Dietary Patterns among Colorectal Cancer Patients in Southwest of Iran: A Cross-Sectional Study

Abstract

Aim: To investigate any difference of dietary habits and food groups consumption between colorectal cancer patients and healthy subjects.

Method: In these cross-sectional study 278 patients with colorectal cancer compared with 278 healthy subjects for viewpoint of Energy and nutrient intakes.

Results: Mean age of participants at recruitment was 58.45±8.18 and 57.26±8.86 in colorectal cancer patients and control group, respectively. 54% of each group was female. 66.2% and 62.9% of participants in each group had never been smoker. There was no significant differences between colorectal cancer patients and matched healthy subjects based on demographic and anthropometric characteristics at baseline same as amount of energy intake (P=0.2). Healthy participants in control group consumed significantly ($p<0.05$) more carbohydrate and protein and also less fat (30% versus 32%), more saturated fat (29.22±4.94 vs. 24.1±5.53), less poly unsaturated fatty acid (8.24±4.5 vs 12.84±4.19, respectively) and more cereals in their daily diet in comparison with colorectal cancer patients. Also, they ate significantly more servings of vegetable and fruit as compared to the patients. Consumption of milk and dairy products did not differ significantly between two groups (p=0.07). Meat consumption was significantly ($p<0.05$) more frequent in cancerous group while they consumed significantly ($p<0.05$) less fish and poultry compared to the healthy group. Furthermore, colorectal cancer patients used significantly more confectionary products.

Conclusion: Our data support the hypothesis that consumption of red meat and fat increases the risk of colon cancer while a dietary pattern that is richer in vegetables and lower in red meat reduces risk. This study confirms that in Iranian population suffered by colorectal cancer consume more red meat and fat and less vegetable and fruits similar to western countries.

Keywords: Colorectal cancer; Dietary habit; Body mass index; Waist circumference; Healthy subjects

Conceptual Paper

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Introduction

Colorectal cancer is one of the three most common cancers in the world and also one of the four leading causes of death among cancerous patients with global prevalence [1,2]. This cancer is associated with a high incidence and mortality among developed countries [3]. In Iran, which is located in southwest Asia, colorectal cancer is one of the five most common cancers in both genders and in the Khuzestan province (in the south west of Iran) colorectal cancer is among the eight most common cancers [4]. Genetic and environmental factors are involved in the incidence of colorectal cancer. Nutrition also plays an important role in the incidence and control of this disease. Recent studies have shown that improved eating diet could potentially reduce colorectal cancer up to 70 percent. High-fat meals especially meals rich of saturated animal fat that are common in Western diet increases chances of involvement by this cancer [5].

Fruits and vegetables consumption can play an important role in the prevention of colorectal cancer through inhibited degradation and mutations in DNA due to the presence of compounds such as Phytoestrogens, folate, antioxidant vitamins and protease inhibitors [6]. High rate of red meat consumption increases the risk of cancer because of presence of iron [7]. The cooking method is also important, cooking at high temperatures, and smoking causes compounds such as poly cyclic aromatic hydrocarbons and heterocyclic amines, which are carcinogen [7]. Excessive alcohol consumption and smoking may increase the risk of colorectal cancer through carcinogenic metabolites [8]. Variations in fiber intake may be the reason for differences in the incidence of colorectal cancer in different geographical areas [9]. Fiber can reduce action potential of these factors by dilution and changes in absorption or deletion of carcinogenic factors in intestine and making bile acids bond with these factors [3,5].

To our best knowledge, most of the studies in literature are about dietary patterns among western countries and there are only few studies about diet in Asian countries such as Iran. Current study aimed to investigate the difference of dietary habits and evaluate different food group's consumption between colorectal cancer patients and healthy subjects.

Methods

This cross-sectional study conducted from April 2012 to April 2015. In this study 278 patients with colorectal cancer, who had been referred to the Imam Khomeini and Shafa Hospitals in Ahvaz city, and 278 healthy subjects were allocated and written

informed consent was obtained from each subject. Colon cancers were defined as tumors of the cecum, appendix, ascending colon, hepatic flexure, transverse colon, splenic flexure, descending and sigmoid colon (C18.0-C18.7 as per the 10th Revision of the International Statistical Classification of Diseases, Injury and Causes of Death), and overlapping or unspecified origins of tumors (C18.8 and C18.9). Rectal cancers were defined as tumors occurring at the recto sigmoid junction (C19) or rectum (C20). Anal canal cancers were excluded. Colorectal cancer considered as the combination of the colon and rectal cancer cases. A simple random sampling method was used for subject selection within the age range of 18-75 years old. Subjects with a history of Diabetes, CVD or any other kinds of chronic disease were excluded because of possible disease-related changes in diet. This group was matched for age and sex with healthy subjects as the control group. Patients and healthy subjects were randomly selected from the same area without any systemic disease. We determined the socio-demographic characteristics and lifestyle for each subject. These data were extracted from the general questionnaire through face-to-face interviews carried out by a trained dietitian. The study was approved by the Ahvaz Jundishapur University of Medical Sciences ethics committee (Registration No. ajums. REC.1393.140).

Energy and nutrient intakes were measured by using 3-days 24 h recall (two working days and one weekend day) for all patients. Three-day food & diary form contains foods at every meal or snack and also the consumed amount by each subject. An adjusted validated food frequency questionnaire (FFQ) [10] was completed by trained dietitians to assess the usual food intakes of participants. This was done by face-to-face interviews. Subjects had a choice of reporting their intake either in terms of reference portion size (homemade dishes, cups and teaspoon) or in grams. The participants were asked to indicate consumption of specified food in daily, weekly, monthly, and yearly bases or never. The reported frequency of each food item and beverage was then converted to frequency intake per day. The portion sizes of foods used by subjects were changed to serving size. Then, the serving of each food item were multiplied by the frequency of intake per day to compute the serving of each food intake per day.

Body weight was measured with minimal clothing and without shoes to the nearest 0.1kg using a calibrated portable scale. Height was measured to the nearest 1cm using a stadiometer, while the subject was in a full standing position without shoes. Body mass index (BMI) was calculated as the ratio of weight (kg) to height (m2). Body fat percentage was calculated using bioelectrical impedance analysis (BIA) method (Omron Bf 511, Japan). Waist circumference (WC) was measured at halfway between the lower border of the ribs and the iliac crest in a horizontal plane using a non-stretchable tape to the nearest 1cm. The average daily nutrient intake was calculated by modified Nutritionist IV software (version 3.5.2, First Data Bank; Hearst Corp, San Bruno, California). All anthropometric measurements were assessed by standard methods.

Statistical analysis was conducted using SPSS version 16 statistical software (SPSS Inc, Chicago, Ill). Two sided P values <0.05 were considered statistically significant. Normality of data distribution was assessed by Kolmogorov-Smirnov test. Data with normal or non-normal distribution are reported as mean ± standard deviation or median (25th, 75th percentile), respectively. Comparisons of food groups between colorectal patients and healthy subjects were done by independent t test or Mann-Whitney U test. Differences in proportions were evaluated by $\chi 2$ or Fisher's exact tests.

Results

Table 1 shows Baseline demographic and anthropometric characteristics in colorectal cancer patients and matched healthy subjects. Mean age ± standard deviation (SD) of participants at recruitment was 58.45±8.18 and 57.26±8.86 in colorectal cancer patients and control group, respectively. 54% of each group was female. 66.2% and 62.9% of participants had never been smoking in colorectal cancer and control groups, respectively. Although, mean ± SD of BMI in colorectal cancer patients was 23.92±3.36 versus 24.2±2.95 in control group, there were no significant differences between colorectal cancer patients and matched healthy subjects based on demographic and anthropometric characteristics at baseline (Table 1).

Table 1: Baseline demographic and anthropometric characteristics of colorectal cancer patients and matched healthy subjects.

Characteristics	Colorectal Cancer Cases	Matched Control	P value
Women, n (%)	150 (54)	150 (54)	
Total	278	278	
Age	58.45 ±8.18	57.26 ±8.86	0.1
BMI(kg/m^2)	23.92 ± 3.36	24.2 ± 2.95	0.31
Body fat percentage	27.6 ± 6.08	28.24 ± 6.37	0.64
Waist circumference (cm)	98.07 ± 6.34	96.02 ± 5.6	0.12
Smoking status, n (%)†			0.09
Never	184 (66.2)	175 (62.9)	
Yes	67 (24.1)	86 (30.9)	
Ex-smoker	27 (9.7)	17 (6.1)	
Education level, n (%)†			0.13
None/ Primary	116 (41.7)	94 (33.8)	
Middle School	26 (9.4)	34 (12.2)	
High school	59 (21.2)	54 (19.4)	
University or higher	77 (27.7)	96 (34.5)	
Place of resident, n (%)†			0.3
Urban	241 (86.7)	250 (89.9)	
rural	37 (13.3)	28 (10.1)	

As Table 2 indicates, there was no significant difference between groups in amounts of daily energy intake (p=0.2). Healthy participants in control group consumed significantly (p<0.05) more carbohydrate and protein in their daily diet

in comparison with colorectal cancer patients (Table 2), and also significantly less fat than other group (30% versus 32%, respectively). Cancerous group as compared to the healthy group ate significantly more saturated fat (29.22±4.94 vs. 24.1±5.53, respectively) and less poly unsaturated fatty acid (PUFA) (8.24±4.5 vs. 12.84±4.19, respectively). As indicated in Table 3, healthy subjects consumed significantly ($p<0.05$) more cereals than colorectal cancer patients during a year. Also, they ate significantly more servings of vegetable and fruit as compared to the patients (Table 3). Consumption of milk and dairy products did not differ significantly between two groups ($p=0.07$). Table 3 shows that meat consumption was significantly ($p<0.05$) more frequent in cancerous group while they consumed significantly ($p<0.05$) less fish and poultry compared to the healthy group. Furthermore, colorectal cancer patients used significantly more confectionary products (Table 3).

Table 2: 24-hour food recall, comparison between the amounts of energy and macronutrients consumed by colorectal cancer patients and the healthy subjects.

Parameters	Case	Matched Control	P value
Energy †	1588 (1425, 1728)	1612 (1417, 1748)	0.2
Carbohydrate †‡	51 (44, 54)	54 (48, 60)	< 0.001
Protein †‡	16 (15, 17.25)	17 (15, 20)	0.001
Total fat †‡	32 (29, 37)	30 (25, 31)	< 0.001
Saturated fat (g)	29.22 ± 4.94	24.1 ± 5.53	< 0.001
PUFA (g)	8.24 ± 4.5	12.84 ± 4.19	< 0.001

Data are shown as mean ± standard deviation and analysed by two-sample t test unless otherwise indicated. † Data were analyzed by $\chi 2$ test or Fisher's exact test, BMI: body mass index.

Table 3: Food frequency questionnaire, comparison between the numbers of servings consumed by colorectal cancer patients containing various food groups and the healthy subjects.

Parameters	Case	Matched Control	P value
Cereals	1460 (264, 1825)	1825 (730, 2190)	< 0.001
Vegetables	120 (108, 192)	240 (192, 365)	< 0.001
Fruits	208 (104, 349)	260 (156, 365)	< 0.001
Milk and dairy products	260 (208, 365)	312 (208, 365)	0.07
Meat	156 (108, 208)	84 (60, 120)	< 0.001
Fish	36 (24,48)	48 (36, 72)	< 0.001
Poultry	144 (96,156)	192 (104, 240)	< 0.001
Egg	96 (36, 144)	48 (36, 144)	0.22
Confectionary products	52 (36, 96)	12 (8, 36)	< 0.001

All data are daily amounts and are shown as mean ± standard deviation and analyzed by two-sample t test unless otherwise indicated. † Data are shown as median (25^{th}, 75^{th} percentiles) and tested by Mann-Whitney U test. ‡ % of total energy, PUFA: Poly Unsaturated Fatty Acid.

All data are servings/year and are shown as median (25^{th}, 75^{th} percentiles) and tested by Mann-Whitney U test.

Discussion

This study was designed to assess the difference of various food group's consumption between colorectal cancer patients and healthy subjects in a cross-sectional study. Many components of dietary intake have been associated with colon cancer in several population based case-control and cohort studies [11]. Foods and food groups that have shown some associations with colorectal cancer risk in various studies include fruits and vegetables, meat, dietary fiber, total fat, eggs, dairy products, coffee, tea, and alcohol [12]. A recent meta-analysis of 13 case-control studies found a significant association between total energy and colon cancer, but saturated, monounsaturated and polyunsaturated fat were not associated with colon cancer independent of total energy [13]. In our study, there was no significant difference in daily energy intake between two groups but colorectal cancer patients consumed significantly more saturated fat and less PUFA daily compared to healthy group. Although, the relation between diet and colon cancer has been examined in several studies which have not confirmed any positive association with total energy intake [14,15]. In the LANDMARK 1982 US National Academy of Sciences review of diet, nutrition and cancer [16], decrease in fat intake to 30% of total calories was the primary recommendation to prevent cancers. In our study colorectal cancer patients consumed significantly more fat compared to the healthy subjects (32% of total energy intake). Some studies have considered positive relationships with intakes of fat and risk of colorectal cancer [17]. The Nurses' Health Study demonstrated a nearly twofold higher risk of colon cancer among women in the highest compared to those in the lowest quintile of animal fat intake [14]. As found in our study, colorectal cancer patients ate less vegetable and fruit than healthy subjects. Fernandez et al. [18] demonstrated that vegetable diversity is related to a moderately decreased risk of colorectal cancer, whereas no clear pattern appeared for fruit diversity [18]. Additionally, another study indicated that vegetables had protective effect [19], same as dietary fiber [20]. Also, Slattery indicated that higher intakes of vegetables were associated inversely with colon cancer risk [20]. Terry et al. [21] found that individuals who consume very low amounts of fruit and vegetables have the greatest risk of colorectal cancer and relatively high consumption of cereal fiber does not appear to lower the risk of colorectal cancer [21]. In our study colorectal cancer patients consumed significantly more red meat and less poultry and fish than healthy subjects. In several other reports, it is well known that red meat but not poultry or fish was associated with colorectal cancer risk [18,22]. In a study, consumption of animal products had a minimal effect on colorectal cancer risk [19]. Furthermore in a large cohort study of men, a direct association between red meat consumption and risk of colon cancer was observed [23]. In the large American Cancer Society Cohort, little relation was found between either meat or fat intake and mortality due to colon cancer [15].

One previous study which examined dietary patterns derived from principle-components factor analysis of colon cancer risk indicated that Western-style diet (more red meat and fat) contributes to colon cancer risk and a prudent diet, enriched with vegetables, refined grains, fruits, fish, and poultry, may help prevents colon cancer [19].

Conclusion

In summary, we believe that our evaluation of difference in consumption of various food groups between colorectal cancer patients and healthy people provides insight into eating patterns which could potentially increase and or decrease the risk of

disease. Our data support the hypothesis that consumption of red meat and fat increases the risk of colon cancer while a dietary pattern that is richer in vegetables and lower in red meat reduces risk. This study confirms that in Iranian population suffered by colorectal cancer consume more red meat and fat and less vegetable and fruits similar to western countries.

References

1. Magalhaes B, Peleteiro B, Lunet N (2012) Dietary patterns and colorectal cancer: systematic review and meta-analysis. Eur J Cancer Prev 21(1): 15-23.
2. Jemal A, Siegel R, Ward E, Hao Y, Xu J, et al. (2008) Cancer statistics 2008. CA Cancer J Clin 58(2): 71-96.
3. Lima MC, Gomes da Silva M (2005) Colorectal cancer: lifestyle and dietary factors. Nutr Hosp 20(4): 235-241.
4. Radmard AR (2010) Five common cancers in Iran. Arch Iran Med 13(2): 143-146.
5. Haggar FA, Boushey RP (2009) Colorectal cancer epidemiology: incidence, mortality, survival, and risk factors. Clin Colon Rectal Surg 22(4): 191-197.
6. Chan AT, Giovannucci EL (2010) Primary prevention of colorectal cancer. Gastroenterology 138(6): 2029-2043.
7. Santarelli RL, Pierre F, Corpet DE (2008) Processed meat and colorectal cancer: a review of epidemiologic and experimental evidence. Nutr Cancer 60(2): 131-144.
8. Bongaerts BW, De Goeij AF, Van den Brandt PA, Weijenberg MP (2006) Alcohol and the risk of colon and rectal cancer with mutations in the K-ras gene. Alcohol 38(3): 147-154.
9. Kamangar F, Dores GM, Anderson WF (2006) Patterns of cancer incidence, mortality, and prevalence across five continents: defining priorities to reduce cancer disparities in different geographic regions of the world. J Clin Oncol 24(14): 2137-2150.
10. Shadman Z, Akhoundan M, Poorsoltan N, Larijani B, Qorbani M, et al. (2014) New challenges in dietary pattern analysis: combined dietary patterns and calorie adjusted factor analysis in type 2 diabetic patients. J Diabetes Metab Disord 13(1): 71.
11. Potter JD, Slattery ML, Bostick RM, Gapstur SM (1993) Colon Cancer: A review of the epidemiology. Epidemiol Rev 15(2): 499-545.
12. Potter JD (1996) Nutrition and colorectal cancer. Cancer Causes Control 7(1): 127-146.
13. Howe G (1993) Meeting presentation. In: Advances in the biology and therapy of colorectal cancer. MD Anderson's Thirty-seventh Annual Clinical Conference, MD Anderson Cancer Center, Houston (TX).
14. Willett WC, Stampfer MJ, Colditz GA, Rosner BA, Speizer FE (1990) Relation of meat, fat, and fiber intake to the risk of colon cancer in a prospective study among women. N Engl J Med 323(24): 1664-1672.
15. Thun MJ, Calle EE, Namboodiri MM, Flanders WD, Coates RJ, et al. (1992) Risk factors for fatal colon cancer in a large prospective study. J Natl Cancer Inst 84(19): 1491-1500.
16. Parkin DM, Pisani P, Ferlay J (1999) Estimates of the worldwide incidence of 25 major cancers in 1990. Int J Cancer 80(6): 827-841.
17. Randall E, Nichaman MZ, Contant CF (1985) Diet diversity and nutrient intake. J Am Diet Assoc 85(7): 830-836.
18. Fernandez E, D Avanzo B, Negri E, Franceschi S, La Vecchia C (1996) Diet diversity and the risk of colorectal cancer in northern Italy. Cancer Epidemiol Biomarkers Prev 5(6): 433-436.
19. Slattery ML, Boucher KM, Caan BJ, Potter JD, Ma KN (1998) Eating patterns and risk of colon cancer. Am J Epidemiol 148(1): 4-16.
20. Slattery ML, Potter JD, Coates A, Ma KN, Berry TD, et al. (1997) Plant foods and colon cancer: an assessment of specific foods and their related nutrients (United States). Cancer Causes Control 8(4): 575-590.
21. Terry P, Giovannucci E, Michels KB, Bergkvist L, Hansen H, et al. (2001) Fruit, vegetables, dietary fiber, and risk of colorectal cancer. J Natl Cancer Inst. 93(7): 525-533.
22. La Vecchia C, Negri E, Decarli A, D Avanzo B, Gallotti L, et al. (1988) A case-control study of diet and colo-rectal cancer in Northern Italy. Int J Cancer 41(4): 492-498.
23. Giovannucci E, Rimm EB, Stampfer MJ, Colditz GA, Ascherio A, et al. (1994) Intake of fat, meat, and fiber in relation to risk of colon cancer in men. Cancer Res 54(9): 2390-2397.

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