Original Article

Effects of Dietary Habits and Sedentary Lifestyle on Breast Cancer among Women Attending the Oncology Day Treatment Center at a State University in Turkey

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Abstract

Background: Certain lifestyle factors affect the risk of developing breast cancer. Especially, diet and physical activity play a primary role in preventing breast cancer. However, the results of studies on this subject in different societies are still conflicting. **Objective:** The objective of this study is to determine the effects of dietary habits and sedentary lifestyle on breast cancer risk among women attending the Oncology Day Treatment Center at a state university in Turkey. **Materials and Methods:** This case-control study was conducted in the Oncology Day Treatment Center at a state university in Turkey between December 1st, 2016 and June 1st, 2017. The case group consists of 65 women diagnosed with breast cancer, and the control group consists of 65 women without any chronic disease. The Mediterranean diet score was used to assess the dietary habits of the participants, and the International Physical Activity Questionnaire Short Form was used to assess the physical activity (sedentary lifestyle) of the participants. The Shapiro–Wilk *W* test was used to check for normality within the distribution of scale scores. Categorical data were compared using the Chi-square test. Multivariate binary regression analysis was conducted ($P < 0.05$). **Results:** The proportion of participants who received a higher score from the Mediterranean diet score was significantly lower in the case group than in the control group. The proportion of physically inactive individuals in the case group was higher than those in the control group. Body mass index (BMI) at the age of menopause was significantly higher in the case group than the control group. Those who frequently use a deep-frying cooking method to cook red meat have a 6.77 times higher breast cancer risk than those who use a stewing method. Comparing those who do not consume olive oil, or who consume olive oil rarely, once or twice a week compared with those who consume olive oil daily, it was found that the case group has 4.5 times higher risk than the control group. **Conclusions:** Cooking red meat by a deep-frying method, lack of physical activity, having a higher BMI particularly during the postmenopausal period, and nonadherence to the Mediterranean diet are risk factors of breast cancer.

Keywords: *Breast cancer, dietary habits, sedentary lifestyle, Turkey*

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Introduction

Cancer is a major public health problem affecting developed and developing countries. Cancer ranks as the second most common cause of death worldwide, following cardiovascular diseases.[1] Only 5–10% of

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all cancer cases can be attributed to genetic defects, whereas the remaining 90–95% have their roots in environment and lifestyle factors, including cigarette smoking, diet, alcohol consumption, physical inactivity, obesity, sun exposure, infections, and environmental pollutants.[1,2] Various kinds of research have been conducted to explain the effect of nutrition on cancer by examining the associations between dietary patterns and cancer rates in various populations.[3,4]

Breast cancer is the most common cancer in women worldwide and the leading cause of cancer death.[5] The incidence of breast cancer increased by 30% in Western countries toward the end of the 20th century.[6] This is due in part to changes in reproductive patterns, menopausal hormone use, and increased detection through screening.[7] The cancer incidence rate in Turkey is higher than the worldwide cancer incidence in men, whereas it is lower than the worldwide cancer incidence in women. It is reported that the five most common cancers in Turkey are the same most common cancers reported worldwide and in other developed countries. The most common cancers are tracheal, bronchial, and lung cancer in men (52.5/100,000 people Age-Standardized Incidence Rate) and breast cancer in women (43.0/100,000 people Age-Standardized Incidence Rate).[8]

Various studies explain that lifestyle factors that can be controlled, as well as genetic factors, cause breast cancer.[9-11] Breast cancer incidence rates vary by geographic region. Only a small portion of breast cancer cases are associated with genetic defects or exposure to chemicals or carcinogens. Other cases are associated with lifestyle trends. The breast cancer incidence has been observed in various countries as parallel with significant lifestyle and healthy behavior patterns.[12] Epidemiological studies have revealed a protective association between the Mediterranean diet and cancer incidence or mortality. Even though the association was not statistically significant in some of the studies, none of the studies revealed a detrimental association.[13-15] The Mediterranean diet is rich in antioxidants and includes components such as polyphenols, flavonoids, resveratrol, and anthocyanin. High intakes of fruits and vegetables are helpful in reducing cancer risk, as is an intake of these components.[16] The aim of this study determines the effects of dietary habits and sedentary lifestyle on breast cancer risk among women attending the Oncology Day Treatment Center at a state university in Turkey.

Materials and Methods

This case-control study was conducted in the Oncology Day Treatment Center at a state university in the Central Anatolia Region of Turkey between December 1st, 2016 and June 1st, 2017. Between the two groups, the Mediterranean diet score in order to make a meaningful difference of 2.5 ± 5 units in terms of scale scores that the minimum number of individuals required in each group was determined as 64 (Type I error = 0.05, test power = 0.80). Power analysis was done using the sample width procedure for the difference between the two group means in MedCalc version 15.8 software. The case group and control group consisted of 65 women each. The inclusion criteria for the case group were accepted as being older than 18, having been diagnosed for 2 months at the most, having the cognitive ability to understand and answer the questions, and being able to communicate. The exclusion criteria were determined as having another chronic disease other than breast cancer, being pregnant or lactating, and having had cancer previously. Women older than 18 and without any chronic disease were included in the control group. Participants in the case and control groups read and signed the informed consent forms.

To collect data regarding the patients who participated in this study, a questionnaire form consisting of several sections was used to ask for information regarding the general health of the patients, their usual dietary habits, their body mass indexes (BMIs) before and after the diagnosis, and their physical activity patterns. Anthropometric measurements, such as weight and height of the participants, were obtained.

The Mediterranean diet score was used to assess whether the participants had followed the Mediterranean diet before diagnosis. The Mediterranean diet score developed by Panagiotakos *et al.*[17] is based on a positive or negative scoring of the diet components. Eleven food categories are included, with a score of 0–5 within each category. Scores for food categories representative of a Mediterranean diet (unrefined grain products, potatoes, fruits, vegetables, legumes, fish, red meat and meat products, poultry, full dairy, olive oil, and alcoholic beverages) increase as consumption frequency increases. Scores less than or equal to 29 were evaluated as inadequate, and scores higher than 29 were evaluated as adequate.

The International Physical Activity Questionnaire Short Form was used to assess the physical activity of the participants.[18] The International Physical Activity Questionnaire (IPAQ) is a frequently used instrument for the evaluation of physical activity. It was developed in the late 1990s by a multinational working group, supported by the World Health Organization.[18] Based on the IPAQ scoring procedure, physical activity status is classified into three categories: (1) low physical activity,

insufficiently active subjects (<600 MET min/week), (2) moderate physical activity (600–3000 MET min/week), and (3) high physical activity, health enhancing physical activity active subjects (>3000 MET min/week).[19]

Statistical analysis

The Shapiro–Wilk *W* test was used to check for normality within the distribution of scale scores. Categorical data were compared using the Chi-square test. SPSS (Statistical Package for the Social Sciences) for Windows Software (version 24.0 SPSS, Chicago, IL, USA) was used for all statistical analyses and a $P < 0.05$ was considered statistically significant. Multivariate binary regression analysis was conducted.

Results

Twenty percent of the case group and 12.3% of the control group were aged less than or equal to 40, whereas 80% of the case group and 87.7% of the control group were more than 40. Also, 78.5% of the case group and 80% of the control group consisted of housewives, 47.7% of the case group and 41.5% of the control group were primary school graduates, and a majority of each group of participants were married ($P > 0.05$).

In both the case and control groups, the number of participants who experienced menarche at the age of 12 or younger is equal to the number of participants who experienced menarche later than 12 years of age. The proportion of women who had never given birth was lower in the case group (24.6%) than in the control group (10.8%). The proportion of women who had given birth to more than two children was significantly lower in the case group (41.5%) than in control group (67.7%). Also, 55.4% of the case group were premenopausal and 44.6% of them were postmenopausal, whereas 49.2% of the control group were premenopausal and 50.8% of them were postmenopausal. A significant difference was observed for these two groups in terms of menopause ($P > 0.05$). No significant difference was found among the groups in terms of age at menopause, surgical menopause ratio, and hormone replacement therapy use ($P > 0.05$) [Table 1]. About 50.8% of the participants in the case group and 46.2% of the participants in the control group had a family history of cancer. The prevalence of a positive family history of breast cancer was higher in the case group compared to the control group ($P < 0.05$). About 29.2% of the case group and 20% of the control group were cigarette smokers. The proportion of the participants who answered yes to the frequent exposure to other people's smoke (second-hand smoke) was higher (75.4%) than in the control group (50.8%) ($P < 0.05$) [Table 1]. Upon examining the premenopausal women, it was learned that the body weights and BMI of the participants in the case group were lower than those of the participants in the control group ($P > 0.05$). When examining the postmenopausal women, it was learned that the body weights and BMI of the participants in the case group were higher than those of the participants in the control group, while only the differences regarding BMI were significant [Table 2]. Table 3 shows the compliance of individuals to the Mediterranean diet in terms of the frequency of consumption of each component of the Mediterranean diet. About 43.8% of the case group and 46.2% of the control group consumed unrefined foods once or twice a week, whereas 53.8% of the case group and 67.7% of the control group consumed raw/cooked vegetables daily, and 75.4% of the case group and 87.7% of the control group consumed fruits daily ($P > 0.05$). The proportion of participants who never consumed legumes or who consumed legumes less than once a week was significantly higher in the case group than in the control group ($P < 0.05$). The proportion of participants who consumed fish once or twice a week was lower in the case group, compared with the control group ($P > 0.05$).

Also, 56.9% of the case group and 43.1% of the control group ate one portion of red meat once a week at most; the proportion of participants who ate two to three portions of red meat every week was lower in the case group than in the control group, and the proportion of participants who ate more than two to three portions of red meat every week was higher in the case group than in the control group ($P < 0.05$). The proportion of participants who consumed olive oil every day was significantly lower in the case group (58.5%) than in the control group (90.8%) ($P < 0.05$). None of the participants in either group consumed alcohol [Table 3].

The proportion of participants who scored more than 29 on the Mediterranean diet score was significantly lower in the case group (15.4%) than in the control group (44.6%) ($P < 0.05$). In addition, 55.4% of the case group and 47.7% of the control group were physically inactive. Moreover, 32.3% of the case group and 43.1% of the control group were categorized in the low physical activity category. About 20.3% of the case group and 9.2% of the control group were sufficiently active ($P > 0.05$) [Table 4].

The evaluation of some of the breast cancer risk factors using the logistic regression models is presented in Table 5. It was found that women who have never given birth and women who gave birth once only are 1.7 times more likely to develop breast cancer than women who gave birth more than twice; women who gave birth twice are 1.3 times more likely to develop breast cancer than women who gave birth more than

Table 1: Distribution of case and control groups according to some breast cancer risk factors among women attending the Oncology Day Treatment Center at a state university in Turkey

	Case group, *n* (%)		Control group, *n* (%)
Age at menarche (years)			
≤12	26 (40.0)		26 (40.0)
>12	39 (60.0)		39 (60.0)
χ^2, *P*		0.000, 1.000	
Parity			
≤1	16 (24.6)		7 (10.8)
2	22 (33.8)		14 (21.5)
>2	27 (41.5)		44 (67.7)
χ^2, *P*		9.370, 0.009	
Menopausal status			
Premenopausal	36 (55.4)		32 (49.2)
Postmenopausal	29 (44.6)		33 (50.8)
χ^2, *P*		0.439, 0.482	
Age at menopause (years)			
<55	28 (96.6)		28 (84.8)
≥55	1 (3.4)		5 (15.2)
χ^2, *P*		2.419, 0.120	
Surgical menopause			
Yes	3 (10.3)		4 (12.1)
No	26 (89.7)		29 (87.9)
χ^2, *P*		0.049, 0.825	
Use of hormone replacement therapy			
Yes	4 (13.8)		4 (12.1)
No	25 (86.2)		29 (87.9)
χ^2, *P*		0.038, 0.845	
Family history of breast cancer			
Yes	33 (50.8)		30 (46.2)
No	32 (49.2)		35 (53.8)
χ^2, *P*		0.277, 0.599	
Review percentages of cancer in the family			
Breast	9 (13.8)		2 (3.1)
Uterus, endometrium	4 (6.2)		0 (0.0)
Other	20 (30.8)		28 (43.1)
χ^2, *P*		9.922, 0.019	
Smoking			
Yes	19 (29.2)		13 (20.0)
No	46 (70.8)		52 (80.0)
χ^2, *P**		1.462, 0.222	
Passive smoking			
Yes	49 (75.4)		33 (50.8)
No	16 (24.6)		31 (47.7)
χ^2, *P**		8.909, 0.012	

χ^2: Chi-square test, $P<0.05$

twice ($P < 0.05$). Exposure to cigarette smoking increases the risk of developing breast cancer by 2.5 times ($P > 0.05$). Women who frequently use the deep-fry cooking method to cook red meat are 6.77 times more likely to develop breast cancer than women who frequently use the stewing method ($P < 0.05$). Women who never/rarely consume olive oil or consume it once or twice in a week were compared with women who consume olive oil daily, and it was found that women in the case group are 4.5 times more likely to develop breast cancer than those in the control group ($P < 0.05$). It was found that the control group was 20% less likely to develop breast cancer than the case group in terms of their jogging prevalence ($P < 0.05$) [Table 5].

Table 2: Evaluation of case and control groups according to menopausal status, body weight, and body mass index among women attending the Oncology Day Treatment Center at a state university in Turkey

	Menopausal status	Case group		Control group		*P*
		n	*X*±SD	*n*	*X*±SD	
Body weight (kg)	Premenopausal	36	74.78±13.07	32	79.94±14.80	0.132
	Postmenopausal	29	83.16±15.06	33	79.18±13.44	0.277
BMI (kg/m^2)	Premenopausal	36	28.96±4.94	32	30.66±5.61	0.188
	Postmenopausal	29	34.01±6.25	33	29.81±4.86	0.004

Student's *t*-test, $P<0.05$. SD=Standard deviation, BMI=Body mass index

Table 3: Evaluation of nutrition in case and control groups in accordance with the Mediterranean diet model among women attending the Oncology Day Treatment Center at a state university in Turkey

	Case group, *n* (%)		Control group, *n* (%)
Nonrefined cereals			
Never	45 (69.2)		45 (69.2)
Daily	10 (15.4)		17 (26.2)
≥1-2 times a week	10 (15.4)		3 (4.6)
χ^2, *P*		5.58, 0.061	
Potato			
Never and ≤1 time per week	24 (36.9)		21 (32.3)
1-2 times per week	35 (53.8)		30 (46.2)
≥3 times per week	6 (9.2)		14 (21.5)
χ^2, *P*		3.79, 0.151	
Vegetables			
Daily	35 (53.8)		44 (67.7)
≥1-2 times per week	30 (46.2)		21 (32.3)
χ^2, *P*		2.61, 0.106	
Fruits			
Daily	49 (75.4)		57 (87.7)
1-2 times per week and never	16 (24.6)		8 (12.3)
χ^2, *P*		3.27, 0.071	
Legumes			
Never and ≤1 time per week	27 (41.5)		15 (23.1)
1-4 times per week	38 (58.5)		50 (76.9)
χ^2, *P*		5.07, 0.024	
Fish			
Never	14 (21.5)		13 (20.0)
≤1 time per week	27 (41.5)		23 (35.4)
1-2 times per week	24 (36.9)		29 (44.6)
χ^2, *P*		0.829, 0.661	
Red meat and products			
≤1 serving per week	37 (56.9)		28 (43.1)
2-3 servings per week	14 (21.5)		33 (50.8)
≥2-3 servings per week	14 (21.5)		4 (6.2)
χ^2, *P*		14.48, 0.001	
Poultry			
≤3 servings per week	63 (96.9)		61 (93.8)
≥4-5 servings per week	2 (3.1)		4 (6.2)
χ^2, *P*		0.70, 0.403	
Full fat dairy products			
Daily	59 (90.8)		58 (89.2)
1-2 times per week and never	6 (9.2)		7 (10.8)
χ^2, *P*		0.08, 0.770	
Use of olive oil (times week)			
Never rare, 1-2 times per week	27 (41.5)		6 (9.2)
Daily	38 (58.5)		59 (90.8)
χ^2, *P*		17.91, 0.001	
Alcoholic beverages			
Never	65 (100.0)		65 (100.0)

χ^2: Chi-square test, $P<0.05$

Table 4: Distribution of Mediterranean diet score and International Physical Activity Questionnaire scores in case and control groups among women attending the Oncology Day Treatment Center at a state university in Turkey

	Case group, *n* (%)	Control group, *n* (%)
Mediterranean diet score		
≤29	55 (84.6)	36 (55.4)
>29	10 (15.4)	29 (44.6)
χ^2, *P*	13.22, 0.001	
Categorical distribution of physical activity		
<600 (inactive)	36 (55.4)	31 (47.7)
600-3000 (low physical activity)	21 (32.3)	28 (43.1)
>3000 (adequate physical activity)	8 (12.3)	6 (9.2)
χ^2, *P*	1.659, 0.436	

χ^2=Chi-square test, $P<0.05$

Discussion

In this study, we evaluated the effects of dietary habits and sedentary lifestyle on breast cancer risk among women attending the Oncology Day Treatment Center at a state university in Turkey. It was found that 55.4% of the case group and 47.7% of the control group were physically inactive. Also, 32.3% of the case group and 43.1% of the control group were categorized in the low physical activity category. About 20.3% of the case group and 9.2% of the control group were sufficiently active ($P > 0.05$). The proportion of participants who scored more than 29 on the Mediterranean diet score was significantly lower in the case group (15.4%) than in the control group (44.6%) ($P < 0.05$). Women who never/rarely consume olive oil or consume it once or twice in a week were compared with women who consume olive oil daily, and it was found that women

Table 5: Evaluation of some breast cancer risk factors with logistic regression model among women attending the Oncology Day Treatment Center at a state university in Turkey

	Case group	Control group	OR	95% CI
Parity, *n* (%)				
Never	16 (24.6)	7 (10.8)	7.57	1.775-32.285
≥2	27 (41.5)	44 (67.7)	1.00	
P	0.006			
2	22 (33.8)	14 (21.5)	4.266	1.351-13.469
≥2	27 (41.5)	44 (67.7)	1.00	
P	0.013			
Passive smoking, *n* (%)				
Yes	49 (75.4)	33 (50.8)	2.556	0.901-7.254
No	16 (24.6)	31 (47.7)	1.00	
P	0.078			
Cooking method of red meat, *n* (%)				
Boiled meat	40 (61.5)	47 (72.3)	1.00	1.622-28.264
Fried meat, braised meat	18 (27.7)	5 (7.7)	6.77	
P	0.009			
BMI (kg/m^2), X±SD	31.21±6.07	30.23±5.21	1.101	0.995-1.217
P	0.063			
Fruits, *n* (%)				
Daily	49 (75.4)	57 (87.7)	1.00	0.829-10.623
1-2 times per week, never	16 (24.6)	8 (12.3)	2.966	
P	0.095			
Legumes, *n* (%)				
Never, ≤1 time per week	27 (41.5)	15 (23.1)	1.82	0.67-4.947
1-4 times per week	38 (58.5)	50 (76.9)	1.00	
P	0.240			
Use of olive oil (times week), *n* (%)				
Never rare, 1-2 times per week	27 (41.5)	6 (9.2)	4.507	1.396-14.548
Daily	38 (58.5)	59 (90.8)	1.00	
P	0.012			
Walking frequency (day per week), *X*±SD	2.62±3.13	4.85±2.67	0.795	0.681-0.929
P	0.004			

SD=Standard deviation, BMI=Body mass index

in the case group are 4.5 times more likely to develop breast cancer than those in the control group ($P < 0.05$).

Early menarche and late menopause are known to increase the risk of breast cancer.[20] Menarche, the first menstrual cycle, is characterized by monthly fluctuations in hormone levels, ovulation, and proliferation of breast cells. The synthesis of endogenous hormones and the longer fertility period through ovulation have a negative effect on breast cancer.[21] In an epidemiological study, 8421 breast cancer cases were documented, and it was found that among women with early menarche (age 12 years or younger), the breast cancer risk was 1.17 times greater than among women with late menarche (age 14 years or older).[22] In another study, it was found that women who go through menopause at the age of 55 or older have a 12% higher risk of breast cancer compared to women who go through menopause earlier (between 50 and 54).[20] In our study, no significant difference was found among the groups in terms of age at menarche, age of menopause, and surgical menopause [$P > 0.05$, Table 1].

It was found that there was an inversed association between parity and breast cancer risk in a study conducted.[23] In another study, it was found that increasing parity was inversely associated with premenopausal breast cancer.[24] In our study, the proportion of women who have never given birth (24.6%) was higher than those in the control group (10.8%), whereas the proportion of women who gave birth more than twice was lower than those in the control group, and the difference was significant ($P < 0.05$). The logistic regression model suggests that women who have never given birth and women who gave birth once only are 1.7 times more likely to develop breast cancer than women who gave birth more than twice; women who gave birth twice are 1.3 times more likely to develop breast cancer than women who gave birth more than twice ($P < 0.05$).

In the majority of women who applied for genetic testing because of a family history of breast cancer, no specific mutation can be found. However, a familial cancer history increases the risk of breast cancer even though there is no evidence of mutation. Breast cancer risk is associated with the number of relatives diagnosed with breast cancer as well as genetic affinity.[25] It is assumed that 27% of all breast cancer is caused by inherited factors, and having at least one close relative with breast cancer is apparent in 13% of breast cancer cases.[26] Similarly, in our study, it was found that 13.8% of the participants in the case group and 3.1% of the participants in the control group had a family history of breast cancer ($P < 0.05$).

Studies on the relationship between breast cancer and smoking have shown that compounds found in tobacco smoke, such as polycyclic hydrocarbons, aromatic amines, and *N*-nitrosamines, may induce mammary tumors.[27] In a meta-analysis study, it was found that environmental tobacco smoke exposure (second hand smoke) is associated with the medium level of breast cancer. However, there are fewer studies on second hand smoke.[28] The study findings of the European Prospective Investigation into Cancer and Nutrition suggest that when compared to women who never smoked and were not exposed to second hand smoke at home or work, at the time of the study registration, current and former smokers and those currently exposed to second hand smoke were at increased risk of breast cancer (hazard ratios: 1.16, 1.14, and 1.10).[29] In our study, it was determined that 29.2% of the case group and 20% of the control group smoked cigarettes. The proportion of the participants who answered yes to the frequent exposure to other people's smoke (second hand smoke) was higher (75.4%) than the control group (50.8%) ($P < 0.05$). The logistic regression analysis suggests that exposure to cigarette smoking increases the risk of developing breast cancer by 2.5 times ($P > 0.05$).

Various mechanisms were used to attempt to explain that higher levels of physical activity decrease the incidence of breast cancer.[30] These mechanisms include biological interactions of sex hormones, insulin resistance, and insulin levels, inflammation, oxidative stress, and adipocytes.[31] In a meta-analysis where 139 studies were examined, Hardefeldt *et al*.[30] found that physical activity significantly reduced the risk of breast cancer, with high-intensity physical activity being slightly more protective than low-intensity exercise. In a case-control study conducted using the IPAQ, the scores were significantly higher in the control group than in the case group.[32] In our study, 32.3% of the case group and 43.1% of the control group were categorized in the low physical activity category, whereas 12.3% of the case group and 9.2% of the control group had sufficient physical activity ($P > 0.05$) [Table 4].

A high BMI leads to an increase in postmenopausal breast cancer risk and a worse prognosis for those who had a family history of breast cancer.[33] Five hundred and three breast cancer cases were examined in a cohort study, and it was found that a higher BMI increases breast cancer risk by 1.97 times on average.[34] In a study to assess the relationship between BMI and cancer incidence, a weak positive relationship was found between an increase in BMI and breast cancer risk among postmenopausal women.[35] Similarly, in another study, postmenopausal women of normal weight were compared to obese women, and it was found that obese

women had a 1.32 times higher risk of breast cancer than women of normal weight.[36] Similarly, in our study, the BMI average in postmenopausal women was found to be significantly higher in the case group than in the control group ($P < 0.05$). The logistic regression model suggests that the case group had a 1.101 times higher breast cancer risk than that of the control group. For the postmenopausal BMI, it was found that the case group (34.01 ± 6.25 kg/m²) was 1.4 times more likely to develop breast cancer than the control group (29.81 ± 4.86 kg/m²) ($P < 0.05$).

Due to food variety and various food combinations, the Mediterranean dietary model provides various antioxidant compounds such as phytoestrogens, phytochemicals, enough pomace and folate, and a positive fatty acid profile, flavonoids, carotenoids, and antioxidant vitamins.[3] In the cohort study, Cade *et al*.[4] did not find a strong association between the risk of breast cancer and the consumption of a Mediterranean-type diet. In premenopausal women, a nonsignificant trend was found suggesting that following the Mediterranean diet more closely was associated with lower risk of breast cancer. In a systematic review, it was found that although cohort studies reported controversial results, case-control studies resulted in an inverse relation between this Mediterranean dietary pattern and breast cancer risk in pre- or/and postmenopausal women.[37] In our study, the Mediterranean dietary score was found to be significantly higher in the control group than in the case group ($P < 0.05$). Demetriou *et al*.[3] evaluated the effect of the Mediterranean dietary score on breast cancer risk, and no significant association was found. However, higher consumptions of vegetables, fish, and olive oil were independently associated with a decreased risk. In our study, the proportion of participants who never consumed legumes, or who consumed legumes less than once a week, was significantly higher in the case group than in the control group ($P < 0.05$). The proportion of the participants in the case group who ate one portion of red meat at most once a week was higher than in the control group; the proportion of participants who ate two to three portions of red meat every week was lower in the case group than in the control group; and the proportion of participants who ate more than two to three portions of red meat every week was higher in the case group than in the control group ($P < 0.05$). In addition, the proportion of participants who consumed olive oil every day was significantly lower in the case group (58.5%) than in the control group (90.8%) ($P < 0.05$). The logistics regression analysis suggests that those who frequently use the deep-frying cooking method to cook red meat have a 6.77 times higher breast cancer risk than those who use the stewing method ($P < 0.05$). Comparing those who do not consume olive oil, or consume olive oil rarely (once–twice a week), with those who consume olive oil daily, it was found that the case group has a 4.5 times higher risk than the control group ($P < 0.05$).

Conclusions

To conclude, never giving a birth, exposure to cigarette smoking, cooking red meat using the deep-frying method, lack of physical activity, having a higher BMI particularly during the postmenopausal period, and nonadherence to the Mediterranean diet increase the risk of breast cancer. All women, particularly women who have breast cancer risk factors (presence of a familial cancer history, early menarche, late menopause, never giving birth, etc.), should follow the Mediterranean diet, engage in sufficient physical activities, and avoid smoking and second hand smoke in order to decrease the risk of breast cancer.

Limitations of study

The major limitation of this study was the recall bias, because hospital-based case-control study can sometimes exposed to bias. However, this limitation was reduced by choosing newly diagnosed consecutive patients. Also, an effort was given to reduce it by performing random selection of the controls, enrolling controls based on their willingness to participate, using the same collection area as the patients. Another limitation of study was that the results do not reflect the general population. As both groups consisted of 65 participants, this may be the reason for the insignificant results regarding changeable risk factors. The number of newly diagnosed breast cancer within a year is 100 in the Oncology Day Treatment Center at a state university in Turkey. Therefore, the study has a small population.

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Conflicts of interest

There are no conflicts of interest.

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