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RESEARCH ARTICLE

COLORECTAL CANCER RISK ASSESSMENT; AWARENESS, MEDITERRANEAN DIET, AND EARLY DETECTION

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ABSTRACT

Objective: Colorectal cancer (CRC) is the second and third most common cancer in women and men worldwide, respectively. Nutrition, one of the modifiable risk factors, especially the Mediterranean diet (MD), is an important tool in the prevention of CRC. This study aims to evaluate the relationship between CRC awareness' components and CRC risk scores.
Material and Methods: An online survey consisting of 47 questions was prepared to collect the study data. CRC awareness components include nutrition compatible with MD, knowledge level about CRC, and approach to early detection methods. The CRC risk score was calculated using the frequency of the participants' CRC risk factors. Statistical analysis was performed that calculated all scores of CRC risk score, and CRC awareness. In data analysis, descriptive statistics, Chi-Square Test, Student's t-test, and Mann-Whitney U test were used. The statistical significance was evaluated as $p<.05$.
Results: A total of 387 participants, 66.4% (n=257) female and 33.6% (n=130) male, were included.in this study. The mean age was 38±13 years. 85.8% of the research group had no family history of CRC. The mean score of the ''Mediterranean Diet Adherence Scale'' of participants was calculated as 7.31±1.9. The CRC knowledge level score was 10.4+2.3. It was found that 71.8% of participants who have a high knowledge level, MD-compatible diet.. 64.3% of participants who are following a diet compatible with the MD stated to have a fecal occult blood test (FOBT). The rate of having an FOBT is significantly higher in those who follow MD compared to those who do not (p=.004).
Conclusion: This study, examined the CRC knowledge level and the compatibility of the MD. There is an important relationship between the level of knowledge and the type of nutrition, but these data are not related to the risk of CRC. Further research in this area is recommended.

Keywords: Colorectal cancer, mediterranean diet, nutrition, risk factors.

INTRODUCTION

According to GLOBOCAN (Global Cancer Observatory) data, in 2020, colorectal cancer (CRC) is the third most deadly cancer type in the world by all ages and genders (1,2). Considering the incidence in Turkey, it ranks fourth in terms of all ages and genders and ranks fifth in cancer-related deaths (1). According to 2020 data, the incidence and mortality of CRC are expected to double in 2040 (2). The incidence and mortality of CRC depend on screening programs such as colonoscopy and flexible sigmoidoscopy, and changes in risk factors (3).

Relativistic survival is decreased by age. However, CRC incidence is higher among men than women (4). The CRC screening programs aim to detect 90% of all sporadic CRC cases in people over 50 years. There are two screening methods: hemoccult test and colonoscopy (5). Hemoccult test can be used to detect the presence of cancer, but it is insufficient. Endoscopic examinations are effective in detecting both precancerous lesions and early cancer. The advantage of these methods includes preventing cancer by identifying and removing adenomas (6). Early detection and extraction of adenomas may reduce CRC incidence (5,6).

CRC mostly occurs sporadically and only 5% of cases are genetic. In comparison with other cancers, there is no single risk factor in most CRC cases. Nutrition is one of the most significant exogenous factors identified so far in the etiology of CRC. Nutrition-related factors such as consumption of red and processed meat, heavy alcohol intake, low fiber intake, using tobacco products; along with obesity, inflammatory bowel disease, and type 2 diabetes are clearly identified risk factors for CRC (7,8). In addition, dietary fiber, milk, garlic, and foods containing calcium, fruits, non-starchy vegetables, foods containing folate as well as fish, foods containing vitamin D and selenium are protective against colon cancer (8).

Although the Mediterranean diet (MD) does not have a precise definition, it expresses the nutritional behaviors of the societies living around the Mediterranean Region by mixing food, religion, economic and cultural practices. (9). This diet includes plenty of whole grains, legumes, nuts, seeds, fruits, and vegetables. In this diet, olive oil has frequently consumed as a source of fat. Red and processed meat, saturated fat, and refined sugar intake are typically restricted. Moderate consumption of a dairy product and fish are supported. There is typically moderate consumption of alcohol (mostly red wine) with meals (10,11). The MD is rich in antioxidants, eicosatetraenoic acid (EPA), docosahexaenoic acid (DHA), n-3 polyunsaturated fatty acids (PUFAs), which come from olive oil, fish, fruits, vegetables, and other fiber sources. MD is suggestive to be protective against CRC, various cancers, and other chronic diseases (12,13).

Nutrition compatible with MD, knowing CRC, and approach to early detection methods create CRC awareness. This study aims to evaluate the relationship between CRC awareness' components and CRC risk scores (Calculation of CRC risk score is based on the frequency of risk factors for participants).

MATERIAL AND METHODS

Planning the Study

In this study, it was aimed to evaluate the relationship between colorectal cancer risk score and colorectal cancer awareness and was planned as a cross-sectional study. The sample size was calculated using the open-access site "OpenEpi.com". It was planned to reach 387 healthy volunteers for 50% frequency, 5% margin of error, 95% confidence interval, and 80% power.

Ethics Committee Approval

A survey containing 47 questions in total was created to collect the data. Ethics committee approval was obtained for the application of the survey (IBG-GOEK 2021-014). It was sent to e-mail groups by Dokuz Eylul University/Health Sciences Institute and the participants were allowed to apply the survey online.

Data Collection

The research group is community-based and students and staff from the field of health were selected. Healthy volunteers aged 18-70 years were included in the study. Informed consent was obtained from the volunteers before starting the survey.

Data Evaluation

The survey consists of four sections. The first part included questions about risk factors. While calculating the score in this section; Weekly alcohol, coffee, fruit, processed meat, and fish consumption, daily multivitamin, calcium, iron, and zinc supplement intake, family history of colorectal cancer, presence of diabetes in the individual, and BMI data were used. The risk score was calculated according to the current odds ratio in literature (15). All scores were calculated in this way and their mean (0.4±0.1) was taken. It was accepted that average and above were considered high risk and below/under average low risk.

The second part of the survey included the Mediterranean Diet Adherence Scale developed and shown to be valid by Pehlivanoglu et al (14). Scores from all questions within the scale were summed. Those who scored 7 and above were defined as compatible, and those who scored below seven were defined as incompatible.

Table 1. Distribution of the research group according to age, socio-demographic features, academic features, presence of colorectal cancer in the family, and Mediterranean Diet compatibility.

	Mean±Sd	**Min-Max**
Age	38±13	18-70
	Frequency (n)	**Percent (%)**
Gender		
Female	257	66.4
Male	130	33.6
Education level		
Post Graduate	98	25.3
University	214	55.3
High School	57	14.7
Secondary School	10	2.6
Primary School	8	2.1
Demographic features		
Aegean Region	234	60.5
Marmara Region	62	16.0
Mediterranean Region	63	16.3
Inner Anatolian Region	15	3.9
Black Sea Region	6	1.6
South East Anatolian R.	4	1.0
Eastern Anatolian R.	3	0.8
Presence of CRC in the family		
None	332	85.8
One person	44	11.4
More than one person	11	2.4
Mediterranean diet compatibility		
Score < 7		
Score ≥ 7	136	35.1
	251	64.9
Risk Group of CRC		
Low Risk Group	**210**	**54.3**
High Risk Group	**177**	**45.7**
Total	**387**	**100.0**

In the third part, there were questions about knowledge level about CRC. In this section, the incidence of colorectal cancer, the type of diet and its preventability with early diagnosis methods, the symptoms, the tools used for early diagnosis methods, and the level of knowledge of risk factors were asked. The knowledge level score was calculated by giving 1 point for correct answers and 0 points for incorrect answers. Later, these scores were averaged. Those who were above average were defined as sufficient, and those below were defined as insufficient.

In the fourth part, there were questions about whether the participants aged 50 and over had CRC screening programs, and if they did not, whether they wanted to have it done. Positive responses were scored as 1 and negative responses as 0, and the scores were averaged. Those above average were classified as

Table 2. Risk Group of Colorectal Cancer and Related Variables

	Low Risk of Colorectal Cancer		High Risk of Colorectal Cancer		
	Frequency	**Percent (%)**	**Frequency**	**Percent (%)**	***p values****
Getting information about CRC from family, friends and social circle					**P=0.011**
Yes	84	45.9	99	54.1	
No	120	58.8	84	41.2	
MD compatibility					P=0.883
Yes	133	53.0	118	47.0	
No	71	52.2	65	47.8	
Knowledge level of CRC					
Yes	113	54.1	96	45.9	P=0.563
No	91	51.1	87	48.9	
Attitude towards early diagnosis methods for CRC					P=0.866
Yes	26	57.8	19	42.2	
No	19	55.9	15	44.1	

* Chi-squared (χ^2) test

positive attitudes, and those below were classified as negative attitudes.

The data were gathered under 2 main headings: CRC risk score and CRC awareness. The CRC risk score was calculated according to the risk factors of the participants. CRC awareness was defined as the common name of nutritional components compatible with MD, knowledge about CRC, and approach to early detection methods. While CRC risk score constitutes the dependent variable of the study, CRC awareness constitutes the independent variable.

Statistical Analysis

The data have been analyzed with Statistical Package for Social Science version 24.0 (SPSS for Windows Inc, Chicago, IL, USA). For the data analysis, descriptive statistics, the Chi-Square Test, Student's t-test, and Mann-Whitney U test were used as appropriate. Statistical significance was determined as $p<.05$ in this study.

RESULTS

A total of 387 individuals of 257 (66.4%) female and 130 (33.6%) male, were included in this study. The mean age of the participants was 38±13 years. 80.6% of the research group has a bachelor's degree or higher. Approximately three-quarters (3/4) of the individuals participated in the study from the Aegean and Mediterranean regions. 85.8% of the research group had no family history of CRC. In addition, 11.4% of the participants had a family history of CRC, and 2.4% had more than one family history of CRC. The average Mediterranean Diet Adherence Scale score of the participants was calculated as 7.31±1.9. It was determined that 64.9% (n=251) of the study group had a total score of 7 and above and had an MD compatible diet. (Table 1).

BMI means was found to be 24.7±4.9. The proportion of participants with a BMI below 30 kg/m2 was 90.4% (n=350). 89.4% of the research group did not consume fish, 89.1% did not use calcium supplements, 85.3% did not consume enough fruit, 82.4% did not use zinc supplements, 71.8% did not use multivitamin supplements, and 64.9% consumed processed meat. In addition, 43.2% of the participant consumed alcohol, 31.8% smoked, 24.3% did not use iron supplements, 15% did not drink coffee, 14% had a family history of CRC, 5.7% had type 2 diabetes, and 9.6% had a BMI of 30 kg/m2 and above (Figure 1).

The mean score of knowledge level, which is another assessment scale, was found as 10.4±2.3. A knowledge level of 54% was found to be sufficient. In this context, when the attitudes towards methods that provide early diagnosis such as colonoscopy and FOBT in individuals aged 50 and over, are evaluated,

the mean score was found to be 0.9±0.8. The rate of those aged 50 and over who had either or both of the early screening tests is 26.3% (n=15). Of the participants aged 50 and under, 68.8% (n=33) stated that they did not consider having a colonoscopy, and 55.3% (n=26) FOBT.

the participants who take zinc and iron supplements and who consume more olive oil, vegetables, and legumes were found to be significantly higher than others (p<.005) (Table 4).

When the desire and attitude towards early detection methods in CRC are evaluated; those who use zinc

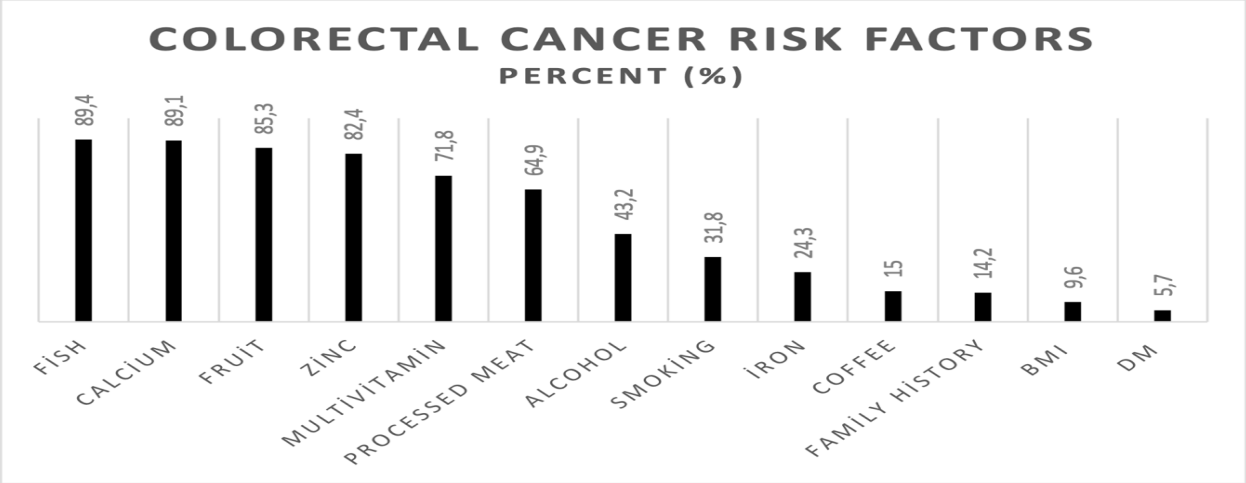

Figure 1. Distribution of participants' responses to factors associated with colorectal cancer

Individuals with a high risk of CRC were found to be significantly higher in obtaining information about CRC from their family, friends, and social environment than those with low risk (p=.011). There was no statistically significant difference between individuals with high or low risk in terms of diet adherence, knowledge level, and attitude (p>.05) (Table 2). The relationship between effective markers in CRC risk score and MD adherence are presented in Table 3. Those who use vitamin and mineral supplements such as multivitamins, calcium, and zinc were found to be more compatible with the MD. Those who consumed processed meat had lower adherence to the MD (p<0.001). 64.3% of those who follow the MD accepted to have an FOBT, and the desire to have an FOBT is significantly higher in those who are fed an MD compared to those who do not (p=.004) (Table 3).

71.8% of those with sufficient knowledge about CRC and 56.7% of those with insufficient knowledge were found to be compatible with the MD. The rate of individuals with a high knowledge level about CRC is significantly higher than individuals with a low knowledge level (p=0.002) (Table 4).

Participants with high school and higher education levels have higher CRC knowledge levels than participants with high school and below education levels (p=.007) (Table 4). CRC knowledge levels of supplements and those who consume more vegetables had a more positive attitude towards early diagnosis of CRC (p<.05) (Table 5).

DISCUSSION

One of the most important factors for the effective management of CRC is early diagnosis. Knowledge level and awareness of society on this issue play a very important role in early diagnosis (16). As a consequence of CRC being a slowly progressing disease, taking preventive measures significantly affects the development process of the disease. One of these preventive precautions is the diet model. Significant relationships were found between the MD and CRC risk, but there are some uncertainties due to the insufficient studies in this area (17). This study is valuable in terms of filling the gap in the field due to the lack of a similar study conducted in Turkey and the lack of literature on this subject.

When the CRC risk status was examined, 41.2% of those who obtained information about CRC from their family, friends, and social environment had low risk, 54.1% had high risk and a significant relationship was found between them. According to this, those participants with high risk are more in touch with their family, friends, and social environment about CRC, and they talk about this issue more in their daily lives. While in a study by Mentella et al., (18) it was found

Table 3. Various Parameters and Their Relationship Adherence to the Mediterranean Diet

	COMPATIBLE		INCOMPATIBLE		
	Frequency (n)	**Percent (%)**	**Frequency (n)**	**Percent (%)**	***p values****
Gender					
Male	66	50.8	64	49.2	**P<0.001**
Female	185	72.0	72	28.0	
Family History of CRC					**P=0.879**
Available	216	65.1	116	34.9	
Not Avalable	35	63.6	20	36.4	
Age					
<50	182	63.0	107	37.0	**P=0.221**
≥50	69	70.4	29	35.1	
Multivitamin intake					
Yes	85	78.0	24	22.0	**P=0.001**
No	166	59.7	112	40.3	
Calcium intake					
Yes	35	83.3	7	16.7	**P=0.008**
No	216	62.6	129	37.4	
Zinc intake					
Yes	54	79.4	14	20.6	
No	197	61.8	122	38.2	**P=0.006**
Consumption of coffee					
Yes	221	67.2	108	32.8	
No	30	51.7	28	48.3	**P=0.023**
Believe in MD as protector against CRC					
Yes	236	66.9	117	33.1	
No	15	44.1	19	55.9	**P=0.008**
Getting information about CRC from doctor or family doctor					
Yes	109	72.7	41	27.3	
No	142	59.9	95	40.1	**P=0.010**
Knowledge level of colorectal cancer					
Sufficient	150	71.8	59	28.2	**P=0.002**
Insufficent	101	56.7	77	43.3	

* Chi-squared (χ^2) test

that the risk of CRC was reduced in those with high adherence to the MD, but in our study, 64.5% of those with a high risk of CRC were fed an MD, and no significant relationship was found between them. Furthermore, a Mediterranean-type diet is not the only effective factor in reducing the risk of CRC. The risk may also be higher in individuals who are fed with MD. On the other hand, the rate of those with high risk (35.5%) is higher than the rate of those with low risk (34.8) in those who had a Mediterranean-type diet. On the contrary, the Mediterranean-like diet is not sufficient on its own to reduce the risk, the risk is certainly higher in those who have an incompatible diet.

In this study, when examined at knowledge level about CRC, knowledge the level of those with low risk (54.1%) is higher than the level of knowledge of those with high risk (45.9%) (p=0.563). Participants who know CRC may be avoiding risk factors or trying hard to increase reducing factors. However, the difference between them was not statistically significant. Positive attitude a. positives early diagnosis method in CRC is higher in those with low risk. It is expected that the rate of positive attitudes will be higher in

Table 4. Various Parameters and Their Relationship Knowledge Level of Colorectal Cancer

	SUFFICIENT		INSUFFICIENT		
Knowledge Level	**Mean-Std.Dev.**		**Min-Max**		
	10.44 ± 2.39		(4-14)		
	Frequency	**Percent (%)**	**Frequency**	**Percent (%)**	***p values****
Education					
High school and higher	30	60.0	45	40.0	**P=0.007**
Above/over high school	179	57.4	133	42.6	
Working status					
Active worker	166	57.6	122	42.4	**P=0.014**
Inactive worker	43	43.4	56	56.6	
Zinc intake					
Yes	49	72.1	19	27.9	**P<0.001**
No	160	50.2	159	49.8	
İron intake					
Yes	167	57.0	126	43.0	**P= 0.037**
No	42	44.7	52	55.3	
Mediterranean Diet					
Compatible	150	59.8	101	40.2	**P= 0.002**
Incompatible	59	43.4	77	56.6	

* Chi-squared (χ^2) test

Table 5. Attitude Towards Colorectal Cancer

	Positive Attitude		**Negative Attitude**		
	Frequency	**Percent (%)**	**Frequency**	**Percent (%)**	***P value***
Zinc intake					
Yes	12	80.0	3	20.0	**P=0.045**
No	33	51.6	20	48.4	
Consumption of vegetable					
Yes	21	72.4	8	27.6	**P=0.035**
No	24	48.0	26	52.0	
Consumption of Sugar					
Yes	36	65.5	19	34.5	**P=0.021**
No	9	37.5	15	62.5	

* Chi-squared (χ^2) test

participants with a high risk of CRC so that early diagnosis will be more beneficial for society and achieve its purpose completely (p=0.883).

Using various MD scales, two prior cohort studies (23, 24) and one case-control research on colorectal adenomas (25) in the United States investigated the link between MD and CRC risk. A higher score was linked to a decreased prevalence of distal colorectal adenomas in men in a case-control study (25). When comparing the higher and lower quintiles of their MD-score among men, Reedy and colleagues (23) found a decrease in CRC risk, notably for distal colon and rectal malignancies. Fung and colleagues (24), on the other hand, found no link between MD-score and CRC risk. When the compatibility with the MD was investigated, it was found that women (73.7%) had a more compassable diet than men (26.3%), and a significant difference was found between them. According to SEER 2021 data, CRC prevalence in men is higher than in women (19). Similarly, our results reveal that women more adhere to MD than men. The relationship between MD and CRC risk was examined in the European Prospective Investigation into Cancer and Nutrition Study (EPIC) cohort.

According to the EPIC study, the association was statistically significant only among women in analyzes by sex, but the term interaction for MD by gender about CRC risk was not statistically significant on any of the MD scales (20).

Studies show that there is an inverse relationship between the use of vitamin-mineral supplements (multivitamin, calcium, vitamin A, vitamin E, etc.) and the risk of CRC (21, 22). In this study, a significant difference was found between taking multivitamins, calcium, and zinc supplements, and a diet compatible with the MD, and it was conducted that more than 80% of those who did not use supplements were fed incompatible with MD. When we observe those who take supplements, it has been determined that most of them are fed incompatible with the MD, 94% of those who eat according to the MD think that colonoscopy is protective against CRC. 4.8% of the same participants think itching, 84.5% change in stool, 90.4% think that blood in the stool is a sign of CRC.

High alcohol consumption has been linked to an increased risk of CRC. In addition to this, genetic predisposition is related to CRC risk (28). 91.2% of participants who are compatible with MD think that genetic predisposition, 71.7% of alcohol consumption, and 8% of milk consumption increase the risk of CRC. In this case, it can be pronounced that most of those who conform with the MD has more knowledge about CRC. When the CRC knowledge level and MD compatibility were evaluated, it appeared that those with higher knowledge were more compatible with the MD (p=.002).

The protective effect of MD on health outcomes, including cancer (29), has been explained by many mechanisms. Many studies have found inverse associations between fiber and whole grains (naturally high in plant-based foods) and positive associations between red/processed meat with CRC risk (28). MD's beneficial effect on CRC is due to its emphasis on plant-based foods and the low content of animal products, especially red meat (28). MD is also high in antioxidants (vitamin C, carotenoids, phenols, and flavonoids) that may help prevent the onset and development of cancer (30). Individual MD components that were shown to be statistically substantially linked with CRC risk in this analysis were comparable to those found in prior CRC studies (26, 27). When CRC knowledge level was examined, it was observed that the knowledge level of participants with high school and higher education levels was higher than others, expectedly. Correlatively, the level of knowledge of participants who have active working is higher than participants who do not work actively (retired, unemployed or student). While 79.9% of those using iron supplements had a high knowledge level, surprisingly, 23.4% of those using zinc supplements had a high knowledge level. Similar to the relationship between adherence to the MD and knowledge level of CRC; those who consume olive oil (90.9%), vegetables (53.1), and legumes (42.6) have higher knowledge levels. In this context, it can be concluded that individuals who eat healthy have higher levels of knowledge about CRC. When the attitude towards early diagnosis in CRC is evaluated, those who take zinc supplements have a more negative attitude than those who do not, while those who consume sugar have a more positive attitude than those who do not.

The most important limitation of the study is that the research type is cross-sectional. Due to the fact that the survey is conducted online under pandemic conditions, the inadequacy or misunderstanding of the questions and the inability to find instant solutions to these problems are a limitation of the study. In addition, another limitation of the study is that there is no other study that can be compared since it is the only study conducted on this subject in Turkey. Besides other studies in this field in the literature contains error margin, as MD in our country differs from the MD in other countries.

CONCLUSION

In this study, which was conducted to examine the level of CRC knowledge and MD compatibility, which is thought to be important about the risk and development of CRC, significant differences were found between the level of knowledge and the type of nutrition. However, the relationship of these data with the risk of CRC could not be determined. Further fieldwork in this area is of critical importance, and there is a growing need for this in the literature.

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Conflict of Interest: None.

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