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Identifying potential risk factors associated with gastrointestinal tract cancers: A case-control study in Turkey

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Abstract

Objective: Gastrointestinal cancers have different risk factors. However, it was clearly thought that the risk factors of these cancers should be determined by a case-control studies. The study aims to determine the potential risk factors associated with gastrointestinal cancers with a case-control study design.

Material and methods: This case-control study was conducted with a total of 620 people applied to Department of General Surgery of two hospital in Turkey. The case group consisted of 310 patients diagnosed with gastrointestinal tract cancers. The control group consisted of 310 subjects without any history of cancer including gastrointestinal cancers. The data were collected with the Patient Identification Form including socio-demographic characteristics, and risk factors for gastrointestinal tract cancers.

Results: The mean age of the case and control groups were 58.9±12.9 and 50.0±10.0, respectively. Although there was statistically significant differences in several factors compared, multivariate analysis identified male gender (OR=1.729, p=0.02), higher age (OR=1.068, p<0.001), low body mass index (OR=1.110, p<0.001), high number of children (OR=1.563, p<0.001), cancer history in the family (OR=4.444, p<0.001) and the presence of other chronic diseases (OR=6.314, p<0.001) as risk factors. Mostly vegetable consumption (OR=2.923, p<0.001) was also found to be a lower risk factor for gastrointestinal cancers.

Conclusion: According to this study; age, gender, body mass index, number of children, family history of cancer, chronic diseases were among risk factors for gastrointestinal tract cancers. Vegetable consumption was an important factor to decrease gastrointestinal cancers.

Key words: cancer, gastrointestinal tract, nursing, risk factors

Introduction

Cancer is still a major cause of morbidity and mortality worldwide [1-3], as well as the second leading cause of death. It is estimated that 9.6 million people died because of cancer in 2018, and one out of every six deaths is related to cancer [4]. Due to the global increase in average life expectancy and human population, 20.3 million new cancer cases are expected by 2030 [1].

Gastrointestinal tract cancers originate from the esophagus, stomach, pancreas, hepatobiliary system, small intestine, large intestine, rectum, and anus [3,5]. According to the World Health Organization in 2018, colorectal cancers (1.80 million cases) are the third most common cancers and stomach cancers (1.03 million cases) are the sixth [4]. Based on Turkey Statistical Institute 2018 data; stomach cancer ranks third (8.2%) and colon cancer ranks fourth (7.8%) [6].

Though the incidence of gastrointestinal tract cancers rapidly increases, survival rates for these cancer are high thanks to early diagnosis, effective medical and surgical approaches. Early diagnosis is so important to decrease the incidence of cancer risk. Therefore, it is essential to detect risk factors for gastrointestinal cancers to decrease morbidity and mortality rates [1,7-9].

Several cancer types have specific risk factors such as geographic, race, cultural and socioeconomic characteristics, diet, environmental factors, genetic and familial predisposition [1,8,10,11]. Approximately one-third of deaths due to cancer are most commonly caused by high body mass index, lack of physical

activity, low fruit and vegetable intake, smoking and alcohol consumption [4]. To our knowledge, there are no studies exploring risk factors for gastrointestinal tract cancers except for histopathological identification. In this context, the study was aimed at identifying potential risk factors associated with gastrointestinal tract cancers.

Material and methods

Study design and sample size

This case-control study was conducted with 620 people who applied to Department of General Surgery of two hospitals in Istanbul, Turkey between May-December 2017. The case group consisted of 310 patients diagnosed with colon or stomach located gastrointestinal tract cancers who admitted to the Departments of General Surgery. The control group was consisted of 310 subjects who visited to outpatient clinics of the Departments of General Surgery without having a GI problems/ diagnosis, and any type of cancer history. Patients aged 18 years and older who met the inclusion criteria were included in the sample both in the intervention and control groups. The phase of the gastrointestinal cancer was determined by clinical and histopathological evaluation. Participants who have Phase I or II cancer admit inpatient clinics because of bleeding, having a biopsy, or an emergency etc. and participants who have Phase III or IV cancer admit inpatient clinics to have surgery. For this, the number of participants who has Phase III or IV cancer was admitted the hospital more in this study.

Power analysis was performed to determine the sample size of the study. The power of the test was calculated with G*Power 3.1 program. It was aimed to reach at least 176 people in two groups; 88 people in each group with a 5% significance level and 0.5 effect size in order to exceed 95% value.

Data collection tools

The participants were informed about the aim of the study. Then, data were collected by face to face interview method from patients who voluntarily participated in the study. Informed consent was obtained from all study participants. Each interview lasted about 10-15 min. The data were collected with the Patient Identification Form containing a total of 32 items prepared by the researchers as a result of the literature review [2,12-17]. This form included socio-demographic characteristics, and risk factors for gastrointestinal tract cancers such as gender, age, body mass index (BMI), marital status, number of children, alcohol use, smoking, exercise, family medical history, chronic diseases, eating and drinking habits.

Data analysis

Statistical analysis was carried out using the SPSS software package (Statistical Package for Social Sciences, version 22.0, SPSS Inc., IBM Corporation, Armonk, New York, USA). Data were analyzed with Shapiro-Wilk test to check the normality of distribution, and Leneve test was used to evaluate the homogeneity of variances assumption. Independent-samples T-test was used in comparison of independent groups, while Monte Carlo simulation technique was used in Mann-Whitney U test. The comparison of categorical variables was performed with Chi-squared or Binomial tests, and Monte Carlo simulation technique was used in Pearson chi-squared and Fisher's exact tests. Multiple logistic regression test was used to evaluate the cause and effect relation of descriptive variables with categorical variables in dichotomous and multinomial categories. Quantitative data were summarized as mean±standard deviation and categorical data with descriptive statistics (number and percentage). P-value less than 0.05 was accepted as statistically significant.

Ethical statement

The study protocol was approved by the Ethics Committee of a university in Istanbul Turkey (Dated: 06.01.2016 Numbered:10840098-604.01.01-E.319) and complied with the guidelines of the Helsinki Declaration. Informed consent was obtained from all study participants.

Results

Diagnostic factors in medical characteristics of the case group are summarized in Table 1. Accordingly, a statistically significant portion of the patients had more than one symptom, where abdominal pain (n=79, 25.5%) followed by nausea and vomiting (n=50, 16.1%) were the most frequently reported ones (p<0.001). Most of the case group visited a practitioner right after their first symptom (n=180, 58.1%, p<0.001). General surgery was the first practitioner visited by most of the study patients (n=142, 45.8%), followed by internal medicine (n=108, 34.8%) (p<0.001).

Table 1 Diagnostic factors in medical characteristics of the case group (n=310)

		Case group (n = 310)	p value
Clinical manifestation			
	Bleeding	21 (6.7)	< 0.001[a]
	Abdominal pain	79 (25.5)	
	Abdominal swelling	10 (3.2)	
	Nausea and vomiting	50 (16.1)	
	Constipation	43 (13.9)	
	Multiple complaints	107 (34.5)	
How soon you visited a practitioner after your first symptom?			
	Right after	180 (58.1)	< 0.001[a]
	In a few weeks	30 (9.7)	
	After a month	23 (7.4)	
	More than a month	77 (24.8)	
Which practitioner you visited first?			
	General surgeon	142 (45.8)	< 0.001[a]
	Gastroenterology	60 (19.4)	
	Internal medicine	108 (34.8)	
Phase			
	Phase I	7 (2.2)	< 0.001[a]
	Phase II	24 (8.1)	
	Phase III	75 (24.0)	
	Phase IV	204 (65.7)	
Tested for helicobacter pylori			< 0.001[b]
	Yes	300 (96.8)	
	No	10 (3.2)	
Helicobacter pylori detected			< 0.001[b]
	Yes	50 (16.7)	
	No	250 (83.3)	
Gastrointestinal tumor location			
	Stomach	87 (28.1)	< 0.001[b]
	Colon	223 (71.9)	

Data are given as n (%). Statistical analysis was performed with [a] Chi-squared test, or [b] Binomial test.

A statistically significant number of gastrointestinal cancer cases in this study were diagnosed at phase IV (n=204, 65.7%, p<0.001). The location of gastrointestinal tract cancers in the patients involved in this study was colon (n=223, 71.9%) and stomach (n=87, 28.1%).

Table 2 summarizes the comparison of the demographic characteristics of the case group with the control group with respect to gender, age, BMI, marital status and number of children, alcohol abuse and current smoking habits, exercising, family medical history, presence of other chronic diseases, and common eating and drinking habits. There was a statistically significant male dominance in the case group (n=209, 67.5%) compared to the control group (n=168, 54.2%) (p=0.001). The mean age of the case group diagnosed with gastrointestinal cancers was significantly higher (58.9±12.9 and 50.0±10.0 years, respectively, p<0.001), and, contrarily, the mean BMI (25.2±4.7) was significantly lower than the control group (27.0±3.5, p<0.001). Most of the subjects in both groups were married with children and lived in a nuclear family (Table 2). Smoking, alcohol abuse or exercising habits of the case and control groups were comparable without any statistically significant difference (Table 2, p>0.05). The family history of cancer and the presence of other chronic diseases other than gastrointestinal cancers were significantly higher in the case group compared to the control group (Table 2, p<0.001 for both). There was a statistically significant difference between the two groups with respect to eating habits, except the regular cola consumption (Table 2). The control group consumed either no meat (n=92, 27.7%) or eat meat once a week (n=102, 32.3%); whereas the case group consumed meat once (n=92, 29.7%) or twice (n=120, 38.7%) weekly (p<0.001). Adding salt to most meals was significantly higher in the case group (p<0.001), and margarine was more commonly used in cooking in the case group (n=70, 22.6%). Another interesting observation was that vegetables were the mostly consumed in the control group (n=192, 61.9%), whereas the patients involved in the study preferred both vegetables and meet (n=100, 32.3%).

The risk factors for gastrointestinal cancers were analyzed by multiple logistic regression test (Table 3). Accordingly, in multivariate analysis, the gender male (odds ratio [95% confidence interval], 1.729 [1.090-2.745], p=0.02), higher age (1.068 [1.045-1.091], p<0.001), low BMI (1.110 [1.050-1.174], p< 0.001), occupation as housewife (4.200 [1.484-11.890], p=0.007), number of children (1.563 [1.277-1.912], p< 0.001),

Table 2 Comparison of demographic characteristics of the case group with the control group (n=620)

Demographic characteristics		Control group (n = 310)	Case group (n = 310)	p value
Gender (Women / Men)		142 (45.8) / 168 (54.2)	101 (32.5) / 209 (67.5)	0.001[a]
Age		50.0±10.0	58.9±12.9	<0.001[d]
BMI		27.0±3.5	25.2±4.7	<0.001[d]
Education	Primary school	49 (15.9)	119 (38.8)	<0.001[b]
	Secondary school	12 (3.8)	31 (10)	
	High school	132 (42.5)	100 (32.3)	
	Higher education	117 (38.8)	60 (19.4)	
Marital status (Single / Married)		36 (11.6) / 274 (88.4)	47 (15.1) / 263 (84.9)	0.519[a]
Occupation	Workman	95 (30.6)	35 (11.3)	<0.001[b]
	Civil servant	85 (27.4)	15 (4.8)	
	Self-employed	49 (15.9)	98 (31.6)	
	Housewife	11 (3.5)	62 (20.0)	
	Retired	70 (22.6)	100 (32.3)	
Children (Number of children)		2 (4-0)	3 (5-0)	<0.001[c]
Family type (Nuclear / Extended)		277 (89.4) / 33 (10.6)	232 (74.8) / 78 (25.2)	<0.001[a]
Smoking (No / Yes)		240 (77.4) / 70 (22.6)	238 (76.8) / 72 (23.2)	0.924[a]
Alcohol use (No / Yes)		253 (81.6) / 57 (18.4)	265 (85.5) / 45 (14.5)	0.233[a]
First degree relative with any cancer (No / Yes)		250 (80.6) / 60 (19.4)	150 (48.4) / 160 (51.6)	<0.001[a]
Chronical disease (No / Yes)		260 (83.9) / 50 (16.1)	140 (45.2) / 170 (54.8)	<0.001[a]
Exercise (No / Yes)		218 (70.3) / 92 (29.7)	221 (71.3) / 89 (28.7)	0.860[a]
Weekly meat consumption	None	92 (27.7)	58 (19.4)	<0.001[b]
	1	102 (32.3)	92 (29.7)	
	2	67 (22.3)	120 (38.7)	
	3 and more	49 (16.5)	40 (12.2)	
Add salt to most meals (No / Yes)		275 (88.7) / 35 (11.3)	233 (75.2) / 77 (24.8)	<0.001[a]
Gallstone (No / Yes)		267 (86.1) / 43 (13.9)	249 (80.3) / 61 (19.7)	0.067[a]
Common oil type in cooking	Olive oil	142 (45.2)	100 (32.3)	<0.001[b]
	Vegetable oil	108 (35.5)	90 (29)	
	Butter	31 (9.7)	25 (16.1)	
	Margarine	29 (9.7)	70 (22.6)	
Mostly consumed food group	Vegetable	192 (61.9)	129 (41.6)	<0.001[b]
	Meat	68 (22.0)	81 (26.1)	
	Both	50 (16.1)	100 (32.3)	
Cola (No / Yes)		280 (90.3) / 30 (9.7)	290 (93.5) / 20 (6.5)	0.184[a]
Tea (Number of cups)		3 (5-1)	2 (10-1)	0.017[c]

Data are given as n (%), mean ± standard deviation (SD) or median (max-min). Statistical analysis was performed with [a] Fisher's exact test, [b] Pearson chi-squared test, [c] Mann-Whitney U test, or [d] Independent T-test. BMI, body mass index.

Table 3 Multiple logistic regression of risk factors in patients with gastrointestinal system tumors

	p value	Odds ratio	95% Confidence Interval	
			Lower	Upper
Gender (Male)	0.020	1.729	1.090	2.745
Age	<0.001	1.068	1.045	1.091
BMI	<0.001	1.110	1.050	1.174
Occupation (Civil servant)	<0.001	0.088	0.031	0.244
Occupation (Housewife)	0.007	4.200	1.484	11.890
Number of children	<0.001	1.563	1.277	1.912
First degree relative with any cancer (Yes)	<0.001	4.444	2.674	7.386
Chronical disease (Yes)	<0.001	6.314	3.708	10.752
Mostly consumed food group (Vegetable)	<0.001	2.923	1.646	5.192

BMI, body mass index.

cancer history in the family (4.444 [2.674-7.386], p<0.001) and the occurrence of other chronic diseases (6.314 [3.708-10.752], p<0.001) were identified as the diagnostic factors for colon and stomach located gastrointestinal cancers. Occupation as civil servant (0.088 [0.031-0.244], p<0.001) and mostly consuming vegetables (2.923 [1.646-5.192], p<0.001) were found to be the factors associated with lower risk for colon and stomach located gastrointestinal cancers (Table 3).

Discussion

The aim of this study was to provide data for potential risk factors that are associated with colon or stomach located gastrointestinal tract cancers. Data to identify potential risk factors were collected from 310 patients diagnosed with gastrointestinal cancers and compared with 310 randomly selected volunteer healthy subjects. Accordingly, the diagnostic factors for gastrointestinal cancers were identified as multiple nonspecific symptoms in clinical manifestation, gender (male), age, education level, occupation, BMI, no helicobacter pylori, number of children, cancer history in the family and the presence of other chronic diseases. Gastrointestinal tract cancers including stomach and colon cancer are known to have a higher incidence rate in males with an increasing cumulative risk up to age 75 years [1,15,18]. Consistent with the literature, in this study, the statistical comparison of the study patients with the healthy subjects indicated a striking dominancy of male patients (67.5% in the case group and 54.2% in the control group) diagnosed with gastrointestinal cancers, and the mean age of patients was 58.9±12.9 years and significantly higher than that of the healthy subjects (50.0±10.0 years). The most common presenting symptom was abdominal pain (25.5%), where most of the study patients suffered from multiple symptoms including bleeding (34.5%). Regarding other factors considered for better diagnosis of gastrointestinal cancers, the data obtained from this study mostly coincided with the literature. Improved sanitation and eradication strategies are known to effectively reduce the incidence of gastric cancer caused by helicobacter pylori [8,12,13,19]; similarly, in this study, a statistically significant proportion of the study patients were tested negative for helicobacter pylori. BMI and education level of the study patients were shown to be negatively related to gastrointestinal cancer occurrence. The incidence of gastrointestinal cancers increased with the increase in the number of children and other chronic diseases. Icli et al. (2011) in their study with 253 Turkish patients with gastric cancer, on the other hand, reported no considerable difference between the groups with respect to three types of chronic diseases, diabetes, hypertension, and arteriosclerotic hearth disease, namely [13]. There are, however, other studies in the literature showing a positive correlation between diabetes and colon cancer [10]. The occupation of the patient is also an important factor for cancer development, since a high stress environment is a well-known risk factor for many cancer types [8,12,16,17]. In this study occupation of a housewife, that is a stay-home women/mother, appeared to have a very high risk with respect to the incidence of gastrointestinal cancers. The results obtained in this study also indicated cancer history in the family as one of the diagnostic factors for gastrointestinal cancer. It is important to note that there is no study in the literature evaluating the correlation of a family medical history on cancer with the occurrence of gastrointestinal cancer, which can be an important factor for early diagnosis. Rinzivillo et al. (2015) have recently showed that family history of colorectal and breast cancer to be risk factors for the development of small intestine neuroendocrine cancers [20]. Although known as significant risk factors for many cancer types [8,11,21,22], in this study, smoking and alcohol habits of both the study patients and healthy subjects were similar without any statistically significant difference; therefore, there was no relationship between smoking or alcohol abuse and the occurrence of gastrointestinal cancers.

Dietary and lifestyle factors are known to be risk factors for the occurrence of many cancer types including gastrointestinal cancers [2,8,11,23-25]. There are many reports in literature identifying high level of salt consumption as a risk factor for cancer development, especially for gastric cancer [2,8,10]. Total meet intake is another important factor for cancer development, since heme iron present in meet can damage DNA and is the main precursor for important carcinogens such as endogenous nitrosamine and free radicals [2,8,12,15,21,26,27]. Vegetables are rich in vitamin C and fiber were shown to have a protective role against cancer in many studies [10,12,14,16,17,26-29]. Studies for the carcinogenic effect of soda and tea consumption, on the other hand, are inconclusive and appear to be dependent on the dosing/frequency and carcinogenic and anti-carcinogenic chemicals present in the food and beverages [8,17,26]. The effect of physical activity, i.e., exercising, is also not clear, since there are contradictory reports in the literature proving either positive or negative effect on the occurrence of cancer [8,11,16]. With its antiangiogenic effect using olive oil for cooking was, on the other hand, reported to be beneficial for cancer [11,15,17]. In this study with 310 patients with stomach and colon located gastrointestinal cancers and 310 healthy subjects, eating meet at most once a week, adding less or no excessive salt to meals, using olive or vegetable oil, but not margarine, for cooking, and preferring vegetables as the main course were significantly more common in the healthy subjects than in the study patients. However, multiple logistic regression tests indicated only the consumption of fewer vegetables or preferring both meat and vegetables for the main course as significant risk factors.

Limitations

There are some limitations in this study. Firstly, the research cannot be generalized to all samples. Lastly, our sample was consisted mostly of people who has colorectal tumors, and the risk factors may differ according to the localization of the tumor. Our suggestion is to plan studies who investigate the risk factors for both colorectal and stomach tumors separately.

Conclusion

This study on investigation of potential risk factors for gastrointestinal cancers evaluated diagnostic factors such as helicobacter pylori and the presence of other chronic diseases, and also explored risk factors such as eating and cooking habits, to provide a broad range of factors to be considered in gastrointestinal cancer patients. The determination of diagnostic factors such as low BMI will enable the identification of asymptomatic patients and early diagnosis of gastrointestinal cancer for better treatment outcomes. In addition, the identification of more vegetable consumption as an important factor for reducing risk of gastrointestinal cancer development is important for self-care measures of the patients. Nurses should also provide counseling to the patients on healthy diet and identify risk factors for gastrointestinal cancer.

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