)	0.165	31 (93.9)	55 (88.7)	0.407	10 (90.9)	76 (90.5)	0.963	78 (91.8)	8 (80.0)
>9 years	9 (9.5)	3 (13.6)	6 (8.2)		8 (12.3)	1 (3.3)		2 (6.1)	7 (11.3)		1 (9.1)	8 (9.5)		7 (8.2)	2 (20.0)
Nutritional status (n=100)															
Normal weight	24 (24)	20 (83.3)	0 (0.00)	<0.001	14 (21.2)	6 (17.6)	0.673	4 (11.1)	16 (25.0)	0.096	2 (18.2)	18 (20.2)	0.873	20 (22.5)	0 (0.0)
Overweight/Obesity	76 (76)	4 (16.7)	76 (100)		52 (78.8)	28 (82.4)		32 (88.9)	48 (75.0)		9 (81.8)	71 (79.8)		69 (77.5)	11 (100.0)
BMI (kg/m <sup>2</sup> ) (n=100)															
≤ 25.6 kg/m <sup>2</sup>	24 (24)	21 (87.5)	3 (3.9)	<0.001	16 (24.2)	8 (23.5)	.937	4 (11.1)	20 (31.3)	0.02	2 (18.2)	22 (24.7)	0.632	24 (27.0)	0 (0.0)
>25.6 kg/m <sup>2</sup>	76 (76)	3 (12.5)	73 (96.1)		50 (75.8)	26 (76.5)		32 (88.9)	44 (68.8)		9 (81.8)	67 (75.3)		65 (73.0)	11 (100.0)
Cardiovascular Risk (n=96)															
Moderate/Low	14 (14.6)	10 (41.7)	4 (5.6)	<0.001	12 (18.8)	2 (6.3)	0.102	3 (9.4)	11 (17.2)	0.307	3 (30.0)	11 (12.8)	0.144	12 (14.1)	2 (18.2)
Elevated	82 (85.4)	14 (58.3)	68 (94.4)		52 (81.3)	30 (93.8)		29 (90.6)	53 (82.8)		7 (70.0)	75 (87.2)		73 (85.9)	9 (81.8)
WC (cm)															
≤91,12 cm	24 (24)	16 (66.7)	9 (12.3)	<0.001	19 (29.2)	6 (18.8)	0.267	7 (21.2)	18 (28.1)	0.461	3 (30.0)	22 (25.3)	0.747	22 (25.6)	3 (27.3)
>91,12 cm	76 (76)	8 (33.3)	64 (87.7)		46 (70.8)	26 (81.3)		26 (78.8)	46 (71.9)		7 (70.0)	65 (74.7)		64 (74.4)	8 (72.7)

The recommendation "limiting the consumption of fast food and processed foods rich in fat, sugar and starch" does not appear at the table because there was no adherence by any patient. BMI- body mass index; WC - waist circumference; Cardiovascular risk: i. moderate / low - WC<88 cm; ii. elevated: WC>88 cm. Pearson's X2 test. Significance level: p <0.05.

The patients scored an average of 3.6 (0.92) out of a total of 6 scores of adherence to the recommendations. Among the assessed recommendations, the one with the highest average score was limiting alcohol consumption with 0.95 (0.16) scores. The one with the lowest average was having a healthy weight, which adds the BMI score (0.21+0.20) and WC (0.04+0.11). There was an inverse correlation between the total scores of adherence to the recommendations with weight (r:-0.274; p=0.006), BMI (r:-0.371; p<0.001), and WC (r:-0.351; p<0.001).

Two main patterns of adherence to the WCRF/AICR guidelines were identified, the first being named 'grains/fruits/fiber' and represented by adherence to having a healthy BMI to the diet rich in grains, vegetables, fruits,

and beans and to the total fiber; and a second pattern was named 'fast food/sugar', characterized by adherence to the BMI, limiting the consumption of fast food and other processed foods high in fat, sugar and starch, and limiting the consumption of sugary drinks. The grain/fruit/fiber pattern explained 31.9% and 'fast food/sugar' explained 30.6% of the total variance of adherence to the recommendations. In the second pattern (fast food/sugar), we found adherence to the BMI recommendation with a stronger factor load than in the grain/fruit/fiber pattern (Table 2). Lower weight, BMI, and higher score of adherence to the recommendations were found in patients at the highest quartile, both in the grain/fruit/fiber and fast food/sugar patterns (Table 3).

**Table 2.** Patterns of adherence to the 2018 WCRF/AICR recommendations and factorial loads

Adherence scores	Patterns of adherence to the recommendations and factorial loads	
	Grains/fruits/fiber	Fast food/sugar
BMI score	0.3317	0.4672
Vegetable score	0.8601	0.079
Fiber score	0.8547	-0.1947
Fast food score	-0.1191	0.8016
Sugar score	-0.0428	0.7927
Proportional variance (%)	31.93	30.67
Accumulated variance (%)	31.93	62.59
KMO Coefficient	0.527	

BMI: Body Mass Index; KMO: Kaiser-Meyer-Olkin Coefficient.

**Table 3.** Characteristics of weight, BMI and adherence score according to the quartile categories of the adherence patterns to the 2018 WCRF/AICR recommendations

	Grains/fruits/fiber			Fast food/sugar		
	Q1	Q4	p	Q1	Q4	p
Weight	66.91 (9.5)	59.5 (8.2)	0.005	73.84(13.1)	62.07 (9.4)	0.001
BMI (kg/m <sup>2</sup> )	29.04 (3.8)	25.82 (2.8)	0.001	31.53(4.24)	26.59(3.21)	<0.001
Total scores	3.33 (0.69)	4.07 (1.04)	0.005	4.56 (0.75)	2.67 (0.42)	0.001

BMI: body mass index. Q1. 1st quartile of adherence to patterns; Q4: 4th quartile of adherence to patterns. Student's t test for analysis of difference of means. Significance at P<0.05.

## DISCUSSION

The present study investigated adherence to the 2018 WCRF/AICR cancer prevention guidelines by Brazilian women with breast cancer and it showed that 93.0% of them follow two or fewer guidelines. We identified two main patterns of adherence to the guidelines, related to 'grains/fruits/fiber' and 'fast food/sugar', which had an impact on the patients' weight and BMI. Women at the highest quartile of the patterns had lower weight and BMI. These findings suggest that, among the assessed women, adherence to cancer prevention guidelines was insufficient, and those with greater adherence showed better weight management and BMI.

Although they have already been diagnosed with the disease and are in a favourable moment for the adoption of healthier behaviours related to self-care (20), the

participants of the present study did not show this improvement in their choices through adherence to prevention guidelines (21,22).

It is important to use the third WCRF report (7), because it presents new recommendations considering servings consumed, time and type of physical activity, consuming a diet rich in whole grains, vegetables, fruits and beans, and limiting the consumption of fast food and other processed foods rich in fats, starches and sugars. This last recommendation needs to be highlighted since research indicates a higher consumption of these foods and its relationship with the increase in overweight and obesity, in addition to cancer and other chronic diseases (23,24).

In Brazil, to the best of our knowledge, there have been no publications that evaluated women with breast cancer using the guidelines of the third report of the WCRF/AICR (7), the adherence scores, and the evaluation using

patterns that show adherence to different recommendations, combined according to the population's behaviour. A recent study with prostate cancer patients (25) has shown a lack of adherence to most of the WCRF/AICR recommendations. Despite its importance for assessing this lack of adherence by cancer survivors and strengthening the discussion about the need for a healthy lifestyle after the diagnosis, the study evaluates adherence to each recommendation independently without exploring the combination of recommendations and without considering the adherence score.

In patients with breast cancer (26,27) the risk of the disease was inversely proportional to the total scores, but this association did not appear when the guidelines were assessed individually, indicating that the combination of recommendations, or a pattern of recommendations, better reflects their lifestyle and its impact on the risk of the disease or its recurrence. In our study, the use of assessment by patterns of adherence allows a look at the combination of behaviours related to the patients' lifestyle, which converges with reality, given that the lifestyle demonstrates different behaviours, which compromise the health status when combined.

We verified that the fast food/sugar adherence pattern had a greater impact on the BMI score, and this suggests that the consumption of ultraprocessed and ready-to-eat foods may have a greater influence on the weight and, consequently, contribute to the long-term recurrence of the disease. Among breast cancer patients, the consumption of ultraprocessed products is responsible for 27.1% of the total calories ingested (28), which is above the average of that observed in the Brazilian adult population (19.5%) (29). Ultraprocessed foods contribute to weight gain due to their high caloric density, excessive amount of sugar, and fat in their composition and their palatability (29-31).

The grain/fruit/fiber pattern explains most of the total variability of adherence scores to the guidelines (31.9%), suggesting that patients consume more of these foods, which may occur because they represent a healthy eating pattern (11). However, its impact on the BMI is lower than that of the fast food/sugar pattern, suggesting that the consumption of healthy foods without adequate guidance can increase calorie intake and contribute to weight gain (11).

Regardless of the adherence pattern, being in the highest quartile of the two patterns implies lower weight and BMI. Elevated BMI and adiposity are well established in the literature as risk factors for breast cancer and its recurrence (21,22,32-34). The high BMI and the 10% increase in weight gain, 2 years after the diagnosis, are associated with a greater chance of breast cancer recurrence (34). Additionally, women with breast

cancer who have excess weight, high BMI, WC, and body fat percentage (%), and do not adhere to the recommendation of having a healthy weight (35).

Obesity is a risk factor for breast cancer and body fat has an important relationship with the survival of patients with this disease (36). It is known that obesity is characterized by a chronic, low-intensity inflammation status, enhancing biological pathways that may explain the association between high adiposity and cancer recurrence (34).

Reaching this weight and BMI management requires adherence to the other guidelines regarding food consumption and physical activity, but the combination of two or three recommendations already allows positive impacts on this management. Nevertheless, it is essential to highlight those changes in lifestyle can be complex, especially when accompanied by the treatment side effects and emotional changes related to the diagnosis. Female survivors of breast cancer may be willing to build a new perspective of their lifestyle and contribute to their own treatment through appropriate food choices (20,32).

Some limitations of our study need to be considered, such as the cross-sectional design that does not allow us to assess the causality between adherence to the guidelines and disease development or its recurrence. Also, we did not assess the level of physical activity and this is an important recommendation for disease prevention and recurrence, given that physical activity is associated with a 27% reduction in the risk of mortality in female survivors of breast cancer (32).

Nevertheless, the study adds an important contribution to the literature by using the latest WCRF/AICR report, as well as the adherence scores proposed for researchers in the area, considering not only those who adhere or do not adhere, but deepening the analysis on the effect of this adherence, combining different recommendations, and finding behaviour patterns related to this adherence based on the factor analysis by the principal components.

We also emphasize that the use of the WCRF/AICR prevention guidelines must be included in the reality of low and middle-income countries as a way of preventing disease recurrence, minimizing costs with cancer treatment, and reducing mortality.

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