

Research Article

The Changing Dietary Habit of Turkish Cancer Survivors During Follow-Up Period

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Abstract

Objectives: Cancer survivors are more related with healthy life-style including healthy diet after diagnosis. We evaluate inhere the dietary habit of Turkish breast or colon cancer patients after diagnosis in addition the changing dietary habit during follow-up period.

Methods: Totally 228 breast or colorectal cancer patients were included. Dietary patterns were evaluated with food consumption frequency questionnaire. Any difference and related socioeconomical factors of patients with dietary changings were evaluated by logistic regression analysis.

Results: Over two third of survivors had breast cancer with the median age of 57. The mean follow-up period of the patients was found to be 4.19 ± 3.55 years. Most of patients (71.7%) reported the changing in food intake after the diagnosis. The most common changings were an increase of consuming fruit and vegetables, lower intake of red and processed meat, and sugar. Physical activities ($p=0.003$), presence of chronical illness ($p=0.003$) and adjuvant chemotherapy and radiotherapy ($p=0.001$) were correlated with changing dietary habit.

Conclusion: The appropriate diet is important for management of cancer survivors. Our study shows the importance of adaptation of healthy dietary habits of cancer survivors that reflects Turkish population.

Keywords: Cancer survivors, dietary modification, Turkish population

Cite This Article: Emirzeoglu L, Oven BB. The Changing Dietary Habit of Turkish Cancer Survivors During Follow-Up Period. EJMI 2022;6(3):284–291.

Well being after cancer diagnosis has become important for both health care and cancer survivors.^[1] Lifestyle factors like eating healthy diet, maintaining healthy weight and engaging recommended physical exercise have been reported to affect both cancer survival and reduction of chronic disease incidence.^[2,3] After the diagnosis, cancer survivors are more interested in learning dietary recommendations, physical exercise and nutritional supports.^[4] Although healthy life style has been found with better survival for cancer survivors, previous study showed that obesity, physical inactivity, poor-quality diets are common among cancer

survivors.^[5] It was reported that 50-80% of the cancer survivors tend to be positive lifestyle modification after diagnosis.^[1] Diet riched in fruit and vegetables were associated with improved health status.^[6] American Cancer Society(ACS) suggested to consume a diet which included high in fruit, vegetables (5 serving, 2.5 cup), whole grain and low sugar, low red and processed meat for cancer survivors.^[7] In addition ACS recommended avoiding sugar and containing drinks.^[8] National Comprehensive Cancer Network guidelines recommend also that consumption of vegetables and fruit should comprise half of the volume of food on the plate, whole grain

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Submitted Date: May 10, 2022 **Accepted Date:** June 20, 2022 **Available Online Date:** July 21, 2022

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should comprise 30% of the plate and other 20% should be protein. Systemic review suggests that healthy dietary habits may lead longer survival for female breast cancer.^[9] Among survivors who adopted the recommendations, all cause of mortality decreased in the rate of 15-43% with 29% decreased of cancer recurrence.^[10] It was shown that also for colon cancer, higher intake of red and processed meat, sugar, refined grains lead to increase risk of worse survival outcomes. Improvement of fruit and vegetables intake and reduction of dietary fat intake have been reported as 25-55% and 13-31% of among cancer patients.^[11]

Understanding dietary habits of cancer survivors after diagnosis is important for new strategies for intervention. This study is valuable to point out of dietary changes of Turkish colon or breast cancer survivors which were mostly diagnosed cancer for both gender in Turkey and also to determine whether these dietary changes differ based on socioeconomical characteristics.^[12]

Methods

This study consisted of 228 breast cancer and colorectal cancer patients who were treated in Sultan II. Abdulhamid Khan Educational and Research Hospital Oncology Department and Bahcesehir University Medical Park Göztepe Hospital Oncology Department between January 2017 and January 2019. All patients had been completed their primary therapy, operation, chemotherapy or radiotherapy and they were followed without disease recurrence. The median follow-up time was 4.19 ± 3.55 years. Patients who were under active treatment were excluded. Patients' socioeconomical features like age, marital status, educational level, chronic disease were obtained from the patients' file after local ethical committee approval and written informed consent. Current dietary pattern was evaluated with food consumption frequency questionnaire which were adopted from The Ministry of Health's book titled the 'Determination of nutritional status.'^[13] This survey included the frequency of the consumption of liquid food like tea, coffee, water, fizzy drink /day and also consumption of sugar, red meat, processed meat, fruit, vegetables and dairy product. Patients were also questioned about changing of dietary habits after cancer diagnosis. The food consumption of the patients is "0" if there is no food, "1" for consumption once a month, "2" for consumption twice a month, "3" for consumption 1-2 times a week, "4" for consumption 3-4 times a week, 5-6 times a week consumption was scored as "5" and daily consumption as "6" and this consumption classification was called "Food Consumption Amount Score" (FCAS). This study was approved by Bahcesehir University Clinical Research Ethics Committee; 2019-01/06, and conducted in accordance with the provisions of the Helsinki Declaration.

Statistical Analysis

SPSS version 25.0 (IBM Corp., Armonk, NY, USA) program was used for statistical analysis. Whether the scores obtained from each continuous variable were normally distributed was analyzed using descriptive, graphical and statistical methods. Kolmogorov-Smirnov test was used to test the normality of the scores obtained from a continuous variable with the statistical method. While evaluating the study data, in addition to descriptive statistical methods (number, percentage, mean, median, standard deviation, etc.), Mann-Whitney U Test and Kruskal Wallis-H Test were used to test the difference between groups. The level of relationship between two continuous variables was evaluated with the Spearman correlation test. Multiple Linear Regression analysis was used to determine the effect of independent factors on dependent variables. The results were evaluated at the 95% confidence interval and the significance level was $p < 0.05$.

Results

Patient's Characteristics

The mean age of the 228 patients included in the study was 57.92 ± 12.77 , and the mean body mass index was calculated as 26.89 ± 4.70 . 50.5% of the patients were under the age of 60, 86.9% were women, 78.5% of the patients with known marital status were married, 60.2% of the women were premenopausal, 86.9% were It was determined that they did not work actively in any job and only 29.9% of them were of normal weight. When their educational status was examined, it was seen that 35.5% of the patients were primary school graduates, 33.6% were high school graduates, and 30.8% were university graduates. It was determined from the available data that 43% of the patients had a chronic disease, 15.9% were smokers, 49.5% had regular physical activity, and 21.5% consumed additional supplements.

More than half of the survivors had breast cancer (57.9%) and 42.1% of them had colon cancer. While surgical treatment was applied to 97.2% of the patients, chemotherapy (CT) was applied to 67.5%, radiotherapy (RT) and hormone therapy (HT) were applied to 57.9%; The mean follow-up period of the patients was found to be 4.19 ± 3.55 years (Table 1).

Food Consumption Amount of Patients

In the milk and dairy products food group, the most consumed product monthly by the patients was yogurt (5.1 ± 1.5), and the daily consumption rate of yogurt was 63.6%; the patients consumed the most butter as fat (4.0 ± 2.1) and the daily consumption rate of butter was 46.7%; the rate of consumption of 1 spoon per day in which

Table 1. General characteristics of patients

	Category	n	%	Mean±SD
Age	All	228	100.0	57.92±12.77
Gender	Female	152	66.7	
	Male	76	33.3	
Disease	Breast cancer	132	57.9	
	Colorectal cancer	96	42.1	
Surgery	Yes	221	97.2	
	No	7	0.4	
Adjuvant chemotherapy	Yes	154	67.5	
	No	74	32.5	
Adjuvant radiotherapy	Yes	132	57.9	
	No	96	42.1	
Hormone therapy	Yes	76	57.9	
	No	56	42.1	
Chronic disease	Yes	98	43.0	
	No	130	57.0	
Physical activity	Sedantary	115	50.5	
	Regular	113	49.5	
Follow-up (year)	≤2	86	37.7	4.19±3.55
	3-4	89	39.0	
	>4	53	23.3	

SD: Standard Deviation.

oil is consumed every day is 46.7%; It was determined that the daily refined sugar consumption of the patients was only 9.3%. The monthly vegetable and fruit consumption rates of the patients were close to each other (4.9 ± 1.2 and 5.5 ± 1.3), but the daily consumption of vegetables was lower than fruit (fruit, 81.3%; vegetables, 53.3%) while detecting; It was determined that the highest rate of tea consumption of the patients was 3-5 cups (36.4%) and coffee consumption was 1 cup (38.3%) per day. While 89.7% didn't use solid oil while cooking, 86% were used butter while cooking. Red meat consumption was seen mostly 1-4/week among survivors (71%). Eating yoghurt, which is traditional for Turkish taste, increased despite the decreased milk consumption (>90%).

FCAS Averages of Patients by Disease and Treatment Characteristics

Most of patients (71.7%) reported the changing in food intake after the diagnosis. The most common changings were an increase of consuming fruit and vegetables, lower intake of red and processed meat, and sugar. Over one third of the patients (number =81) stated to give up the sugar usage with fluid, food like coffee or tea. None of our patients drank alcohol regularly before or after the diagnosis and 88.6% of them didn't consume fizzy drink also. It was determined that the tea/coffee consumption

of patients diagnosed with breast cancer was statistically significantly higher than patients diagnosed with colon cancer ($Z=-2.310$; $p=0.021$). It was observed that the tea/coffee consumption of the patients who did not receive adjuvant chemotherapy was lower ($Z=-2.978$; $p=0.003$). As the time passed since the cancer diagnosis of the patients increased, it was observed that the tea/coffee consumption of the patients increased statistically significantly ($K-W\chi^2=-6.662$; $p=0.036$) (Table 2).

Factors Associated with Frequency of Food Consumption

Physical activities ($p=0.003$), presence of chronic illness ($p=0.003$) and adjuvant chemotherapy and radiotherapy ($p=0.001$) were correlated with changing dietary habit. Patients who had physically active and hadn't chronic disease and survivors who had given chemotherapy were more commonly changed their diet after diagnosis. High educational level were positively related with consumption of red meat, physical activities and negatively correlated with sugar consumption. Age was negatively associated with the physical activities and positively related with presence of chronic disease. A statistically significant negative correlation was found between the frequency of consumption of milk and dairy products and the frequency of consumption of sugar ($r=-0.251$; $p=0.009$) and tea/coffee ($r=-$

Table 2. Food Consumption Amount Scores According to Disease and Treatment Characteristics

Features	Consumption Scores						
	Red meat Mean±SD	White meat Mean±SD	Dairy products Mean±SD	Oil Mean±SD	Sugar Mean±SD	Vegetable/Fruit Mean±SD	Tea/coffee Mean±SD
Disease							
Breast cancer	3.91±1.15	1.96±1.05	3.09±1.38	2.47±1.03	2.35±1.74	5.19±0.89	2.22±1.20
Colorectal cancer	3.65±1.20	1.88±0.97	3.17±1.24	2.28±1.06	2.77±1.73	5.27±0.97	1.62±1.15
Z/p	-1.087/0.277	-0.380/0.704	-0.216/0.829	-0.482/0.630	-1.299/0.194	-0.741/0.459	-2.310/0.021*
Stage							
I-II	3.80±1.21	2.00±1.06	3.04±1.39	2.28±1.03	2.51±1.78	5.18±0.93	2.10±1.20
III-IV	4.00±1.00	1.74±0.88	3.34±1.15	2.89±0.93	2.24±1.61	5.28±0.84	1.98±1.27
Z/p	-0.827/0.408	-1.336/0.181	-1.200/0.230	-2.366/0.018*	-0.577/0.564	-0.424/0.671	-0.279/0.780
Adjuvant chemotherapy							
Yes	3.87±1.12	1.89±0.92	3.17±1.36	2.31±1.04	2.52±1.85	5.27±0.76	2.35±1.15
No	3.83±1.23	2.00±1.16	3.03±1.33	2.58±1.02	2.35±1.59	5.12±1.08	1.71±1.22
Z/p	-0.307/0.759	-0.195/0.845	-0.638/0.523	-1.101/0.271	-0.426/0.670	-0.165/0.869	-2.978/0.003*
Adjuvant radiotherapy							
Yes	4.05±1.19	1.97±1.05	3.15±1.38	2.42±1.03	2.27±1.67	5.15±0.86	2.20±1.18
No	3.58±1.08	1.90±1.00	3.07±1.30	2.43±1.05	2.69±1.82	5.29±0.97	1.90±1.25
Z/p	-1.74/0.083	-0.074/0.941	-0.107/0.915	-0.218/0.828	-1.336/0.182	-1.354/0.176	-1.41/0.158
Hormone therapy							
Yes	3.95±1.15	1.94±1.07	3.07±1.37	2.57±1.05	2.58±1.64	5.24±0.87	2.24±1.27
No	3.71±1.18	1.93±0.97	3.17±1.31	2.23±0.99	2.27±1.88	5.16±0.97	1.84±1.10
Z/p	-0.769/0.442	-0.112/0.911	-0.003/0.997	-1.405/0.160	-0.999/0.318	-0.175/0.861	-1.573/0.116
Follow-up (year)							
≤2	3.84±1.17	1.90±0.98	3.18±1.37	2.55±1.03	2.49±1.75	5.27±0.96	1.78±1.25
3-4	3.90±1.27	2.06±1.16	3.03±1.47	2.55±0.93	2.58±1.80	5.06±0.91	2.24±1.06
>4	3.80±1.04	1.86±0.96	3.08±1.13	2.03±1.10	2.20±1.68	5.24±0.81	2.46±1.21
K-W χ^2	0.103/0.950	0.275/0.871	0.161/0.923	4.966/0.084	0.403/0.817	1.824/0.402	6.662/0.036*

*=p<0.05, Z= Mann-Whitney U Test, K-W χ^2 = Kruskal Wallis-H Test, SD: Standard deviation.

0.193; p=0.049). Similarly, a statistically significant negative correlation was found between red meat consumption and the frequency of vegetable/fruit consumption ($r=-0.264$; p=0.006) (Table 3).

The relationship Between Food Consumption Frequency Scores

Consumption of vegetables and fruits negatively affected consumption of red meat ($\beta=-0.23$; p=0.012); It was determined that CT/RT application status ($\beta=0.19$; p=0.041) and BMI ($\beta=0.24$; p=0.015) had a positive effect. It was determined that advanced disease stage affected butter oil consumption positively ($\beta=0.24$; p=0.014), and increased follow-up period negatively ($\beta=-0.20$; p=0.040). The presence of chronic disease had a negative effect on tea/coffee consumption ($\beta=-0.19$; p=0.046); It was determined that CT/RT application status ($\beta=0.22$; p=0.021) and increased follow-up time ($\beta=0.21$; p=0.024) affected positively (Table 4).

Discussion

The most common cancers in Turkish population are breast and colon cancer which were reported to be related with dietary pattern and body weight. Aim of this study is to assess Turkish cancer survivors who adhere to dietary recommendations. We evaluated dietary habits by questioned as reporting any changing after cancer diagnosis during food item survey. In the previous studies the period after completion of cancer treatment may be favorable time for promotion of lifestyle changes.^[14] We overviewed our cancer survivors median 3 years after the curative treatment. Cancer patients are associated with low level of physical activity, poor adherence to dietary recommendation, high prevalence of obesity after treatment.^[15] After cancer diagnosis patients often change their dietary habit to improve health. In a one survey applied among breast, colorectal, prostat cancer survivors, two thirds of them were changed positively their diet after 2 years from the diagnosis.^[16] Re-

Table 3. Independent Factors Associated with Frequency of Food Consumption (Multivariate Linear Regression Analysis)

Factors	Unstandardized Coefficients		β	Standardized Coefficients		Model
	B	SE.		t	p	
Red meat	3.848	1.040	-	3.701	<0.001	R ² =0.188
Education (Primary Education=0, High School=1, University=2)	-0.167	0.154	-0.117	-1.089	0.279	F=4.672
BMI	0.059	0.024	0.240	2.487	0.015*	p=0.001
Working status (No=0, Yes=1)	0.121	0.349	0.035	0.347	0.730	
CT/RT(No=0, Yes=1)	0.518	0.250	0.186	2.070	0.041*	
Vegetable/Fruit consumption (No=0, Yes=1)	-0.294	0.116	-0.230	-2.544	0.012*	
Dairy products	3.318	0.391	-	8.491	<0.001	R ² =0.107
Marital status (Married=0, Single=1)	0.378	0.173	0.206	2.182	0.031*	F=4.129
Frequency of sugar consumption	-0.168	0.072	-0.217	-2.321	0.022*	p=0.008
Tea/coffee consumption frequency	-0.150	0.104	-0.136	-1.444	0.152	
Butter	3.366	0.970	-	3.469	0.001	R ² =0.144
Chronic disease (No=0, Yes=1)	0.370	0.421	0.086	0.879	0.382	F=4.276
Physical activity (Regular=0, Sedentary =1)	1.630	0.404	0.148	1.560	0.016*	p=0.003
Stage (I/II=0, III-IV=1)	1.191	0.474	0.237	2.514	0.014*	
Follow-up time	-0.118	0.057	-0.196	-2.082	0.040*	
	2.713	0.931	-	2.913	0.004	R ² =0.273
Tea/coffee						
Age	-0.321	0.250	-0.133	-1.285	0.202	F=5.312
Gender (Male=0, Female=1)	0.458	0.332	0.128	1.380	0.171	p=<0.001
BMI	-0.027	0.023	-0.103	-1.162	0.248	
Chronic disease (No=0, Yes=1)	-0.455	0.225	-0.186	-2.017	0.046*	
CT/RT(No=0, Yes=1)	0.636	0.272	0.219	2.337	0.021*	
Follow-up time	0.072	0.031	0.209	2.293	0.024*	
Dairy consumption frequency	-0.138	0.079	-0.152	-1.745	0.084	

*:p<0.05; Multiple Linear Regression; BMI: Body Mass Index; CT: Chemotherapy; RT: Radiotherapy.

duced alcohol consumption and lower intake of red meats are the most common dietary changes among breast cancer survivors.^[17] They reported also to increased their fruit and vegetables intake, decreased fat, sugar, coffee and alcohol intake.^[1] Hagen et al. compared 180 breast cancer patient and 101 healthy women in respect to changing dietary habits.^[14] Totally 22% of the patients altered their diet as avoiding alcohol, smoked food, dairy product.^[15] Vance

et al. also reported that 86% of the cases changed behaviour after diagnosis by increasing consumption of fruit vegetable amount, lower intake of red meat, and reduced alcohol among 28 breast cancer patients one year after diagnosis.^[17] More than 70% of our cancer survivors reported the changing dietary habits after cancer diagnosis. The percentage was less compared to other articles in literature. Especially increased fruit and vegetables consumptions,

Table 4. The relationship Between Food Consumption Frequency Scores

	Red meat	White meat	Dairy products	Oil	Sugar	Vegetable/Fruit
White meat						
r	0,027					
p	0,784					
Dairy products						
r	0,052	-0,028				
p	0,597	0,779				
Oil						
r	0,002	-0,092	0,030			
p	0,981	0,347	0,760			
Sugar						
r	-0,004	-0,114	-0,251	0,179		
p	0,967	0,244	0,009*	0,065		
Vegetable/Fruit						
r	-0,264	-0,154	-0,001	0,161	-0,012	
p	0,006*	0,114	0,994	0,097	0,904	
Tea/Coffee						
r	-0,027	-0,002	-0,193	-0,036	0,059	0,081
p	0,783	0,983	0,046*	0,713	0,544	0,407

*=p<0.05; r= Spearman Correlation Analysis.

lower intake of red and processed meat and sugar were common. Our rate was lower than literature because red meat and carbohydrate rich food has been more preferable than vegetable in Turkish population. In our population use of alcohol is low because of religious reasons independent from cancer.

It was shown that low fat diet group had a significant improvement of disease free survival among 2437 breast cancer survivors who were randomized into intervention (low fat diet) and control groups.^[9] Recommended dietary modifications were reduction of red and processed meat intake and increased eating of high fiber food for colorectal cancer survivors to prevent recurrence.^[18] Vrieling et al. analyzed dietary pattern of 2533 postmenopausal breast cancer survivor and classified dietary pattern as healthy (high vegetable and fruit intake, vegetable oil) and unhealthy (high intake of red meat, processed meat) by food frequency questionnaire and they showed that unhealthy diet was associated with poor survival. Women, preferred healthy diet, were either mostly past-smoker or having high educational and occupational level compared to those with unhealthy dietary habit.^[19] In our group, survivors who were physically active and did not have chronic diseases and who also received chemotherapy changed their eating habits more after diagnosis. High educational level was found to be positively related with consumption of red meat. In the literature, adherence to healthy diet recommendation was found to be higher among breast cancer survivors than prostate cancer survivors.^[20] Totally 81 of our patients were

breast and 26 had colon cancer and there was no difference between cancer type and changing rate of dietary pattern after diagnosis. We couldn't aim to evaluate the effect of dietary pattern on survival of cancer survivors. After finding out engagement of cancer patients to healthy diet recommendation and diet regimen, it may be better to analyze the effects of diet on survival in Turkish population.

Among 50 Chinese American cancer survivors, were included 50 week healthy lifestyle intervention program and evaluated before and postintervention survey. Most of them had breast (66%) or colon cancer (5%), Although over half of them were within normal weight, they did not meet the recommended daily consumption of vegetable (4 serving) or fruit (3 serving). They adapted mostly daily physical activity (96%) after the intervention.^[4] Hagen et al. reviewed the changing of dietary pattern after 2 years from the breast cancer diagnosis with 36 food item frequency questionnaire.^[15] They evaluated both at the time of diagnosis of breast cancer and after 2 years from the diagnosis and 22% of cancer patients altered their diet like avoiding from alcohol, milk and dairy product, meat (25%), sugar(52%) (15), high intake of fruit and vegetables (42%), water (32%) (15). Among African American breast cancer survivors, 16.7% of the survivors could adapt recommended daily serving fruit and vegetables.^[8] In another nationality as Latin American breast cancer survivors also had very low intake of plant-based food and very high intake of added sugar with limited red and processed meat and alcohol consumption.^[21] Among breast cancer survivors in Malay-

sia reduced consumption of red meat, seafood, noodles and increased consumption of fruit, vegetables, fish, low-fat milk were evaluated with dietary changes questionnaire performed before and after breast cancer diagnosis.^[22] There are many differences in different nationalities/cultures in terms of dietary habits. Thus, our study is valuable report indicating dietary habits and changings after cancer diagnosis among Turkish population. It should be better to evaluate patients with survey at the time of diagnosis and after 3 months from the diagnosis however we evaluated only one survey median 3 months of followed up. We could not differentiate low or high fat diet or refined grain or amount of vegetable or fruits which are important characteristics of the healthy Western diet. It should be better to perform large prospective trial comparing normal control and Turkish cancer survivors and investigate changing dietary habits among them for long term period.

The appropriate diet is important for management of cancer survivors.^[18] Examining the cancer specific dietary recommendations is critical step in cancer survivors not only for preventing recurrence but also to avoid non-cancer comorbidity. Our study is important to showing a deficiency in adaptation of healthy lifestyle to cancer survival reflecting Turkish ethnicity. Among breast and colon cancer survivor, not only treatment but also modification and education for diet might be important to reduce mortality.

Disclosures

Ethics Committee Approval: The study was performed in accordance with the declaration of Helsinki. The patients give a written informed consent before the study. This study was approved by Bahcesehir University Clinical Research Ethics Committee (IRB approval number: 2019-01/06).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – L.E., B.B.O.; Design – L.E., B.B.O.; Supervision – B.B.O.; Materials – L.E., B.B.O.; Data collection &/or processing – L.E., B.B.O.; Analysis and/or interpretation –L.E.; Literature search – B.B.O.; Writing – L.E.; Critical review – B.B.O.

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