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An Investigation into the Assessment of Nutritional Status, Quality of Life, and Adherence to the Mediterranean Diet among Women Affected by Breast Cancer

Meme Kanseri Tanısı Almış Kadınlarda Beslenme Durumu, Yaşam Kalitesi ve Akdeniz Diyetine Bağlılığın Değerlendirilmesine İlişkin Bir Araştırma

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Abstract

Aim: The aim of this study is to assess the quality of life and adherence to the Mediterranean diet (MD) among female breast cancer patients.

Material and Method: The study included a cohort of 120 women who received a breast cancer diagnosis within the last year. Anthropometric measurements were conducted, and body composition analysis was carried out to determine body fat percentage. The Mediterranean Diet Adherence Scale (MEDAS) and the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire-Core 30 (EORTC QLQ-C30) were employed for data collection.

Results: A total of 120 breast cancer patients, with an average age of 49.8±10.56 years, were enrolled in the study. Among these participants, 42.5% were categorized as having a normal weight. The mean waist circumference and waist/hip ratio were 94.6±12.20 cm and 0.87±0.10, respectively. Body fat percentages were determined to be 36.8±8.61%. The average total energy intake was 1944.9±385.24 kcal, with the percentage of total fat intake from energy averaging at 35.6±4.81%. Patients had a mean body mass index (BMI) of 29.0±5.80 kg/m^2, with 40.8% of them classified as obese. The mean MEDAS score was 7.3±2.65, and the EORTC QLQ-C30 score averaged at 69.7±11.94. There is a negative correlation was found between BMI, waist circumference and MEDAS score; A positive correlation was found between MEDAS scores and EORTC scores.

Conclusion: Breast cancer patients with high compliance with the Mediterranean diet have a higher quality of physical, emotional and social life. Therefore, evaluation of modifiable risk factors in breast cancer patients is essential for the prognosis of the disease.

Keywords: Mediterranean diet, breast cancer, quality of life, diet

Öz

Amaç: Bu araştımanın amacı meme kanseri tanısı almış kadınlarda yaşam kalitesi ve Akdeniz diyetine uyumun araştırılmasıdır.

Gereç ve Yöntem: Bir yıl içerisinde tanı almış 120 meme kanserli kadın araştırmaya katılmıştır. Bazı antropometrik ölçümler alınmıştır. Ayrıca Akdeniz Diyeti Kalite İndeksi (MEDAS) ve Avrupa Kanser Tedavi ve Organizasyon Komitesi Yaşam Kalitesi Ölçeği (EORTC QLQ-C30) kullanılmıştır.

Bulgular: Ortalama yaşları 49,8±10,56 yıl olan 120 meme kanserli katılımcının %42,5'i normal ağırlıktadır. Katılımcıların bel çevreleri ve bel/kalça oranları sırasıyla ortalama 94,6±12,20 cm, 0,87±0,10'dir. Vücut yağ yüzdeleri %36,8±8,61 olarak saptanmıştır. Toplam enerji alımları 1944,9±385,24 kkal ve toplam alınan yağın enerjiden gelen yüzdesi ortalama %35,6±4,81 olarak saptanmıştır. Hastaların beden kütle indeksi (BKİ) değerleri 29,0±5,80 kg/m² olup; %40,8'i obezdir. Ortalama MEDAS skoru 7,3±2,65; EORTC QLQ-C30 skoru ise 69,7±11,94'dur. Hastalarda BKİ, bel çevresi ile MEDAS skoru arasında negatif; MEDAS skorları ile EORTC skorları arasında pozitif korelasyon saptanmıştır.

Sonuç: Akdeniz diyeti uyumu yüksek olan meme kanseri hastalarının, fiziksel, duygusal ve sosyal yaşam kalitesi daha yüksektir. Bu nedenle meme kanserli hastalarda değiştirilebilir risk faktörlerinin değerlendirilmesi hastalığın prognozu açısından elzemdir.

Anahtar Kelimeler: Akdeniz diyeti, meme kanseri, yaşam kalitesi, diyet

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INTRODUCTION

Breast cancer stands as the predominant form of cancer in women and ranks as the second most prevalent cancer globally.[1] Reports indicate a growing awareness of the need for women who have survived breast cancer to prioritize the adoption of healthy lifestyle choices. This is not only critical for improving their quality of life before and after treatment but also for mitigating potential health complications associated with the treatment itself.[2] With rates of overweight and obesity reaching epidemic proportions, a significant proportion of newly diagnosed breast cancer patients embark on treatment already at risk of a poorer prognosis. Moreover, it's noteworthy that weight gain is a commonly observed adverse outcome during chemotherapy within the context of breast cancer treatment.[3,4] Weight gain during breast cancer treatment has been linked to an elevated risk of cancer recurrence, under-treatment, and increased mortality. These risks tend to escalate with greater weight gain.[5] Various factors contribute to weight gain during the course of breast cancer treatment, including the administration of adjuvant medications, reduced physical activity, the presence of depression, and inadequate nutritional intake.[6-8] Prioritizing the modification of diet and lifestyle factors to mitigate treatment-induced weight gain is of paramount importance for this patient population.[9] The Mediterranean diet (MD) has demonstrated associations with weight maintenance, enhanced quality of life, and the prevention of cancer recurrence in individuals diagnosed with breast cancer.[10] The protective effects of Mediterranean diet against breast cancer stem from its richness in fiber, antioxidants, flavonoids, vitamins, carotenoids, and olive oil. Additionally, the MD may influence breast cancer risk by reducing endogenous estrogens, elevating sex hormone binding globulin levels, neutralizing free radicals, preventing DNA damage, and reducing oxidative stress.[11] Available evidence suggests that adherence to the MD may positively impact the overall prognosis and longevity of women diagnosed with breast cancer.[12] Obesity significantly inceases the risk of developing breast cancer. The MD has the potential to mitigate obesity, thus reducing the risk of breast cancer by promoting weight management. Furthermore, the MD bears substantial implications in the context of breast cancer by playing a pivotal role in preventing disease progression, enhancing overall quality of life, and extending lifespan. This study aims to investigate dietary and lifestyle factors among individuals recently diagnosed with breast cancer.

MATERIAL AND METHOD

The study was carried out with the permission of Ankara Medipol University Faculty of Health Sciences Ethics Committee (Date: 09/12/2020, Decision No: 51). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The study encompassed female individuals aged 18 to 65 who sought medical care at a privately-owned oncology clinic and had received a breast cancer diagnosis within the previous year. The sample size for this research was determined using the G*Power 3.1 program, with an effect size of 0.5, a Type I error (α) level of 0.05, and a test power of 0.80 (α= 0.05, 1-β= 0.90), resulting in a minimum required sample size of 102. A total of 120 women diagnosed with breast cancer voluntarily participated in the study. The data collection period spanned from November 2020 to April 2021.

Exclusion criteria included individuals with a prior history of cancer treated with chemotherapy, those diagnosed with triple-negative breast cancer and tested negative for estrogen receptors (ER-), progesterone receptors (PR-), and human epidermal growth factor receptor 2 (HER-), as well as pregnant and breastfeeding individuals. Additionally, women with cognitive, visual, or hearing impairments that hindered effective communication were excluded from the study.

Participants were provided with comprehensive information regarding the study's content and objectives. Moreover, each participant who expressed their willingness to participate in the study read and signed an informed consent form. The researcher conducted face-to-face interviews to administer the questionnaire to the subjects.

The questionnaire comprises five distinct sections:

1. Demographic characteristics, disease information, dietary habits
2. Anthropometric measurements and body composition analysis
3. 24-hour food consumption record
4. Mediterranean Diet Adherence Scale (MEDAS)
5. European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30 -Version 3.0)

Anthropometric Measurements and Body Composition Analysis

During a fasting state, body weight was measured with participants wearing light clothing and barefoot, and body composition was assessed using the segmental bioelectrical impedance analysis method. All measurements were conducted using a TANITA BC 601 bioelectrical impedance analyzer (BIA). Height measurements were also obtained by the researcher.[13] Body Mass Index (BMI) was calculated using the formula weight (kg) / height^2 (m^2) and categorized according to the World Health Organization (WHO) guidelines. Specifically, BMI was classified as follows: <18.50 kg/m^2 as underweight, 18.50-24.99 kg/m^2 as normal, 25.00-29.99 kg/m^2 as overweight, and ≥30.00 kg/m^2 as obese.[14]

The waist and the hip circumference of the participants was measured by the researcher. Waist circumference of individuals is classified according to WHO. Accordingly, a waist circumference of ≥80 cm in women was evaluated in the risk group in terms of metabolic complications. The waist-to-hip

ratio was determined by dividing the waist circumference measurement by the hip circumference measurement. A ratio of ≥0.80 in women, as per WHO guidelines, is considered a high risk factor for chronic diseases. The waist-to-hip ratio was determined by dividing the waist circumference measurement by the hip circumference measurement. A ratio of ≥0.80 in women, as per WHO guidelines, is considered a high risk factor for chronic diseases.[13]

24-hour Food Consumption Record

The dietary intake of patients over a 24-hour period was recorded and evaluated using the Computer-Aided Nutrition Program known as BEBIS 7.2.[15]

Mediterranean Diet Adherence Screener (MEDAS)

The Mediterranean Diet Adherence Screener (MEDAS) comprises 14 questions. This scale assesses factors such as the types of fats used in meals (e.g., margarine, butter, olive oil), daily olive oil consumption, fruit and vegetable portions, red meat consumption, weekly wine consumption, legumes, fish and seafood, nuts, cake consumption, tomato sauce with olive oil, and white meat vs. red meat consumption rates. Each question is assigned specific criteria based on consumption amounts, with 1 or 0 points allocated accordingly. The total score for all 14 questions is calculated, with a score of 7 or higher indicating acceptable adherence to the Mediterranean diet and a score of 9 or higher indicating strong adherence.[16]

European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-30)

The European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-30) is widely recognized as one of the most reliable instruments for assessing the quality of life in cancer patients.[17] The EORTC QLQ-30 Quality of Life Scale, developed by Aaronson et al. [17] comprises 30 questions organized into three sections: global health status, functional score, and symptom score. The functional score section, consisting of 15 questions, assesses various aspects of functioning, including physical, role, emotional, cognitive, and social function. The symptom score section, composed of 13 questions, addresses symptoms such as fatigue, nausea and vomiting, pain, dyspnea, insomnia, loss of appetite, constipation, diarrhea, and financial difficulties. This section serves to elucidate prominent factors affecting the patient's quality of life. The last two questions in the scale pertain to general health function and overall assessment of the patient's quality of life. Responses to the first 28 questions employ a four-point Likert scale, with options ranging from "1- Not at all" to "4- A lot." In the 29th and 30th questions, patients are asked to rate their general health and general quality of life on a scale from "1- Very poor" to "7- Excellent." The cumulative scores derived from the entire scale are used to gauge the patient's quality of life through specific calculations. A higher score corresponds to a higher quality of life.

Statistical Analysis

The data obtained were statistically analyzed using the SPSS 24.0 software package in a computerized environment. Descriptive statistical measures, including the mean, standard deviation, minimum and maximum values, as well as percentiles, were employed for data summarization. Parametric tests were selected based on the fulfillment of their respective assumptions. Specifically, the Independent Sample t-test was utilized to assess mean differences between two independent groups. Analysis of variance (ANOVA) was applied when comparing more than two independent groups, with the Tukey post hoc test employed for identifying specific group differences when homogeneity of variances was met. Alternatively, the Tamhane's T2 test was used when homogeneity was not satisfied. In the evaluation of categorical data, the Chi-square test and Fisher's Exact test (with post hoc Benferroni corrected Z test when necessary) were conducted to determine both the direction and significance of relationships between variables. Pearson correlation coefficient was used to examine the relationship between two quantitative data sets. The predetermined level of statistical significance was set at 0.05.

RESULTS

The sociodemographic characteristics and disease-related profiles of the participants, along with anthropometric measurements and body composition analyses, are provided in **Table 1**. **Table 2** presents a comparative analysis of anthropometric measurements between premenopausal and postmenopausal women.

Table 1. Characteristics of participants (n=120)

Variables	n (%) or mean±SD (min-max)	
Age (year)	49.8±10.56 (21-65)	
Menopause		
Premenopause	60	50.0
Postmenopause	60	50.0
Menarche age	13.4±1.30 (11-16)	
Having children		
Yes	89	74.2
No	31	25.8
Age at first birth (year)	22.6±10.65 (17-35)	
Lactation duration (month)	11.6±8.77 (0-30)	
Smoking status		
Yes	7	5.8
No	88	73.4
Quit	25	20.8
Metastasis history		
Yes	45	37.5
No	75	62.5
Metastasis		
Bone	19	15.8
Brain	8	6.7
Lung	6	5.0
Liver	12	10.0
Cancer Stage		
1.Stage	37	30.8
2.Stage	45	37.5
3.Stage	21	17.5
4.Stage	17	14.2

Table 2. Comparison of anthropometric measurements of pre-menopausal and post-menopausal women

Variables	n (%) or mean±SD (min-max)						
	Premenapause (n=60)		Postmenapause (n=60)		Total		p
Body weight (kg)	74.8±13.23 (48.5-112.8)		74.7±16.29 (43.8-138.4)		74.8±14.77 (43.8-138.4)		t*=0.050 p=0.960
Height (cm)	158.7±4.49 (150.0-169.0)		162.5±6.25 (149.0-180.0)		160.6±5.75 (149- 180)		t*=-3.894 p=0.000
Body mass index (kg/m²)	29.8±5.26 (19.2-46.9)		28.3±6.26 (17.2-49.6)		29.0±5.80 (17.2- 49.6)		t*=1.393 p=0.166
BMI classification							
Underweight	2	3.3	3	5.0	5	4.2	
Normal	24	40.0	27	45.0	51	42.5	t*=3.696
Overweight	5	8.3	10	16.7	15	12.5	0.296
Obese	29	48.4	20	33.3	49	40.8	
Waist circumference (cm)	98.7±15.46 (68.0-136.0)		90.4±15.98 (63.0-147.0)		94.6±12.20 (63.0- 147.0)		t*=2.909 p=0.004
Waist circumference							
<80 cm	6	10.0	15	25	21	17.5	t*=4.675
≥80 cm	54	90.0	45	75	99	83.5	0.031
Hip circumference (cm)	106.6±10.87 (86.0-137.0)		108.2±12.56 (83.0-138.0)		107.4±11.71 (83.0- 138.0)		t*=-0.747 p=0.456
Waist-to-hip ratio	0.9±0.11 (0.7-1.2)		0.8±0.08 (0.7-1.1)		0.87±0.10 (0.71- 1.20)		t*=5.189 p=0.000
Waist-to-height ratio	0.6±0.10 (0.4-0.8)		0.6±0.11 (0.4-0.9)		0.6±0.10 (0.38- 0.89)		t*=3.119 p=0.002
Body fat (%)	38.4±7.48 (20.1-56.2)		35.2±9.40 (17.5-51.9)		36.8±8.61 (17.5- 56.2)		t*=2.102 p=0.038
Body fat (kg)	30.9±10.85 (11.0-56.1)		28.5±13.73 (8.5-71.8)		29.7±12.37 (8.5- 71.8)		t*=1.047 p=0.297
Body fat classification							
Low	2	3.3	3	5.0	5	4.2	t**=2.400
Moderate	14	23.3	21	35.0	35	29.2	p=0.301
High	44	73.4	36	60.0	80	66.6	
Body muscle mass (%)	57.0±6.42 (41.6-72.0)		60.3±7.87 (38.3-76.4)		58.7±7.34 (38.3- 76.4)		t**=-2.528 p=0.013
Body muscle mass (kg)	42.2±5.66 (26.6-54.1)		44.4±6.44 (38.3-76.4)		43.3±6.13 (22.0- 63.3)		t*=-2.013 p=0.046
Weight changes in the last 6 months							
Increased	38	63.3	35.0	58.3	73	60.8	t*=1.750
Decreased	19	31.7	18.0	30.0	37	30.8	p=0.417
Don't know	3	5.0	7.0	11.7	10	8.4	
Weight gain in the last 6 months (kg)	6.4±2.72 (2.0-14.0)		7.1±5.30 (2.0-20.0)		6.8±2.28 (2-20)		t*=-0.545 p=0.590
Weight loss in the last 6 months (kg)	6.4±3.57 (1.0-13.0)		4.0±1.38 (1.5-6.1)		5.4±1.73 (1-13)		t*=2.460 p=0.022

*Student t test

The study revealed that the participants had a daily energy intake of 1944.9±385.24 kcal, with 35.6±4.81% of their energy derived from fat, and an average daily carbohydrate consumption of 238.4±48.61 g per day (**Table 3**).

Table 3. Daily energy and macro nutrient intakes of participants

Energy and macronutrients	mean±SD (min-max)
Total Energy (kkal)	1944.9±385.24 (923-3147)
Carbohydrate (g)	238.4±48.61 (116-368)
Carbohydrate (%)	49.1±5.21 (32-62)
Protein (g)	76.5±23.86 (30-256)
Protein (%)	15.4±1.98 (10-27)
Fat (g)	80.3±33.64 (31-378)
Fat (%)	35.6±4.81 (22-47)
Average daily protein intake per kg	1.0±0.35 (0.46-4.11)
Fiber (g)	16.7±5.43 (11-36)

In **Table 4**, which presents a comparison of breast cancer stage among participants along with various variables, a significant association was observed between cancer stage and BMI (p<0.05).

The **Table 5** displays the MEDAS and EORTC QLQ scores, as well as its subscale scores, for the participants. The total score for MEDAS was 7.3±2.65, while the total score for the EORTC QLQ scale was 69.7±11.94.

MEDAS scores were observed to be higher in individuals who were underweight, possessed a waist circumference of 80 cm or less, exhibited a waist/hip ratio of 0.85 or below, maintained a waist/height ratio of 0.5 or below, and consumed less than 25% of their daily energy intake from fats. Those with higher MEDAS scores tended to report a higher quality of life. However, these differences were not found to be statistically significant (**Table 6**).

Table 4. Comparison of breast cancer stage with some variables (n,%)

Variables	1. Stage		2. Stage		3. Stage		4. Stage		Test*/p
	n	%	n	%	n	%	n	%	
Body mass index									
Underweight	1	2.7	3	6.7	-	-	1	5.9	
Normal	19	51.4	18	40.0	8	38.1	6	35.3	X²=30.390
Overweight	5	13.5	2	4.4	4	19.1	4	23.5	p=0.011
Obese	12	32.4	22	48.9	9	42.8	6	35.3	
Waist circumference (cm)									
< 80	6	16.2	10	22.2	4	19.0	1	5.90	X²=2.361
≥ 80	31	83.8	35	77.8	17	81.0	16	94.1	p=0.501
Waist-to-hip ratio									
< 0.85	21	56.8	22	48.9	11	52.4	7	41.2	X²=1.124
≥ 0.85	16	43.2	23	51.1	10	47.6	10	58.8	p=0.743
Waist-to-height ratio									
<0.50	9	24.3	11	24.4	4	19.0	2	11.8	X²=1.426
≥ 0.50	28	75.7	34	75.6	17	81.0	15	88.2	p=0.700
Daily fat intake (E%)									
< 25	2	5.4	-	-	1	4.80	-	-	X²=3.312
≥ 25	35	94.6	45	100.0	20	95.2	17	100.0	p=0.346

* Chi square test

Table 5. MEDAS and EORTC QLQ scores of the participants (n=120)

Scales	mean	SD	min	max
MEDAS	7.3	2.65	2	13
EORTC QLQ-C30	69.7	11.94	34.00	100.00
Functional Scales				
Physical functioning	79.4	18.74	26.67	100.00
Role functioning	79.0	21.77	33.30	100.00
Cognitive functioning	79.6	21.33	33.30	100.00
Social functioning	79.0	22.61	33.30	100.00
Emotional functioning	75.6	24.17	25.00	100.00
Global Health Status/QoL	78.7	21.42	16.67	100.00
Symptom Scales				
Pain	24.4	21.70	0.00	100.00
Nausea-vomiting	27.5	24.60	0.00	100.00
Fatigue	44.9	38.56	0.00	100.00
Constipation	42.6	36.54	0.00	100.00
Dyspnoea	23.6	20.32	0.00	100.00
Insomnia	47.9	31.62	0.00	100.00
Diarrhoea	33.3	34.17	0.00	100.00
Loss of appetite	26.6	31.57	0.00	100.00
Financial difficulties	28.0	33.74	0.00	100.00

QoL: Quality of life

It has been found that there is a strong positive correlation between body weight and BMI, WC, WHR, body fat (%), W/H, and energy intake ($p < 0.0001$). These findings indicate a close interrelation among metabolic factors such as body weight, BMI, WC, WHR, body fat (%), W/H, and energy intake ($p < 0.05$). A negative correlation was observed between the MEDAS score and body weight, BMI, WC, WHR, body fat (%), and W/H. While a weak negative correlation was found between fat intake (E%) and EORTC-QLQ, a weak positive correlation was found between fat intake (E%) and MEDAS. Furthermore, a weak negative correlation was found between MEDAS and EORTC-QLQ. This suggests that individuals with higher fat consumption may have a higher likelihood of experiencing cancer-related fatigue. A positive correlation was found between EORTC-QLQ and WC, WHR (**Table 7**).

Table 6. Comparison of MEDAS and EORTC total scores based on participants' anthropometric measurements and the overall fat content of their diets

Variables	EORTC		MEDAS	
	mean± SD	Test /p	mean± SD	Test /p
Changes in body weight (kg) (n=44)				
≤ +5	72.52±9.83	F*=0.004	7.3±9.60	F*=1.120
+6-10	72.39±1.,03	p=0.996	7.6±2.45	p=0.336
≥ +11	72.82±9.64		9.0±2.94	
Body mass index				
Underweight	71.01±10.31		9.2±3.76	
Normal	68.63±12.89	F*=1.062	7.2±2.66	F*=1.483
Overweight	66.88±9.47	p=0.155	6.5±2.06	p=0.142
Obese	72.95±10.04		6.9±2.52	
Waist circumference (cm)				
< 80	65.11±11.66	t**=-1.848	7.8±2.64	t**=0.958
≥ 80	70.58±11.81	p=0.067	7.2±2.65	p=0.340
Waist-to-hip ratio				
< 0.85	67.93±11.11	t**=-1.579	7.5±2.64	t**=1.189
≥ 0.85	71.43±12.58	p=0.117	6.9±2.65	p=0.237
Waist-to-height ratio				
< 0.50	68.31±14.05	t**=-0.638	8.1±2.62	t**=1.882
≥ 0.50	70.06±11.40	p=0.525	7.0±2.62	p=0.062
MEDAS Score				
< 7	68.40±12.48	t**=-1.339	-	-
≥ 7	71.36±11.11	p=0.183		
Daily fat intake (E%)				
< %25	67.15±16.10	t**=-0.374	7.3±2.51	t**=0.049
≥ %25	69.77±11.90	p=0.709	7.3±2.66	p=0.961
Metastasis				
Yes	70.75±11.64	t**=-0.727	6.73±2.64	t**=-1.693
No	69.09±12.15	p=0.705	7.57±2.62	p=0.093
Cancer stage				
1.stage	69.35±10.80		7.22±2.89	
2.stage	71.58±12.08	F*=1.129	7.38±2.55	F*=0.344
3.stage	70.05±13.03	p=0.340	7.52±2.35	p=0.794
4.stage	65.35±12.47		6.71±2.84	

*One Way Anova test, **Independent Sample t test

Table 7. Correlations between some variables in participants

Variables		Body weight	BMI	WC	WHR	Body fat (%)	W/H	Energy intake	Fat intake (E%)	MEDAS	EORTC--QLQ
Body weight	r		0.936**	0.786**	0.337**	0.767**	0.713**	0.634**	0.147	-0.157	0.088
	p		0.000	0.000	0.000	0.000	0.000	0.000	0.110	0.087	0.346
BMI	r	0.936**		0.873**	0.488**	0.831**	0.841**	0.528**	0.148	-0.102	0.115
	p	0.000		0.000	0.000	0.000	0.000	0.000	0.107	0.269	0.216
WC	r	0.786**	0.873**		0.753**	0.749**	0.950**	0.422**	0.176	-0.107	0.197*
	p	0.000	0.000		0.000	0.000	0.000	0.000	0.055	0.245	0.033
WHR	r	0.337**	0.488**	0.753**		0.383**	0.726**	0.133	0.204*	-0.078	0.229*
	p	0.000	0.000	0.000		0.000	0.000	0.149	0.025	0.399	0.013
Body fat (%)	r	0.767**	0.831**	0.749**	0.383**		0.720**	0.381**	0.054	-0.092	0.049
	p	0.000	0.000	0.000	0.000		0.000	0.000	0.554	0.316	0.599
W/H	r	0.713**	0.841**	0.950**	0.726**	0.720**		0.305**	0.144	-0.086	0.220*
	p	0.000	0.000	0.000	0.000	0.000		0.001	0.116	0.351	0.017
Energy intake	r	0.634**	0.528**	0.422**	0.133	0.381**	0.305**		0.136	0.011	0.017
	p	0.000	0.000	0.000	0.149	0.000	0.001		0.138	0.908	0.854
Fat intake (E%)	r	0.147	0.148	0.176	0.204*	0.054	0.144	0.136		0.021	-0.007
	p	0.110	0.107	0.055	0.025	0.554	0.116	0.138		0.820	0.939
MEDAS	r	-0.157	-0.102	-0.107	-0.078	-0.092	-0.086	0.011	0.021		0.210*
	p	0.087	0.269	0.245	0.399	0.316	0.351	0.908	0.820		0.022
EORTC-QLQ	r	0.088	0.115	0.197*	0.229*	0.049	0.220*	0.017	-0.007	0.210*	
	p	0.346	0.216	0.033	0.013	0.599	0.017	0.854	0.939	0.022	

Pearson correlation. *p<0.05. **p<0.005, WC: Waist circumference, WHR: Wait-to-hip ratio, W/H: Waist to height ratio, MEDAS: Mediterranean Diet Adherence Screener, EORTC-QLQ: European Organization for the Research and Treatment of Cancer Quality of Life Questionnaire

DISCUSSION

Physiological alterations are evident in individuals with breast cancer and the treatments they receive. While therapeutic modalities such as chemotherapy and radiation have shown effectiveness in managing the disease, they are associated with various adverse consequences, including cardiovascular, metabolic, and nutritional complications. These treatment-related complications have been observed to adversely affect various aspects of patients' well-being, including their aerobic capacity, fatigue levels, and muscle strength. These adverse effects have been found to contribute to the development of depressive symptoms, ultimately diminishing the overall quality of life experienced by individuals undergoing treatment[18] The importance of adopting a healthy lifestyle, characterized by consistent engagement in physical activity and adherence to proper nutrition, is emphasized as a means to mitigate the psychological and physiological side effects of medical treatment.[19] This study aimed to assess the correlation between anthropometric measurements, nutritional status, adherence to the Mediterranean Diet (MD), and the quality of life among women diagnosed with breast cancer.

It has been observed that women undergoing breast cancer treatment may experience weight gain. In women aged 40 or younger diagnosed with breast cancer, there is a phenomenon of ovarian function suppression, attributed to factors such as extensive chemotherapy, premature ovarian failure, or adjuvant endocrine therapy. The onset of menopause, characterized by treatment-induced amenorrhea, has been associated with an increased susceptibility to weight gain.[20] Maintaining an optimal body weight in women diagnosed with breast cancer has been shown to reduce the risk of disease recurrence, improve long-term survival rates, and lower the susceptibility to chronic diseases.[21,22] The findings of our investigation revealed that 60.8% of women experienced a change in body weight over the last six months (**Table 2**). Among these individuals, 45.5% reported a weight gain of 5 kg or less, while 51.8% reported a weight loss of 5 kg or less (not shown in the table). Considering these values, it was determined that the average weight gain in the last 6 months was 6.8±2.28 kg, and the average body weight loss in the last 6 months was 5.4±1.73 kg (**Table 2**). Based on these results, it was observed that the trends of weight gain and loss among women diagnosed with breast cancer were similar.

Obesity is known to contribute to increased inflammation in adipose tissue, creating an environment conducive to the initiation and progression of breast cancer. There exists a correlation between obesity and the incidence of postmenopausal breast cancer, as well as an elevated risk of breast cancer recurrence and mortality. A systematic meta-analysis of 82 studies, encompassing 213,075 breast cancer survivors and 23,182 breast cancer-related deaths, revealed a correlation between BMI and breast cancer survival.[23] Both low BMI (<18.5 kg/m^2) and high BMI (>27.0 kg/m^2) negatively affect the prognosis of breast cancer treatment. Specifically, chemotherapy-induced symptoms such as nausea, malaise, and fatigue can reduce treatment adherence, weaken immunity, lead to emotional distress, negatively impact quality of life, and result in increased appetite.[24] Our survey findings showed that 4.2% of women were categorized as "underweight" based on their BMI. The low number of underweight individuals may be attributed to the fact that 68.3% of our patients were in stages 1 or 2 of cancer (**Table 4**). Waist circumference measurement serves as an indicator of visceral adiposity, and as visceral adiposity increases, several metabolic and hormonal alterations occur, including the development of insulin resistance, reductions in sex hormone-binding globulin concentrations, and elevations in androgen levels and aromatization.[25] The international literature, predominantly based on data from developed societies, underscores that the risk of breast cancer is higher in women with abdominal adiposity compared to women with fat accumulation in the hips and lower extremities.[26] A study conducted by Lee et al.[27] aimed to assess the association between waist circumference and breast cancer. They found that the average waist circumference during the premenopausal period was 72.9±8.3 cm, while it was 79.9±8.4 cm during the postmenopausal period. Additionally, they observed that 19.6% of premenopausal women and 50.3% of postmenopausal women in the sample had a waist circumference over 80 cm. The study also revealed a statistically significant correlation between breast cancer and waist circumference. Our investigation yielded a mean waist circumference of 94.6±12.20 cm for the participants, with 82.5% of women having a waist circumference over 80 cm. In this study, waist circumference was found to be higher in premenopausal women than in postmenopausal women. (**Table 2**). Based on these findings, it is apparent that the average waist circumference of women is higher than reported in the literature, and this difference may be influenced by factors such as average age, BMI, and physical activity level. Consequently, these results suggest that excess waist circumference or waist-hip ratio is more strongly associated with postmenopausal breast cancer risk.[28] Studies investigating the relationship between waist-hip ratio and breast cancer risk have indicated that the risk of breast cancer increases with an elevated waist-hip ratio.[29] It is widely believed that individuals with a waist-hip ratio exceeding 0.85 are more susceptible to developing breast cancer. Our investigation revealed that the waist-hip ratio of participants was determined to be 0.87±0.10. Based on these findings, it was evident that the participants had a high waist-hip ratio, indicating an increased vulnerability to breast cancer when compared to existing literature. Recent research has indicated that women with a normal BMI but excessive body fat may be at an increased risk of breast cancer.[30,31] Excess body fat is closely associated with

adipocyte hypertrophy, and insulin resistance is a known consequence of excessive body fat.[32] In our study, the percentage of body fat in women diagnosed with breast cancer was 36.8±8.61%, while fat mass was 29.7±12.37%. According to the classification of fat mass, 66.6% of female participants had a "high" fat mass (**Table 2**). This finding aligns with existing literature, providing evidence that women diagnosed with breast cancer have a notable proportion of adipose tissue and overall body mass.

The Women's Health Initiative Randomized Controlled Dietary Modification study, a significant randomized controlled study conducted in the United States, investigated the impact of daily fat consumption quantity and fat type on the occurrence of breast cancer. This study included a total of 48,835 postmenopausal women. The results indicated that a low-fat diet potentially decreases the risk of developing breast cancer by approximately 9% when women who consume a low-fat diet (20% of total energy from fat) are followed for 8 years.[33] Secondary analyses suggested a potentially more significant decrease in risk among female participants who initially followed a high-fat diet as part of their regular eating habits. The study findings revealed that 97.5% of female participants had a daily fat consumption rate exceeding 25%, with an average daily total fat intake of 80.3±33.64 g. Based on these results, it is evident that the daily fat intake of the women participating in the study was high.[33] There is a suggestion that the specific type of fat ingested in one's dietary intake could potentially influence the likelihood of experiencing menopause. A meta-analysis found that postmenopausal women who consumed diets high in total fat and polyunsaturated fats had a higher risk of developing breast cancer, while dietary fat had protective effects in premenopausal women.[34] Our study findings revealed that a majority of the participants, specifically 53.3%, reported daily consumption of butter (not shown in the table). While the quantity of saturated fat consumed is indeed significant, it is crucial to note that excessive consumption of such lipids, which inherently contain saturated fat, can potentially raise concerns.

The World Health Organization defines quality of life as people's perceptions of their place in the culture and value system relative to their goals, expectations, standards, and concerns.[35] Quality of life is determined by the individual's functional health status, pain level, self-perception, and quality of interaction with their environment. A systematic review by Lis et al.[36] reported a strong association between nutritional status and quality of life in the cancer population. When evaluating the scale dimensions according to the EORTC QLQ-C30 Quality of Life Scale, which we used in our study to measure quality of life, the results were as follows: physical function (79.4±18.74), role function (79.0±21.77), mental function (79.6±21.33), social function (79.0±22.61), and emotional function (75.6±24.17). It was determined that the participants obtained the highest and lowest scores in the mental function and emotional function sub-dimensions, respectively (**Table 5**). It can be suggested that the participants exhibit a quality of life that exceeds the mean, enabling them to lead lives of high quality despite the presence of breast cancer. In a study by Montagnese et al.[37] which evaluated the effect of lifestyle changes for 12 months after treatment on the quality of life in women diagnosed with breast cancer, physical functionality, role function, and social functionality improved. However, certain indicators related to the quality of life showed a reduction. When the mean scores of quality of life symptoms were evaluated in our study, it was determined that dyspnea (23.6±20.32) had the lowest score, while the highest difficulty was experienced in sleeping (47.9±31.62). Based on this result, it can be concluded that dyspnea is one of the significant symptoms that negatively affect the quality of life in breast cancer patients in our sample.

Numerous studies and meta-analyses have explored the relationship between anthropometric measurements and breast cancer occurrence.[38-40] Positive associations have been reported between body mass index (BMI), waist-to-hip ratio, and the risk of developing breast cancer in previous research. One study involving breast cancer patients found that adherence to the Mediterranean Diet (MD) was associated with improved patient prognosis.[41] According to the literature, patients with high adherence to the MD had a 15-year overall survival rate of 63.1%, whereas patients with low compliance had a rate of 53.6%. Another study applied the MD to 100 individuals with breast cancer for 6 months, resulting in observed reductions in BMI and waist circumference.[41] According to epidemiological studies, a diet rich in fat, alcohol consumption, a sedentary lifestyle, and obesity play a significant role in breast cancer.[1] James and et al. have argued that BMI alone is not a sufficient measure for evaluating body fat composition and have advocated the use of waist-to-hip ratio (WHR) for assessing central obesity. Based on this, 16 studies were conducted to investigate the association between BMI and body fat (%) with breast cancer risk. These studies have shown a stronger relationship between WHR increase and breast cancer.[42] In our study, a strong positive correlation was found between BMI, WC, WHR, body fat (%), W/H, and energy intake. It was observed that calorie balance and fat ratio are more important than a specific diet for breast cancer. Studies conducted have similarly demonstrated that an increased fat intake in individuals with breast cancer is associated with a decreased quality of life.[43,44] In a study patients with higher MEDAS scores were found to have lower quality of life compared to those with lower MEDAS scores. Research also indicates that as waist circumference and waist-to-hip ratio increase in breast cancer patients, their quality-of-life decreases.[37] In our study, a positive correlation was observed between EORTC-QLQ and WC, WHR, which may be attributed to the participants being newly diagnosed and in the early stages of breast cancer (**Table 7**).

CONLUSION

This study aimed to highlight the impact of nutrition on breast cancer risk, drawing on a large body of basic molecular and cellular research on the disease. Weight gain during and after breast cancer treatment is associated with increased mortality, increased rates of obesity, cardiovascular disease, and diabetes. In our study, the quality of life scores of individuals diagnosed with breast cancer were found to be close to the average. The fact that MEDAS scores are close to the average shows that many patients tend to pay more attention to their eating habits after diagnosis. The energy and the nutrients consumed by the participants were within the normal range, and 50% or more of the participants were found to be overweight or obese. This cross-sectional study showed us that there is a negative relationship between the Mediterranean Diet and the increase in patients' values such as body weight, BMI and waist circumference, which are modifiable risk factors. It has also been found that as patients' diet quality increases, their quality of life also increases.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Ankara Medipol University Faculty of Health Sciences Ethics Committee (Date: 09/12/2020, Decision No: 51).

Informed Consent: Written informed consent taken from the patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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