Assessment of the Nutritional Profile of Women with Breast Cancer from the Agadir Region (South of Morocco)

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Although the incidence of breast cancer and the resulting mortality are very high in Morocco, no study has been carried out on the role of the nutritional factors in the development of BC. The objective of this study was to assess the nutritional profile of women with BC in southern Morocco Methods: The study was conducted with 91 women with breast cancer. Face-to-face semi-structured interviews were used for the assessment of the nutritional profile and the collection of socio-economic data. Biometric measures were carried out in parallel. The results showed that postmenopausal women had a significantly higher mean weight and Body Mass Index than non-menopausal women (p < 0.015). The majority of patients (79%) had energy intakes above recommendations. The proportion of lipids was excessive in 46% of cases. Intakes of saturated fatty acids were high in 14% of patients. But those of unsaturated fatty acids were high in over 50% of patients. About 58 % had a very high intake of fast sugars. Cholesterol input was high in 40% of cases. Vitamins A, E and D were provided in small amounts, respectively in 66%, 45% and 91% of patients. Likewise, intakes were low for water-soluble vitamins, especially Vitamins B9 (62.6%) and B12 (54%). Almost the majority of participants in our study (92%) had very low calcium intakes. Inputs of magnesium, zinc and selenium were insufficient in 43%, 35% and 48% of patients respectively. Obesity, excessive energy and sugar intake, as well as mineral and vitamin deficiencies could explain the high incidence of breast cancer in southern Morocco. A balanced diet would fight against breast cancer.

Keywords: Anthropometric data; Breast cancer; Morocco; Nutritional profile.

Among tumors, breast cancer (BC) is one of the most diagnosed with an incidence and mortality rate reaching respectively 24.5% and 15.5% worldwide[1]. BC is a complex condition subdivided into molecular subtypes related to the status of estrogen (ER) and progesterone (PR) receptors, and human epidermal growth factor (HER2) receptors. Similarly, two phenotypic subtypes of expression of hormonal receptors in the epithelial cells of the ducts or lobules of the mammary glands are distinguished; luminal A cells have more ER than luminal B cells. BC may have a different etiology depending on the status of the receptors[2]. For example, the literature reported a strong binding of ER + type to reproductive factors[3], hormone replacement therapy in menopause[4] and

the mass body index (BMI)[5]. Diet also plays an important role in the development of BC[6]. BC was favored by cereals and available sugars and inversely related to vegetables and polyunsaturated fatty acids[7-8]. Nutrition is also of major importance as many patients (40%) make lifestyle changes, including diet, following a positive diagnosis of cancer[9-10]. Some studies have reported that patients with BC have an inadequate diet[11-12], which may contribute to their deteriorating health status during treatment[13]. A balanced and healthy diet could prevent the occurrence of BC, improve the state of health of patients and prevent co-morbidities linked to this condition, particularly cardiovascular diseases which represent the most frequent comorbidity and the main cause of death unrelated to BC in women over 50 years of age[14].

Incidence (36.9%) and mortality (24.7%) values linked to BC in Morocco are higher than the world average[15]. This raises questions about the etiology of this disease, especially with regard to the diet and quality of life of Moroccan women. To our knowledge, no study has been undertaken to evaluate the nutritional status of women with BC in Morocco. This study aims at assessing the nutritional profile of women from the Agadir region (southern Morocco) with BC, in relation to their pathological status and their anthropometric characteristics.

MATERIALS AND METHODS

Sampling and Data Collection

The study was carried out between January 2019 and February 2020. A convenience sample of 91 women with BC was recruited from the Hassan II Regional Hospital Center and the Agadir Regional Center of Oncology. All subjects were initially informed that their biological and anthropometric data would be exploited for scientific purposes. All participants signed informed and express consent. The study was authorized by the Moroccan Ministry of Health (authorization number 3851/02092017) and approved by the Moroccan Association of Research and Ethics (approval number 4/REC/20). Recruitment concerned patients with BC without metastases, with postoperative, preoperative, ongoing or completed treatment, and without any sign of recurrence or relapse. The exclusion criteria were metastatic BC and other cancers, decompensated heart disease, hepatic failure, renal failure, psychiatric illness and any refusal to sign consent. Data were collected using a questionnaire in direct interviews, face-to-face, and from medical records. They included education level, occupation, marital status, parity and hormonal status of the respondent (menopausal status and use of contraception). BCs have been classified into molecular subtypes based on the expression of hormone receptors (ER + / ER-; PR + / PR-, HER2 +/–; luminal A and luminal B). Body mass, height, waist circumference and hip circumference were determined and compared to WHO recommendations[16]. Abdominal obesity was indicated if the waist circumference was e" 88 cm or 0.85 for the waist-to-hip ratio (TT / TH).

The body analysis was performed using a Tanita® BC 418 MA analyzer (Tanita Corporation, USA) which determines weight, BMI, percentage fat mass (FM), lean mass (LM) and visceral fat (VF). All of these measurements were carried out while standing. The BMI was classified according to the WHO recommendations as underweight (BMI <18.5 kg / m2), normal weight (18.5 d" BMI 24.9 kg / m2), overweight (25 d" BMI 29.9 kg / m2) and obese (BMI> 30 kg / m2). Based on their body fat (BF) percentage, the patients were classified into a lean group, a normal BF group and an excess BF group (with body fat levels <24%, between 24% and 33%, and > 33% respectively). All patients were asked to complete three non-consecutive days' food diary (two working days and one weekend day). To estimate food servings, photos of household measurements such as plates, spoons, glasses, bowls, and cups were shown to patients using SuviMax survey books. Nutritional intake calculations were performed using Nutrilog® software (Ver2.20). Several nutritional variables were evaluated, including energy intake, macronutrients (proteins, carbohydrates, lipids, cholesterol and fiber), vitamins (A, D, E, B2, B6, folic acid, B12, C), minerals and oligoelements (calcium, iron, magnesium, zinc, selenium). Due to the lack of standards or recommended intakes specific to the Moroccan population, nutritional intakes were determined by referring to those recommended by The Institute of Medicine of the National Academies (USA)[17].

Statistical analyzes

Statistical analyzes were performed

using SPSS-20 software. Data represented mean ± standard deviation for quantitative variables and as a percentage for qualitative variables. Comparisons between groups were made using analysis of variance (ANOVA) and Student's "t" test. Pearson's correlation test was used to assess associations between nutrient intakes and anthropometric parameters of different groups.

RESULTS

Table 1 summarizes the socio-demographic and pathological characteristics of the patients. The results show that 79% were from the urban areas, close to 65% were illiterate and only 3.3% had university level. Three quarters were housewives. The majority were married (56%). The menopausal status represented 54% and 65% of the respondents used oral contraception

Table 2 shows the anthropometric parameters of the interviewees. The average age

was 48.54 ± 9.83 years. Their weight and BMI were 68.69 ± 11.60 and 28.56 ± 4.73 respectively. Postmenopausal women had a significantly higher mean weight and BMI than non-menopausal women (p < 0.015). We found that about 75% of them were overweight or obese and 84% had a very high waist circumference. The patients also presented an excess of BF. The BF rate was significantly higher in postmenopausal than in premenopausal women (p < 0.007).

Table 3 displays the intakes of various nutrients among the participants in our survey. The majority of them (79%) had energy intake well above the recommendations. The contribution of lipids in these intakes was excessive for 46% of patients. As for the qualitative aspect, the intakes of saturated fatty acids were only high in 14% of cases. Intake of saturated fatty acids was positively correlated with tumor size (r = 0.233 and p = 0.026).

The consumption of monounsaturated fatty acids was high in 50.55%, and low in 23% of

Table 1. General data of the respondents

Residence		**Menopausal status**	
Rural	20.88 % (n = 19)	Pre-menopausal	46.15 % (n = 42)
Urban	79.12 % (n = 72)	Post-menopausal	53.85 % (n = 49)
Marital status		**Education level**	
Singles	13.19 % (n = 12)	Illiterate	64.83 % (n = 59)
Brides	56.04 % (n = 51)	Primary	18.68 % (n = 17)
Divorced	16.48 % (n = 15)	Secondary	13.19 % (n = 12)
Widows	14.29 % (n = 13)	University	3.30 % (n = 3)
Oral contraception		**Working status**	
Yes	64.84 % (n = 59)	Manager	2.21 % (n = 2)
No	35.16 % (n = 32)	Employee	4.40 % (n = 4)
		Worker	12.08 % (n= 11)
		Housewife	81.31 % (n= 74)

Table 2. Anthropometric parameters of the respondents

	Age	Weight (kg)	Height (cm)	BMI (kg/m2)	WC (cm)	HC (cm)	WT/HC	FM (%)	LM (%)	VF (kg)
Average	48.54	68.69	155.68	28.56	96.81	104.38	0.93	36.54	42.91	7.84
Standard deviation	9.83	11.60	6.50	4.73	10.22	10.90	0.07	6.98	4.41	2.93
Minimum value	26	44	138	19.10	64	70	0.78	17.10	30.30	1
Maximum value	74	97.20	169	39.90	119	129	1.15	48.40	53.70	14
Percentiles 25	42	60.70	151	24.90	90	98	0.88	30.80	39.50	6
50	49	68.20	156	28.10	99	104	0.93	37.30	42.80	8
75	54	77.60	159	32.20	103	113	0.97	42.60	46.10	10

BMI: body mass index, WC: waist circumference, HC: hip circumference, FM: fat mass, LM: lean mass, VF: visceral fat.

patients (Table 3). Intakes of polyunsaturated fatty acids were very high in nearly 53% of patients and only 6.6% had very low intakes. The consumption of sugars was important. About 42% had a very high intake, with a high consumption of fast sugars in 58%. As for proteins, the intake was satisfactory in 61.54% and low in only 13.2% of cases. No significant difference was observed between the cancer subtypes except for the sugars intake that was significantly very high in women with RP + compared to RP- subtype (table 4).

The cholesterol intake was too high in 40% of patients (table 3). These intakes were significantly greater in premenopausal women than in postmenopausal women (p < 0.01).

The fiber content of food was low in approximately 31% of patients. Obese women consumed significantly lower amounts of fiber than non-obese women (p < 0.05).

The majority of the patients (92%) had very low Ca intakes. On the other hand, phosphorus intakes were very high compared to the recommendations in 93% of cases.

Mg, Zn and Se intakes were insufficient in 43%, 35% and 48% of cases respectively, but Fe intake was satisfactory in 74% of patients.

For fat-soluble vitamins, approximately 66%, 45% and 91% of patients had very low intakes of vitamins A, E and D respectively. As for water-soluble vitamins, it should be noted that the intakes were insufficient in vitamin C for 32%, B1 for 24%, B2 for 35.2%, B6 for 10%, B9 for 62.6%, and B12 for 54%. The comparison

Table 3. Total daily intake of nutrients

Macronutrients and energy	Mean (SD)	Recommendations (INMA, 2005)	Patients with non-standard intake (%)
Energy (Kcal/day)	2562 (606)	1800 – 2000	
Proteins (%)	12.99 (3.88)	12 – 15	+35.21
Proteins (g/Kg/day)	1.22 (0.43)	0.8 – 1	+26.26
Carbohydrates (%)	52.57 (10.83)	55 – 60	+42
Sugar (%)	12.15 (5.41)	< 5	+58
Lipids (%)	34.54 (10.42)	25 – 35	+46
Fibres (g)	32.14 (16.63)	25 – 30	-31
Cholesterol (mg)	300 (262.9)	180 – 205	+40
SFA (%)	7.1 (2.63)	< 10	+14
MUFA (%)	20.84 (7.75)	15 – 20	+50.55
PUFA (%)	4.41 (2.34)	5 - 10	+53
Minerals (mg)			
Calcium	551 (252)	88 - 110	-92
Phosphorus	1302 (477)	25 - 45	+93
Iron	13.75 (9.49)	8.1 - 18	+24
Magnesium	303.9 (120.54)	265 - 320	-43
Zinc	8.17 (3.43)	6.8 - 8	-35
Selenium	48.79 (22.6)	45 - 55	-48
Vitamins			
A (mcg)	275.47 (236.4)	500 – 700	-66
ýD (mcg)	9.62 (5.22)	15 – 20	-45
ýE (mg)	14.05 (7.94)	12 – 15	-91
ýC (mg)	115.14 (96.46)	60 – 65	-32
B1 (mg)	1.16 (0.46)	0.9 – 1.1	-24
B2 (mg)	1.27 (1.13)	0.9 – 1.1	-35
B6 (mg)	1.96 (0.84)	1.1 – 1.3	-10
B9 (mg)	311 (133.73)	320 – 400	-62
B12 (mg)	3.1 (2.41)	2 – 2.4	-54

SFA: saturated fatty acids, MUFA: monounsaturated fatty acids, PUFA: polyunsaturated fatty acids, +: above standard, -: substandard

Table 4. Energy and macronutrient intake according to breast cancer subtypes

| | Estrogen receptor | | Progesterone receptor | | | | HER | Phenotype |
	ER+ (n=71)	ER- (n=20)	PR+ (n=65)	PR- (n=26)	HER+ (n=27)	HER- (n=64)	Luminal A (n=45)	Luminal B (n=28)
Energy (Kcal/day)	2565±60	2554±642	2594±590	2483±651	2546±590	2569±618	2650±608	2428±551
Proteins (%)	12,94±3,91	13,15±3,87	12,68±3,80	13,77±4,04	12,78±3,64cc	13,08±4,00	12,47±3,20	13,71±4,70
Lipids (%)	34,62±10,64	34,25±9,85	34,54±11,01	34,54±8,95	35,85±10,20	33,98±10,53	33,82±10,70	36,25±10,24
Carbohydrates (%)	52,61±10,74	52,40±11,42	52,94±11,03	51,62±10,48	51,59±10,02	52,97±11,21	53,96±10,40	50,04±10,74
Simple sugars (g)	12,67±5,70	10,31±3,83	12,96±5,82**	10,13±3,59	10,65±4,20	12,79±5,76	13,12±6,24	12,10±4,51
SFA (%)	6,84±2,49	8,14±2,94	6,63±2,39	8,37±2,84	5,89±1,71c	7,65±2,79	6,57±2,52	7,44±2,50
MUFA (%)	21,07±8,03	20,04±6,80	21,13±8,31	20,13±6,23	21,72±8,44	20,47±7,48	20,38±7,55	22,37±8,50
PUFA (%)	4,42±2,10	4,39±3,14	4,45±2,18	4,31±2,75	4,67±2,94	4,30±2,06	4,53±2,40d	4,20±1,41
Fiber (g)	33,03±17,51	29,01±12,89	34,04±17,67	27,40±12,77	30,13±12,03	32,99±18,24	34,62±19,47	30,3812,90
Cholesterol (mg)	293,33±244,04	325,19±327,30	279,0±240,46	353,5±310,90	271,0±200,37	312,70±285,73	291,02±265,58	291,00±200,70

SFA: saturated fatty acids, MUFA: monounsaturated fatty acids, PUFA: polyunsaturated fatty acids.
**: significantly different (p<0.01) by comparison of PR+ to PR-.

Table 5. Minerals and vitamins intake according to breast cancer subtypes

| | Estrogen receptor | | Progesterone receptor | | | | HER | Phenotype |
	ER+ (n=71)	ER- (n=20)	PR+ (n=65)	PR- (n=26)	HER+ (n=27)	HER- (n=64)	Luminal A (n=45)	Luminal B (n=28)
Vit A (mcg)	247,85±156,05***	373,51±402,51	231,64±120,12***	385,04±383,09	222,53±100,63**	297,80±271,93	228,09±104,63**	314,22±283,73
Vit D (mcg)	9,66±5,24	9,50±5,29	9,72±5,47	9,38±4,63	7,98±1,89**	10,32±5,98	9,34±4,16	10,05±6,54
Vit E (mg)	14,68±8,66	11,81±3,91	15,11±8,85	11,40±4,05	15,16±9,22	13,58±7,36	15,41±10,03	13,29±5,35
Vit C (mg)	120,72±104,62	95,32±56,68	123,48±104,06	94,27±71,68	110,48±78,29	117,10±103,67	123,32±116,46	116,29±79,29
Vit B1 (mg)	1,18±0,46	1,11±0,45	1,19±0,46	1,10±0,45	1,11±0,39	1,19±0,48	1,23±0,52	1,09±0,31
Vit B2 (mg)	1,17±0,50***	1,63±2,21	1,16±0,50***	1,55±1,95	1,03±0,37	1,37±1,31	1,17±0,49	1,17±0,52
VIT B6 (mg)	1,98±0,87	1,89±0,73	2,00±0,86	1,85±0,78	1,78±0,65	2,04±0,90	1,97±0,78	1,99±0,98
Vit B9 (mg)	317,02±122,94	289,59±168,55	319,57±119,20	289,54±165,35	297,90±115,15	316,51±141,32	321,65±118,76	305,83 v127,55
Vit B12 (mg)	3,05±2,48	3,27±2,19	3,09±2,59	3,12±1,95	2,27±0,97***	3,45±2,74	2,82±1,97	3,44±3,08
Mg (mg)	311,93±124,12	275,37±104,74	317,93±124,57	268,82±103,87	297,46±115,90	306,61±123,24	326,57±139,93d	284,68±84,51
Ca (mg)	553,66±260,52	541,19±224,66	563,04±267,71	520,63±209,00	499,62±176,33	572,56±276,10	569,13±288,96	533,34±199,58
P (mg)	1317,33±481,87	1248,27±467,74	1322,04±494,68	1252,45±435,14	1216,07±378,68	1338,47±511,34	1336,09±507,86	1283,29±425,12
Fe (mg)	13,99±9,53	12,93±9,53	14,15±9,88	12,75±8,53	12,13±4,86	14,44±10,83	14,68±11,49	12,64±4,33
Zn (mg)	8,06±2,92	8,54±4,91	8,08±2,79	8,38±4,73	7,51±2,41c	8,44±3,76	8,24±2,87	7,89±2,98
Se (mcg)	48,89±22,08	48,42±24,94	48,82±22,13	48,70±24,17	43,52±20,02	51,01±23,39	49,07±22,66	48,74±20,70

: significantly different at p<0.01, *: significantly different at p<0.001 by comparison of ER + to ER-, PR+ to PR-, HER+ to HER-, and luminal A to luminal B.

of the BC subtypes did not show any significant difference for energy and macronutrient intake (table 4). However, significantly lower Vit A values (p < 0.05) were noted for ER+, PR+, HER2+ and luminal A compared to ER-, PR-, HER- and luminal B respectively (Table 5). The same was true for Vit B2 whose intake was significantly lower for ER+ and PR+ compared to ER- and PR- subtypes respectively (p < 0.001) and for Vit B12 with a lower value (p < 0.001) for the HER2+ compared to HER2- subtype (table 5).

DISCUSSION

This work represents the first study of the main anthropometric and nutritional characteristics of Moroccan women with BC. According to our results, about 38% of the patients were obese. This value is higher than the value of 29 % reported on Moroccan women[18]. An increase in body weight in women with BC was previously reported[19]. Based on BMI, % Fat and waist-to-hip ratio, the participants in our study mainly suffered from abdominal obesity. The results also showed that overweight and obesity, particularly abdominal obesity, affect postmenopausal women more than premenopausal women. Some studies noted weight gain in neo-adjuvant therapy in 50 - 96% of women with BC[20,21]. This excess weight can be a factor of poor prognosis for patients. In fact, obese women are more likely to have large tumors, advanced disease at diagnosis, high rates of metastasis and can develop resistance to endocrine therapy[22,23]. Obesity was also associated with a significant increase in the risk of death from all causes and a marginally significant risk of mortality from BC[19]. In this regard, Flanagan et al.[24] reported that an increase of 1 kg / m^2 in BMI would imply a 3% increase in the probability of recurrence of BC; and that women who were obese at the time of BC diagnosis had a 1.6 times higher risk of recurrence than women with a normal BMI. Other authors noted the existence of an increased risk of developing second BC and a poor prognosis associated with obesity and / or weight gain[25,26]. Obesity and overweight can also affect the effectiveness of antineoplastic treatments, increase their side effects and complicate management due to related comorbidities such as hypertension, hyperlipemia and diabetes[27]. Indeed, the fat mass in particular the visceral fat responsible for abdominal obesity is a metabolically active fat[21]. It secretes several substances such as adipokines, growth factors and inflammatory cytokines. These molecules are involved in cell survival or apoptosis, angiogenesis, migration and proliferation[21], which allows them to play an important role in the occurrence, development, recurrence, metastasis and mortality from BC[28,29].

In general, the nutritional contributions recorded by our study were very unbalanced. Energy intakes were very high in the majority of patients, especially those in post-menopause. Their carbohydrate intakes, especially simple sugars, were very high. These factors, combined with a sedentary lifestyle, explain the overweight and obesity recorded, especially among postmenopausal women. Excessive intakes can promote tumor growth[30]. Likewise, high intakes of saturated fat increase the risk of mortality due to BC, but also due to associated comorbidities[31].

Food intake of vitamin A, D and E was low in the majority of our patients. This finding hardly comforts the patients. Indeed, large intakes of â-carotene (provitamin A) in pre-diagnosis of BC were significantly associated with an improvement in overall survival[32]. We also observed significantly lower intakes of Vit A in women with positive markers of ER, PR and HER subtypes. These results are in agreement with those of Cui et al.[33] who report an inverse association between the risk of BC and dietary carotenoids in menopausal women with ER + and PR +. Similarly, the vitamin D deficiency observed in our study is thought to be one of the risk and mortality factors associated with BC[34]. Vitamin D is involved in the differentiation, proliferation and apoptosis of epithelial cells. A normal serum 25 Hydroxy –Vit D level (> 30ng / mL) at diagnosis was significantly correlated with an improvement in BC-specific survival at least after 3 years of follow-up[35-37]. Vitamin E also has pro-apoptotic, antiproliferative and angiogenesis inhibitory activities[38,39]. It could also be associated with antineoplastic therapies to fight against metastases and improve immune and anti-inflammatory functions[38-40]. In fact, adequate vitamin E intake was associated with a decreased risk of recurrence of BC and overall mortality[38,41,42].

Vitamin B9 and B12 intakes were low in 62% and 52% of the women interviewed,

respectively. This deficiency can have negative consequences on women with BC, as folates play an important role in DNA synthesis, methylation and repair[43-45]. However, supplementation of the diet with folates must take into account that in high doses this vitamin constitutes a risk factor for the development of cancers[46]. Vitamin B12 can have a positive effect in BC. Its use before and during chemotherapy allowed a significant increase in BC survival[47-50]. In addition, various forms of Vit B12 showed anti-tumor activity. Thus, methylcobalamin slowed tumor growth and induced apoptosis in carcinoma cells in mice, although growth promoters such as androgens have been used[51,52]. The 5'-deoxyadenosylcobalamin and methylcobalamin have cytotoxic properties[53]. Methylcobalamin, in addition to its action on tumor growth, increased survival time in mice[54].

Another factor compromising the patients' prognosis is the low intake of vitamin C. Indeed, several studies supported the fact that an adequate intake of vitamin C was associated with a reduction in the risk of recurrence and / or mortality in patients with BC[55,56]. High doses of vitamin C induce apoptosis, reduce cell proliferation and the number of invading cancer cells, and prevent metastasis[57]. These effects are even more marked in cases of aggressive BC, as is the case with that of the triple negative subtype[58].

Our results also showed that the Ca, Mg, Zn and Se intakes were below the required values. Even if the relationship between Ca and BC intakes is not yet well established, this mineral may be involved in breast carcinogenesis through its important role in the regulation of cell proliferation, differentiation and apoptosis[59,60]. In fact, a high calcium intake decreases breast carcinogenesis and the uncontrolled proliferation of epithelial cells induced by fat in the breast and / or by a chemical carcinogen in rodents[61,62]. On another hand, low intakes of magnesium could compromise patient survival. Indeed, a deficiency in Mg can alter certain biological functions in women with BC, in particular those linked to cell proliferation and signaling, and DNA synthesis and repair[63,64]. However, any additional intake of Mg must take into account that of Ca, since the latter behaves as a competitor for Mg, particularly in terms of intestinal absorption[65]. Deficiencies in Zn and Se, associated with those of vitamins C and E,

can lead to an increase in cellular oxidative stress, which would lead to DNA damage[33]. In fact, the development of BC is accompanied by oxidative stress, which increases with the progression of the disease and the levels of antioxidant defenses decrease during antineoplastic treatments[66,67]. In addition to their antioxidant role, vitamin E, vitamin C and Se selectively induce apoptosis in cancer cells[66,68,69]. Furthermore, Zn and organic Se inhibit tumor growth and provide more protection against BC metastasis[70,71].

CONCLUSION

The nutritional profile of Moroccan women with BC showed many imbalances. On the one hand, the intakes of energy, free sugars and saturated fatty acids were high. On the other hand, vitamins A, D, E, B9, B12 and the trace element Zn and Se showed a significant deficit. Improving nutritional quality would help fight against the occurrence of breast cancer and help patients recover better following antineoplastic treatments.

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Authors' contributions
Authors contributed equally to this work.

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