

Mediterranean diet, BMI, healthy lifestyle, and social factors among a sample of Egyptian women with breast cancer

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Background/aim

Mediterranean diet is one of the healthy diets as many health benefits are strongly and robustly supported by evidence from long-term observational studies and randomized trials. This study aims to assess the nutrition-related breast cancer (BC) prevention factors, knowledge, attitudes, and practice of Egyptian BC patients.

Patients and methods

The study included 222 Egyptian women shared as volunteers in a case–control study, with age range: 25–75 years, with breast mass confirmed by mammogram. Using breast tissue core biopsy, 83 diagnosed with malignant tumor lesion, and 54 cases were found to have benign lesion. In total, 85 healthy women (control group) selection that was matched with the patients who had free mammograms on both sides, were chosen to be a control. All women were subjected to thorough clinical examination, anthropometric measurements, diet history, lifestyle, and health attitude assessment.

Results

Data revealed that benign and BC patients were older (49.33 ± 11.98 , 49.49 ± 10.89 years), while BC patients had the highest BMI ($35.45 \pm 15.58 \text{ kg/m}^2$). Data concerned with successful social relationship were good; numerical differences between other factors that concerned lifestyle were reported. Large number of patients with benign tumors and BC did not adhere to consumed healthy diet, their scores when compared with Mediterranean diet were 5.58 ± 3.70 and 5.44 ± 2.81 compared with 6.67 ± 3.00 of the control. BC patients had the lowest intake of milk and dairy products, vegetables, fruits, legumes, fish, and olive oil compared with the control with high significant differences ($P \leq 0.01$), while consumption of red and processed meat was significantly high, which was different from what was recorded in their belief and preference of such food.

Conclusion

According to the findings of this study, Egyptian BC patients who participated in this study had the lowest attitude and adherence to eat healthy diet. Data highlighted the necessity to increase the successful good social relationships and support for cancer patients.

Keywords:

anthropometry, breast cancer, dietary intake, Mediterranean diet, social factors

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Introduction

Breast cancer (BC) is considered one of the most common cancers in women worldwide. BMI is a risk factor associated with BC in women, primarily postmenopausal women [1].

According to the majority of studies, excess body weight is inversely related to premenopausal BC risk. Obesity has also been linked to a lower chance of survival from BC, promotes tumor growth, and also has an impact on aging and the onset of BC. These risk factors may be mediated by adipose tissue, with low-grade chronic inflammation generating an

environment that encourages BC development and growth [2].

According to the World Cancer Research Fund/American Institute for Cancer Research, 30% of BC cases in the United States are preventable. Given the prevalence of BC, lifestyle education is critical. Evidence supports prevention as an effective, long-

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term risk-reduction strategy. Healthcare providers play an important role in empowering patients to live a healthy lifestyle in order to prevent primary BC [3].

The American Cancer Society (ACS) has published guidelines affirming that healthy behaviors, such as maintaining a healthy weight, consuming a plant-based diet, being physically active throughout life, and avoiding exposure to tobacco and alcohol, can substantially reduce the lifetime risk of development or dying of cancer [4].

According to the US Centers for Disease Control and Prevention, physical activity could prevent one in eight BC cases. Strong evidence demonstrates a dose-response relationship between greater amounts of physical activity and reduced BC risk, independent of BMI [5].

Many health benefits of the Mediterranean diet (MedDiet) are strongly and robustly supported by evidence from long-term observational studies and randomized trials of cardiovascular risk factors and disease outcomes, including reductions in cardiovascular disease incidence and mortality, type-2 diabetes and metabolic syndrome, incidence of some cancers, and cognitive function [6].

According to the American Cancer Society 2021, the synergistic effect of nutritional components and lifestyle habits confirms the belief that BC prevention is more than secondary and tertiary. Primary prevention for this form of cancer can benefit from interventions that address both nutritional and lifestyle factors [7].

The cancer-prevention diet consists mostly of foods with significant antioxidant qualities and a favorable fatty acid profile, all of which have been linked to a lower risk of cancer. Because of the wide range of study participant characteristics, the MedDiet's protective role against BC is still debated, and studies examining the link between adherence to the MedDiet and the risk of BC in premenopausal women are fewer than those examining the link in postmenopausal women. Furthermore, the chance that the MedDiet's good benefits are owing to a single component or more likely, the synergistic effects of all of the MedDiet's components, remains a thinly veiled possibility [8].

The traditional MedDiet is characterized by a high intake of plant foods, fruits, vegetables, breads and other cereals (traditionally minimally refined),

potatoes, beans, nuts and seeds; minimally processed, fresh fruits as a typical dessert, with sweets containing sugars or honey a few times per week; a high intake of olive oil (especially virgin and extra-virgin olive oil) as the main source of fat; a moderate intake of dairy products (mostly as cheese and yoghurt); zero to four eggs per week; low to moderate amounts of fish and poultry; low amounts of red meat; and wine consumed in moderation with meals. The relatively high intake of nuts and olive oil makes the MedDiet unique and different from the other healthy diet patterns, but it can be considered a primarily plant-based diet [9].

Morze *et al.* [10] recently released a meta-analysis that included 117 studies with a large number of participants, revealed that higher adherence to the MedDiet was found to be inversely related to BC [RR: 0.94, 95% confidence interval (CI)]. Another meta-analysis with five giant cohorts focused on postmenopausal BC risk classified by estrogen/progesterone-receptor (ER/PR) subtypes, a measurable and significant inverse relation was found between MedDiet adherence and the risk of ER-negative BC (ER), with a RR of 0.60 (95% CI: 390, 93). So, these findings support an inverse association between MedDiet adherence and receptor-negative BC [11].

The favorable impact of MedDiet on mortality and other health outcomes has been generally due to the added health benefits of each nutrient specific to this diet [12]. High-fiber intake is associated with reduced all-cause and BC-specific mortality, with a close linear relationship [13]. Similarly, a diet high in β -carotene, a marker of fruit and vegetable consumption, is associated with a 30% decrease in overall mortality [14].

In addition, eating less fat, especially of animal origin, is associated with improved survival. Chlebowski *et al.* [15] and Di Maso *et al.* [16] reported that women with high adherence to MedDiet reported higher daily intakes of dietary fiber, vegetable fats, and carotenoids and lower intakes of animal fats than women with low compliance. Several studies have reported benefits in overall survival and disease-free progression with increased plant protein intake, moreover total protein intake, especially from plant sources, has increased with increasing adherence to MedDiet [17].

The functional role of ZNF577 is unknown, however, some members of the zinc finger protein (ZNFs)

family, which regulate gene transcription, have been found to be often hypermethylated and silenced in different types of tumors, suggesting that it may represent a commonly disrupted epigenetic pathway in cancer progression [18]. The ZNF577 methylation pattern has been previously identified in BC tissue as a result of adiposity and menopause (can also be detected in leukocytes) [19]. In this context, a specific dietary habit such as MedDiet adherence and specifically fish consumption seems to regulate the level of ZNF577 methylation in blood leukocytes independent of BMI and age. In this context, a specific dietary habit such as MedDiet adherence and specifically fish consumption seems to regulate the level of ZNF577 methylation in blood leukocytes independent of BMI and age. ZNF577 may be considered a biomarker for the impact of environmental factors such as fatness, age and diet on BC, and a therapeutic target in nutrition and precision medicine [20].

The aim of this study was carried out to assess nutrition-related BC prevention factors, knowledge, attitudes, and practice among Egyptian BC patients.

Patients and methods

Patients

A case-control study was conducted at the Baheya Breast Cancer Hospital, Giza, Egypt, during the years 2019–2021. The present study included 222 Egyptian women with age range: 25–75 years, with breast mass confirmed by mammogram. Breast tissue core biopsy was done to that group of patients with the initial diagnosis of BC.

Study design

Eighty-three women were diagnosed with malignant tumor lesion (BC) group (1 a), while 54 cases were found to have benign lesion group (1 b). In addition to 85 healthy women (group 2), their selection was matched with the patients in terms of age and socioeconomic status, who had free mammograms on both sides were chosen to be a control group.

Ethical approval

The present study was conducted with the Code of Ethics of the World Medical Association, according to the principles expressed in the Declaration of Helsinki. This study has been approved by the local Ethics Committee of National Research Centre, Cairo, Egypt, with approval number 19/202. A written informed consent was obtained from all participants after being informed about the purpose of the study.

Inclusion criteria

For group (1 a) (cases): women scheduled for breast biopsy, diagnosed with malignant tumor.

For group (1 b): women were found to have benign lesion.

Group-2 healthy control women: healthy controls were women without any disorders or known chronic disease such as hypertension, diabetes mellitus type-2, and bleeding tendency.

Previous normal mammography:

Women from the same family of BC women were recruited to have the same socioeconomic, diet, and environmental condition.

Women nominated as normal if they did not complain of any breast lump or with grade-1 or grade-2 mammographic finding over the past 12 months (six grades).

Exclusion criteria for both of patients and control group

Pregnant or lactating women and women with any other disease or condition that might interfere with the study assessments. Diabetic women or women that had any chronic disease rather than cancer or being obese/overweight. Women on specific diet regimen. Women on chemotherapy, radiation, or recent antibiotics administration in the last 2 weeks. Women with high-risk condition that negates surgery.

Anthropometric measurements

Body weight and height were measured, following the recommendations of the International Biological Program [21]. Body weight was determined to the nearest 0.01 kg using a Seca Scale Balance, with the participant wearing minimal clothes and with no shoes. Body height was measured to the nearest 0.1 cm using a Holtain portable stadiometer. BMI: weight (in kilograms) divided by height (in meters squared), was calculated.

Lifestyle and social study

Lifestyle and social study were interviewed by trained personnel using a structured questionnaire, including information on age, education, sociodemographic characteristics, and lifestyle habits (e.g. smoking habits, physical activity, sleeping disorders, and personal nutritional supplements or medications).

Scoring system of lifestyle

(1) Smoking and nutritional supplements: yes or no.

- (2) Classification of physical activity: daily activity without exercise (very low), daily activity without regular walking (low), daily activity with walking for 30 min daily (good), and daily activity with light exercise, for example, aerobic exercises (high) [22].
- (3) Sleeping disorders: no, mild: sleep-onset insomnia, moderate: sleep-maintenance insomnia, or severe: mixed insomnia [23].
- (4) Evaluation scale of social system.

Social relations were evaluated by the following three items: 1-communication, 2-cohesion, and 3-giving and take. No: no one, low: 1 only, moderate: 2, good: 2 and 3, very good: all the three items [24].

- (1) The Multidimensional Scale of Perceived Social Support (MSPSS) is a brief questionnaire designed to measure perceptions of support from three sources: family, friends, and a significant other. In this study, the question was only about family, scale is comprised of a total of four items: no: no support, low moderate, good, and very good: depending on the items obtained (1-my family really tries to help me, 2-I get the emotional help and support I need from my family, 3-I can talk about my problems with my family, 4-my family is willing to help me make decisions) [25].
- (2) MedDiet score calculation:

We calculated the MedDiet score using food frequency questionnaire, which included 11 items that correspond to the 11 elements typical of the MedDiet (bread, pasta, rice and cereals, milk and dairy products, fruits, vegetables, red meat, legumes, white meat, fish, commercial sweets, olive oil, pastries, and carbonated beverages). For each participant, the score was built by adding the single point obtained for 11 groups of foods. To each of the 11 food components, 1 point was assigned if the consumption was according to the reference daily/weekly frequency of the Pyramid of the Modern MedDiet, so the range scores from 0 minimum to 11 maximum [26].

Statistical analysis

Data were collected, revised, coded, and entered to the Statistical Package for Social Science (IBM SPSS, Armonk, NY: IBM Corp, USA), version 23. The quantitative data were presented as mean, SDs, and ranges when parametric and median, interquartile range when data were found nonparametric. Also, qualitative variables were presented as number and

percentages. The comparison between two independent groups with nonparametric comparison of more than two independent groups was done by using Kruskal-Wallis test. Analysis of variance test was used to compare between three parametric groups.

Results

The baseline characteristics of the participants included in this study are shown in Table 1. Data revealed that benign and BC patients were older, while BC patients had the higher BMI (35.45 ± 15.58) with high significant difference between the groups. The results showed that the highest percentage of cancer patients was among those with primary education 30.1%, while the lowest percentage was among those with a university and higher education, 12.0, 3.6% respectively, when compared with the other groups. By comparing the different groups with respect to marital life, the percentage of BC among married women was close, while the percentage was higher among single and widowed women. Regarding the level of physical activity of the participants, the percentage of BC cancer patients was higher in the very-low and low-activity level, and the lowest percentage was found in the good level of activity. About 14.8 and 15.7% of the benign tumors and BC cancer patients had severe difficulty in getting regular sleep (mixed insomnia: trouble in both falling asleep and staying asleep through the night), in comparison with 8.2% of the control group. The percent of the benign and BC patients who were smoking was 25 and 20.5%, while the percent among controls was 12.9%. The results showed that the participants in the three groups were not used to taking nutritional supplements. The differences between groups in these items were only numerical.

The distribution of the studied groups according to their attitude toward some social and lifestyle factors is shown in Table 2. Data revealed that the successful relationship of the studied sample showed high significant difference at *P* value less than or equal to 0.01, the percent of patients who had no, low, and moderate level of the relationship was high in the benign and malignant patients, while at the good level, the percent was high 72.3% for the malignant. The results obtained concerned with the 'much support provided by close relatives' were heterogeneous and had no significant difference. The results showed that the percentage of participants in the two items, namely the interest in having breakfast, as well as taking any kind of medication, was variable and without a significant difference.

Table 1 Baseline characteristics and lifestyle factors of the participants

Items	Control group	Benign group	Malignant group	<i>P</i> value
Age (mean±SD)	44.40±11.15	49.33±11.98	49.49±10.89	0.006**
BMI (mean±SD)	27.51±7.10	31.39±6.77	35.45±15.58	0.000**
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	
Education				
Not educated	15 (17.6)	11 (20.4)	10 (12.0)	0.218
Illiterate	6 (7.1)	8 (14.8)	8 (9.6)	
Primary	18 (21.2)	16 (29.6)	25 (30.1)	
Preparatory	2 (2.4)	3 (5.6)	8 (9.6)	
Secondary	23 (27.1)	8 (14.8)	19 (22.9)	
University	16 (18.8)	4 (7.4)	10 (12.0)	
High education	5 (5.9)	4 (7.4)	3 (3.6)	
Civil status				
Single	2 (2.4)	0	3 (3.6)	0.089
Married	73 (85.9)	41 (75.9)	70 (84.3)	
Divorced	2 (2.4)	0	0	
Widow	8 (9.4)	13 (24.1)	10 (12.0)	
Physical activity level ⁺				
Very low	6 (7.1)	8 (14.8)	13 (15.7)	0.093
Low	17 (20.0)	7 (13.0)	24 (28.9)	
Good	52 (61.2)	29 (53.7)	36 (43.4)	
High	10 (11.8)	10 (18.5)	10 (12.0)	
Problems with regular sleep (%) [#]				
No	24 (28.2)	13 (24.1)	27 (32.5)	0.365
Mild	39 (45.9)	27 (50.0)	28 (33.7)	
Moderate	15 (17.6)	6 (11.1)	15 (18.1)	
Severe	7 (8.2)	8 (14.8)	13 (15.7)	
Smoking (%)				
No	74 (87.1)	40 (74.1)	66 (79.5)	0.147
Yes	11 (12.9)	14 (25.9)	17 (20.5)	
Nutritional supplements (%)				
No	71 (83.5)	45 (83.3)	69 (83.1)	0.998
Yes	14 (16.5)	9 (16.7)	14 (16.9)	

⁺Physical activity: very low: daily activity without exercise, low: daily activity without regular walking, good: daily activity with walking for 30 min daily, high: daily activity with light exercise, for example, aerobic exercises. [#]Sleeping disorders: no, mild: sleep-onset insomnia, moderate: sleep-maintenance insomnia, or severe: mixed insomnia. **Highly significant at *P* value less than 0.01, using analysis of variance test.

The data presented in Table 3 showed the distribution of the studied groups according to their preference for different types of foods. The results showed that there were no significant differences between the three groups in their preference for different types of foods. Only significant difference was recorded between patients with benign tumors, BC, and the control group for their preference to eat poultry and their low preference to use olive oil in cooking.

On the other hand, high significant difference between the benign, malignant patients, and the control group in terms of their enjoyment of drinking and eating milk and dairy products, and a significant difference in these products reduce the incidence of disease. It was also found that there were high significant differences between the three groups who urged their belief that

eating vegetables and fruits along with exercising has health benefits, as shown in Table 4.

Table 5 shows percent distribution of the studied participants according to their adherence to food items recommended by MedDiet and their scores. Data revealed that a large number of patients with benign tumors and BC had the lowest intake of milk and dairy products, vegetables, fruits, legumes, fish, and olive oil compared with the control with high significant differences ($P \leq 0.01$), while consumption of red and processed meat was significantly high at *P* value less than or equal to 0.01.

Figure 1 shows that BC patients obtained the lowest score in terms of their adherence to eating the MedDiet (5.44 ± 2.81), compared with patients with benign

Table 2 Distribution of the studied groups according to their attitude toward some social factors

Items	Control group [n (%)]	Benign group [n (%)]	Malignant group [n (%)]	P value
Are you successful in your social relationship				
No	0	2 (3.7)	2 (2.4)	0.005**
Low	2 (2.4)	4 (7.4)	3 (3.6)	
Moderate	36 (42.4)	12 (22.2)	18 (21.7)	
Good	43 (50.6)	36 (66.7)	60 (72.3)	
Very good	4 (4.7)	0	0	
How much social support is provided by family				
No	2 (2.4)	0	4 (4.8)	0.210
Low	3 (3.5)	5 (9.3)	4 (4.8)	
Moderate	26 (30.6)	11 (20.4)	19 (22.9)	
Good	41 (48.2)	34 (63.0)	41 (49.4)	
Very good	13 (15.3)	4 (7.4)	15 (18.1)	
How much are you interested in eating breakfast				
No	1 (1.2)	6 (11.1)	5 (6.0)	0.134
Low	10 (11.8)	9 (16.7)	10 (12.0)	
Moderate	13 (15.3)	5 (9.3)	13 (15.7)	
Good	38 (44.7)	28 (51.9)	37 (44.6)	
Very good	23 (27.1)	6 (11.1)	18 (21.7)	
Yes	14 (16.5)	9 (16.7)	14 (16.9)	
Do you take any kind of medication?				
No	54 (63.5)	31 (57.4)	43 (51.8)	0.306
Yes	31 (36.5)	23 (42.6)	40 (48.2)	

**Highly significant at P value less than 0.01, using Kruskal–Wallis test.

Table 3 Distribution of the studied groups according to their preference for different types of foods

Questions	Control group [n (%)]	Benign group [n (%)]	Malignant group [n (%)]	P value
Do you prefer to eat vegetables?				
Fresh	31 (36.5)	8 (14.8)	28 (33.7)	0.081
Cooked	25 (29.4)	23 (42.6)	26 (31.3)	
Both	29 (34.1)	23 (42.6)	29 (34.9)	
Do you prefer to eat fruit?				
No	3 (3.5)	4 (7.4)	5 (6.0)	0.374
Fresh	80 (94.1)	50 (92.6)	78 (94.0)	
Juices	2 (2.4)	0	0	
Dried	0	0	0	
Canned	0	0	0	
Do you prefer to drink juices?				
No	6 (7.1)	6 (11.1)	4 (4.8)	0.579
Fresh	67 (78.8)	44 (81.5)	70 (84.3)	
Canned	10 (11.8)	2 (3.7)	7 (8.4)	
Both	2 (2.4)	2 (3.7)	2 (2.4)	
Do you prefer to eat eggs?				
Boiled	77 (90.6)	49 (90.7)	70 (84.3)	0.368
Fried	8 (9.4)	5 (9.3)	13 (15.7)	
Omelette	0	0	0	
Do you prefer to eat bread?				
Bread	75 (88.2)	50 (92.6)	77 (92.8)	0.621
Toast	2 (2.4)	0	2 (2.4)	
Both	8 (9.4)	4 (7.4)	4 (4.8)	
Do you prefer to eat dairy products?				
Full fat	65 (76.5)	40 (74.1)	62 (74.7)	0.111
Skimmed	16 (18.8)	14 (25.9)	21 (25.3)	
Other	4 (4.7)	0	0	
What kind of meat do you like to eat?				
Red meat	63 (74.1)	34 (63.0)	52 (62.7)	0.375
Fat meat	8 (9.4)	5 (9.3)	7 (8.4)	

(Continued)

Table 3 (Continued)

Questions	Control group [n (%)]	Benign group [n (%)]	Malignant group [n (%)]	P value
Both	14 (16.5)	15 (27.8)	24 (28.9)	
What is your favorite way to eat birds?				
With skin	20 (23.5)	6 (11.1)	6 (7.2)	
Without skin	44 (51.8)	36 (66.7)	48 (57.8)	0.018*
Both	21 (24.7)	12 (22.2)	29 (34.9)	
What is your preferred method of cooking meat?				
Grilled	49 (57.6)	31 (57.4)	52 (62.7)	
Fried	29 (34.1)	23 (42.6)	31 (37.3)	0.059
Casserole	3 (3.5)	0	0	
Other	4 (4.7)	0	0	
Do you like to use butter? and what types of ghee you usually used				
No	7 (8.3)	7 (13.5)	6 (7.2)	
Ghee	47 (56.0)	23 (44.2)	45 (54.2)	0.667
Artificial ghee	9 (10.7)	10 (19.2)	12 (14.5)	
Mix	21 (25.0)	12 (23.1)	20 (24.1)	
What kinds of oils do you prefer to use in cooking?				
Mixed	21 (24.7)	26 (48.1)	27 (32.5)	
Sunflower oil	10 (11.8)	7 (13.0)	16 (19.3)	
Corn oil	47 (55.3)	19 (35.2)	39 (47.0)	0.045*
Olive oil	5 (5.9)	2 (3.7)	1 (1.2)	
Other	2 (2.4)	0	0	
Do you like to eat pasta?				
Yes	33 (38.8)	21 (38.9)	30 (36.1)	0.922
No	52 (61.2)	33 (61.1)	53 (63.9)	
What type of snacks you prefer between meals?				
No	28 (32.9)	30 (55.6)	35 (42.2)	
Fast meals	2 (2.4)	0	1 (1.2)	
Snacks	10 (11.8)	3 (5.6)	7 (8.4)	0.006**
Soda	8 (9.4)	0	1 (1.2)	
Sandwiches	24 (28.2)	17 (31.5)	18 (21.7)	
Fruits	13 (15.3)	4 (7.4)	21 (25.3)	

*Significant difference at *P* value less than 0.05, using Kruskal–Wallis test. **Highly significant at *P* value less than 0.01, using Kruskal–Wallis test.

tumors and the control groups (5.58 ± 3.70 , 6.67 ± 3.00 , respectively) with significant difference at *P* value less than or equal to 0.05.

Discussion

BC is the main form of cancer diagnosed in women [27,28]. Excess fat and dietary habits rank high among the most relevant risk factors for BC [29–31]. Increasing scientific evidence demonstrates that environmental factors regulate gene expression by regulating epigenetic mechanisms [30,32,33].

Thus, the influence of excess weight and dietary factors on BC promotion could be modulated through epigenetic regulation [34]. Furthermore, pooled evidence from observational studies shows a statistically significant positive association between sedentary behavior and BC risk [35]. The results of this study revealed that the BC patients were the most

obese participants who were shared in this study, as it was found that they scored the highest BMI, at the same time, most of them were from the least-active group.

Zhang *et al.* [36] stated that the role of combined healthy lifestyle factors had a significant protective effect ($HR=0.77$) on BC. In this context, data from this study showed a high percentage of patients with benign and BC who were smoking compared with controls (25, 20, and 12.9%), in addition, both complained of having difficulty in sleeping. There are legitimate biological reasons why smoking may affect BC risk, however, epidemiological evidence is inconsistent. Smoking is associated with a modest but significantly increased risk of BC, especially in women who started smoking in their late teens or early menopause. The relative risk of BC from smoking is higher in women with a family history of the disease [37]. Furthermore, a meta-analysis showed a positive

Table 4 Studied groups' distribution according to their attitude toward the healthy effect of food items and some habits that affect their health

Questions	Control group [n (%)]	Benign group [n (%)]	Malignant group [n (%)]	P value
Do you enjoy eating baladi bread				
Yes	75 (88.2)	48 (88.9)	79 (95.2)	0.240
No	10 (11.8)	6 (11.1)	4 (4.8)	
Do you enjoy eating dairy products				
Yes	72 (84.7)	53 (98.1)	80 (96.4)	0.003**
No	13 (15.3)	1 (1.9)	3 (3.6)	
Do you enjoy eating fried foods				
Yes	46 (54.1)	31 (57.4)	38 (45.8)	0.356
No	39 (45.9)	23 (42.6)	45 (54.2)	
Do you think that the baladi bread improves health?				
Yes	33 (38.8)	20 (37.0)	27 (32.5)	0.710
Maybe	46 (54.1)	29 (53.7)	52 (62.7)	
No	6 (7.1)	5 (9.3)	4 (4.8)	
Do you think that eating baladi bread reduces your risk of disease?				
Yes	7 (8.2)	1 (1.9)	7 (8.4)	0.535
Maybe	54 (63.5)	34 (63.0)	50 (60.2)	
No	24 (28.2)	19 (35.2)	26 (31.3)	
Do you think that eating dairy products reduces your risk of disease?				
Yes	38 (44.7)	40 (74.1)	41 (49.4)	0.012*
Maybe	23 (27.1)	8 (14.8)	19 (22.9)	
No	24 (28.2)	6 (11.1)	23 (27.7)	
Do you think that eating fried foods reduces your risk of disease?				
Yes	66 (77.6)	45 (83.3)	73 (88.0)	0.207
Maybe	19 (22.4)	9 (16.7)	10 (12.0)	
No	0	0	0	
Do you think that vegetables and fruits are beneficial for improving health?				
Yes	78 (91.8)	54 (100.0)	83 (100.0)	0.003**
Maybe	7 (8.2)	0	0	
No	0	0	0	
Do you think that exercise is beneficial for improving health?				
Yes	78 (91.8)	54 (100.0)	83 (100.0)	0.003**
Maybe	7 (8.2)	0	0	
No	0	0	0	
Do you think that smoking is harmful to health?				
Yes	85 (100.0)	54 (100.0)	83 (100.0)	NA

*Significant difference at *P* value less than 0.05, using Kruskal–Wallis test. **Highly significant at *P* value less than 0.01, using Kruskal–Wallis test.

association between long sleep duration and colorectal cancer, and an inverse association with the incidence of hormone-related cancers such as BC [38].

The highest proportion of cancer patients in this study was among those with a primary school education 30.1%, while the lowest rate was among those with a university degree or higher, 12.0, 3.6%, respectively. In contrast, Dong and Qin [39] suggest that higher education may be associated with an increased risk of developing BC, of which alcohol consumption, age at menopause, and hormone therapy, at least in part, can play an intermediary role.

The social environment is a recognized determinant of health and well-being. In BC patients, inadequate

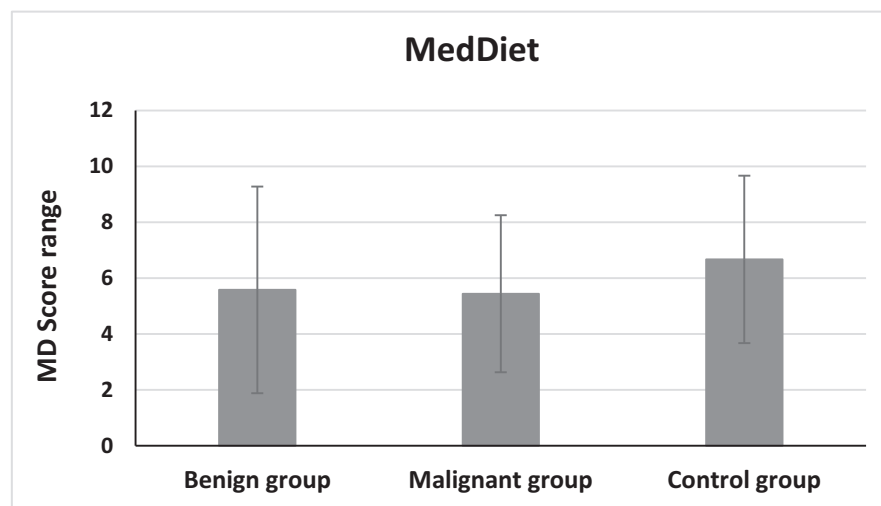
social support is associated with a significant increase in cancer mortality. A common explanation is that socially isolated individuals are worse off due to reduced instrumental support (i.e. support that meets treatment needs). However, the ability to reproduce the adverse effects of social isolation on the development of mammary gland tumors in rodents unequivocally suggests an alternative explanation, that is, socially isolated individuals have a physiological expression that promotes tumor growth [40].

The studied sample in the current study showed that the higher percent of the benign and BC patients was reported in the categories that had no, low, and moderate level of the social relationship compared with the control, while higher percent in the good,

Table 5 Distribution of participants according to adherence to Mediterranean diet for studied groups

Types of food	Control group (N=85)		Benign group (N=54)		Malignant group (N=83)		P value
	Score 0 [n (%)]	Score 1 [n (%)]	Score 0 [n (%)]	Score 1 [n (%)]	Score 0 [n (%)]	Score 1 [n (%)]	
Bred, pasta, rice, and cereals/day	16 (18.8)	69 (81.2)	20 (37.1)	34 (62.9)	23 (27.7)	60 (72.3)	0.050*
Milk and dairy products/day	19 (22.4)	66 (77.6)	34 (62.9)	20 (37.1)	40 (48.2)	43 (51.8)	0.001**
Fruits/day	69 (81.2)	16 (18.8)	47 (87.0)	7 (13.0)	73 (85.9)	12 (14.1)	0.000**
Vegetables/day	57 (67.1)	28 (32.9)	39 (72.2)	15 (27.8)	61 (71.8)	24 (28.2)	0.000**
Red or processed meat/week	50 (58.8)	35 (41.2)	20 (37.0)	34 (63.0)	23 (27.7)	60 (72.3)	0.000**
Legumes /week	26 (30.6)	59 (69.4)	32 (59.3)	22 (40.7)	54 (65.1)	29 (34.9)	0.000**
Egg/ week	10 (11.8)	75 (88.2)	24 (44.4)	30 (55.6)	32 (38.6)	51 (61.4)	0.000**
White meat/week	53 (62.4)	32 (37.6)	35 (64.8)	19 (35.2)	57 (67.1)	28 (32.9)	0.997
Fish/ week	66 (77.6)	19 (22.4)	46 (85.2)	8 (14.8)	70 (82.4)	15 (17.6)	0.001**
Commercial sweets/day	60 (70.6)	25 (29.4)	32 (59.3)	22 (40.7)	52 (61.2)	33 (38.8)	0.032*
Olive oil day	80 (94.1)	5 (5.9)	53 (98.1)	1 (1.9)	83 (97.6)	2 (2.4)	0.000**
Pastries/day	64 (75.3)	21 (29.7)	35 (64.8)	19 (35.2)	56 (65.9)	29 (34.1)	0.322
Carbonated beverages/day	61 (71.8)	24 (28.2)	34 (63.0)	20 (37.0)	51 (60.0)	34 (40.0)	0.232

*Significant difference at *P* value less than 0.05, using Kruskal–Wallis test. **Highly significant at *P* value less than 0.01, using Kruskal–Wallis test.

Figure 1

Mean of the MedDiet scores for the studied sample. MedDiet, Mediterranean diet.

but low in very good relation with significant association between the groups. The results obtained concerned with the 'much support provided by close relatives' item were heterogeneous and had no significant difference. At the same time, the results showed that the percentage of participants in the two items, namely the interest in having breakfast, as well as taking any kind of medication, was variable and without a significant difference. In this context, the American Cancer Society [41] that recommends a healthy breakfast focuses on fruits, vegetables, whole grains, low-fat dairy products, and lean proteins.

The MedDiet is generally considered a healthy diet, characterized by a high intake of fruits, vegetables,

whole-grain products, legumes and fish, and a limited intake of dairy products and red meat [42]. MedDiet scores above 6 are associated with a low risk of BC (odds ratio=0.29, 95% CI: 0.12–0.69) [6].

Van Gemert *et al.* [30] and Sharifa *et al.* [43] discovered a significant inverse association between consumption of legumes and nuts and BC. In this context, diets based on polyphenols, dietary fiber, extra-virgin olive oil, or nuts can significantly reduce oxidative biochemical processes based on metabolic, cardiac, and metabolic pathophysiology [26,43]. These conclusions that have been reached support the current results of this study where significant difference was found in the mean value of the MedDiet score between

the BC patients and patients with benign tumors and the control group. BC patients obtained the lowest score in terms of their nonadherence to eating the MedDiet, that was a translation in their reduced intake of most of the protective foods mentioned in the MedDiet. However, there is a contradiction in what was recorded in their belief in the benefits of eating dairy products, vegetables, and fruits.

The composition of the diet has long been known to affect acid–base balance by providing acidic or basic precursors. In general, foods rich in protein, such as meat, cheese, eggs, and others, increase acid production in the body, while fruits and vegetables increase alkalinity. The ability of any food to make acids or bases is called the potential acid load in the kidney. The potential acid load in the kidney-rich diet induces low-grade metabolic acidosis, which is associated with the development of metabolic changes such as insulin resistance, diabetes, hypertension, chronic kidney disease, bone disorders, low muscle mass, and other complications [44]. Dietary factors that contribute to low-grade chronic metabolic acidosis are associated with BC risk. As the potential renal acid load score is positively correlated with meat consumption and negatively correlated with fruit and vegetable consumption, the daily red meat consumption of the BC patient participants in the present study was significantly high and was low in vegetable and fruit intake compared with the control. Park *et al.* [45] suggested that a diet high in fruits and vegetables and low in meat may have a protective effect against hormone-receptor-negative BC.

Conclusion

According to the findings of this study, Egyptian women with BC who participated in this study had the lowest attitude and adherence to a healthy diet. The findings also revealed that, despite its health benefits, the usage of olive oil was not widespread in Egyptian society. The various food components in any healthy diet as the MedDiet have multiple functions and are emerging as a viable BC diet. Simultaneously, data highlighted the necessity to increase the successful good social relationships and support for cancer patients.

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Conflicts of interest

There are no conflicts of interest.

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