Dietary Consumption of High Fat and Red Meat is Associated with Colorectal Cancer in the Young - a 5-year Single-center Study

JS Crisostomo MD, KS Ang MD, AO Go, MD

INTRODUCTION

Colorectal cancer (CRC) is the third most common malignancy diagnosed worldwide and ranks as the second leading cause of cancer-related mortality. Global estimates according to the World Health Organization GLOBOCAN database show that there are 1.8 million new CRC cases and 880, 792 CRC-related deaths in 2018, with Asia (Philippines included) being the region with the most number of new cases, 5-year prevalent cases, and deaths.[1]

The current consensus guidelines recommend routine screening for CRC at 50 years old among average risk-individuals and earlier for high-risk individuals.[2] Since its implementation, reductions in overall incidence and CRC-related mortalities have been observed. However, this trend has only been seen among individuals over the age of 50 while the incidence among the younger age population is at a rise of 1.4% annually for colon cancers and 2.4% for rectal cancers. In Europe, an even higher increase in the annual incidence was observed among younger subjects aged 20-29 (7.9% per year from 2004-2016), 30-39 years (4.9% per year from 2005-2016), and 40-49 years (1.6% per year from 2004-2016). [3] Underlying etiological factors for such data are yet to be elucidated.

While genetics, ethnicity, age, and family history are non-modifiable risk factors in CRC, environmental factors such as smoking, alcohol consumption, obesity, and dietary habits require assessment for potential association in its development among younger individuals. Limited studies regarding association of risk factors among young adults and adults with CRC are available and this warrants further investigation as it has impact on policy creation and prevention efforts. This study looks at CRC in the young population (age less than 50 years) and adult patients, presentation at the time of diagnosis, the presence of risk factors and their possible association in the development of the disease.

METHODOLOGY

This was retrospective, single-center, cross-sectional study including patients 20 years old and above diagnosed with colorectal cancer from 2015-2019. The endoscopy unit database was used to search in 5,810 colonoscopies, those patients who were diagnosed with colorectal cancer based on histopathology during the 5-year period. Patients ages 35-45 years who underwent colonoscopy in the same period were also included in the study. Data gathered were gender, indication for colonoscopy and general findings.

The patients with colorectal cancer were divided into 2 groups: the young adults (<50 years) and adults (50 years old and above). Data collected from all patients include gender, age at the time of diagnosis, indication for colonoscopy, findings indicating the location (rectal, left-sided or right-sided) and characteristic of lesion (non-obstructing, partially obstructing and almost/completely obstructing) and histopathologic diagnosis.

Risk factors of all included patients obtained through phone query and interview were as follows: family history of carcinoma, smoking status (never, previous, current), alcohol consumption (never, occasional- less than once a week, frequent- $\geq$ 2x/week), BMI

classification, and dietary consumption of red meat and high fat (frequent- ≥3 servings/week, sometimes ≤1 serving/week). Patients with known colon malignancy who were for surveillance and those with known inflammatory bowel disease were not included.

Statistical analysis

Demographic and clinical characteristics of patients were recorded and summarized using applicable descriptive statistics. Numerical data were summarized using mean and standard deviation. Categorical data were presented as frequencies and percentages. Group means of age were computed and compared using ANOVA. Association of two categorical variables was evaluated using Chi square test. Bivariate analysis was performed to measure the association of having cancer at a younger age and the different exposures by calculating the respective odds ratios. All tests were performed at 5% level of significance.

RESULTS

Study subjects and groups

Of the 5, 810 colonoscopies performed from 2015 to 2019, 256 new cases of CRC were diagnosed, 216 (84%) of which belong to the adult population and 40 (16%) were young adults. Sex profiles of patients with and without cancer within the two age groups were almost the same (Chi-square P-value = 0.364). Colorectal cancer was seen predominantly among young adult males (53%) than females as opposed to the age group beyond 50 years with a mean age of 42 and 66.7 years respectively, at the time of diagnosis. In both groups, the most frequent indication for colonoscopy was hematochezia (45.8%) followed by change in bowel habits in the adult population. (Table 1)

Characteristics of lesion/carcinoma

The lesions in both groups were mostly left-sided (55%) and were non-obstructing at the time of presentation but among the adult population, almost or completely obstructing lesion was also commonly seen.

Table 1: Summary of patient demographics

	w/o Colorectal Ca	w/ Colorectal cancer	
	34-45 y.o. (n=216, %)	**Less than 50 y.o. *(n= 40, %)***	**50 y.o. and above *(n=216, %)***
Gender			
Male	114 (53)	24 (60)	105 (48.6)
Female	102 (47)	16 (40)	111 (51.4)
Age (mean, SD)	41 (±2.9)	42.2 (±6.6)	66.7 (±10.1)
Indication for colonoscopy			
Hematochezia	99 (45.8)	25 (62.5)	99 (45.8)
Change in bowel habit	51 (23.6)	4 (10)	53 (24.5)
Abdominal pain	31 (14.3)	8 (20)	36 (16.67)
Palpable mass		2 (5)	6 (2.78)
Anemia		1 (2.5)	15 (6.9)
Screening	35 (16.2)	-	7 (3.2)
Location of lesion			
Rectum	-	12 (30)	58 (26.8)
Left-sided (splenic flexure, descending, sigmoid, rectosigmoid)	-	22 (55)	120 (55.6)
Right-sided (hepatic flexure, ascending, cecum)	-	6 (15)	38 (17.6)
Characteristic of lesion			
Non-obstructing	-	22 (55)	84 (38.9)
Partially-obstructing	-	6 (15)	49 (22.7)
Almost/completely-Obstructing	-	12 (30)	83 (38.4)
Findings			
Normal	26 (12)		
Hemorrhoidal disease and/or anal fissure	104 (48.1)		
Nonspecific colitis, colonic ulcer	33 (15.3)		
Ileitis, ileal ulcers	8 (3.7)		
Colonic polyp	27 (12.5)		
Diverticulosis	18 (8.3)		
Histopathology			
Adenocarcinoma (moderately-, well-, poorly-differentiated)	-	40 (100)	212 (98)
With mucinous Component	-	-	4 (2)

Table 2: Summary of Risk factors

Characteristics	W/o cancer 35 to 45 yrs (n = 216)		With cancer Below 50 yrs (n = 40)		With cancer 50 yrs and above (n = 216)		P-value
Age*, years	41.0	2.9	42.2	6.6	66.7	10.2	< 0.001**
Sex$							
Male	114	52.8	24	60.0	105	48.6	0.364$$
Female	102	47.2	16	40.0	111	51.4	
Family History$							
With	79	36.6	19	47.5	69	31.9	0.148$$
Without	137	63.4	21	52.5	147	68.1	
Smoking$							
Current	76	35.2	15	37.5	33	15.3	< 0.001$$
Previous	52	24.1	8	20.0	91	42.1	
Never	88	40.7	17	42.5	92	42.6	
Alcohol$							
Frequent	51	23.6	9	22.5	23	10.6	< 0.001$$
Occasional	126	58.3	18	45.0	96	44.4	
Never	39	18.1	13	32.5	97	44.9	
Body Mass Index$							
Underweight	13	6.0	2	5.0	41	19.0	< 0.001$$
Normal	140	64.8	28	70.0	141	65.3	
Overweight	45	20.8	8	20.0	29	13.4	
Obese	18	8.3	2	5.0	5	2.3	
High fat / red meat$							
Frequent	115	53.2	33	82.5	105	48.6	< 0.001$$
Sometimes	101	46.8	7	17.5	111	51.4	

** mean | standard deviation, $ freq | % freq| ** ANOVA,* $$ Chi square test

Risk factors

There was no significant association in terms of family history of cancer within the two age groups. Smoking, alcohol intake, body mass index and high fat/red meat dietary pattern were significantly associated to cancer and/or age of patients. Actual odds ratio values were calculated per variable and summarized in Table 3. Only the odds ratio of high fat / red meat variable showed statistical significance (P-value < 0.001). This implies that the odds of developing colon cancer among the younger adults frequently consuming high fat and red meat are almost five times (OR = 4.9837) compared to those who seldom include these in their diet. The other variables showed odds ratio that is not significantly different from 1 or exposure does not affect the odds of developing colon cancer among the younger adults.

Table 3

Factors	Odds Ratio (95% confidence interval)			P-value
	Point	Lower	Upper	
Gender (reference: female)	1.5857	0.7981	3.1506	0.188
Family history	1.9275	0.9733	3.8174	0.059
Smoking	1.0038	0.5073	1.9862	0.991
Alcohol	1.6930	0.8291	3.4570	0.148
Body Mass Index	1.7843	0.7986	3.9867	0.158
High fat / red meat	4.9837	2.1128	11.7554	**< 0.001**

Discussion

Colorectal cancer has an increasing incidence particularly in the young adult population worldwide and underlying etiological factors remain to be established. This study reports the presence and absence of common risk factors in colon cancer among young adults and adults. The predominant risk factor in the young adults was frequent consumption of red meat and high fat diet. Most of the patients in both age groups had no family history of CRC probably owing to the vast majority of sporadic cases seen across all populations.

It is true that CRC is traditionally a disease affecting people over the age of 50. However, it has been documented in several researches that the incidence of this disease is continuously growing in the young adult population. In one study, the largest increase in CRC incidence was among subjects aged 20-39 and is expected to rise annually.[2] The causes of this increase are still unknown.

The presence of non-modifiable and exogenous risk factors is a key consideration on whom to screen early in adults. Red meat consumption and diet rich in saturated/animal fats have been demonstrated to have positive association among Asians in a systematic review. This study was able to find out that frequent consumption of red meat/high fat had a positive correlation with CRC in the young adult population (RR= 4.98 $\geq$ 3 servings/wk, 95% CI: 2.11-11.76). This was compatible to the findings in a meta-analysis of CRC risk factors with RR= 1.13 >5 servings/wk 95% CI 1.09-1.16.

The subjects are obtained from a single center and may not be representative of the actual burden of CRC in the young in the local setting and may in fact be an underestimate of the general population. An extensive research may be valuable in creating validated risk calculators that can be utilized in clinical practice in selecting candidate patients for screening colonoscopy. Moreso, if the increasing incidence of CRC can be reversed by means of lowering the age to start screening.

In conclusion, this study has found out that dietary consumption of high fat and red meat is an independent risk factor colorectal cancer in the young but this finding still needs to be strengthened because can impact possible shifts in screening policies.

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